City of Milwaukee

Department of Public Works

Infrastructure Services Division Facilities Development & Management Section

EECBG,
MPS SOLAR ELECTRIC AND WATER HEATING PROJECTS

(SITE NO. 12) BAY VIEW H.S. - 2751 S. LENOX STREET
(SITE NO. 29) RIVERSIDE H.S. – 1615 E. LOCUST STREET
Milwaukee, Wisconsin

February, 2012

Project Number AR1500310020
Official Notice No. 37

CITY OF MILWAUKEE, WISCONSIN

DEPARTMENT OF PUBLIC WORKS

INFRASTRUCTURE SERVICES DIVISION

FACILITIES DEVELOPMENT &
MANAGEMENT SECTION

PROJECT MANUAL

GOVERNING THE

EECBG, MPS SOLAR ELECTRIC AND WATER HEATING PROJECTS

(SITE NO. 12) BAY VIEW H.S. - 2751 S. LENOX STREET

(SITE NO. 29) RIVERSIDE H.S. – 1615 E. LOCUST STREET

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CITY OF MILWAUKEE
GENERAL OFFICIAL NOTICE
TO CONTRACTORS

Separate sealed bids for each project will be received until 10:30 A.M. of the bid opening date at which time bids will be publicly opened and read for furnishing all material and doing all work for each project in accordance with the requirements of the respective Official Notice on the bid form furnished in accordance with plans, specifications, contract documents, and proposed form of contract on file in the office of the Department of Public Works, Municipal Building, 841 N. Broadway, Room 506, Milwaukee, Wisconsin, 53202.

PROSPECTIVE BIDDERS ARE TO CAREFULLY EXAMINE AND REVIEW ALL CONTRACT DOCUMENTS AND MATERIALS IN SAID OFFICE BEFORE SUBMITTING BID.

AFFIDAVITS OF NO INTEREST MUST ACCOMPANY THE BIDS, AND THE FAILURE OF PROSPECTIVE BIDDERS TO COMPLY WITH THESE REQUIREMENTS MAY DISQUALIFY THE BID.

THE CONTRACTOR/LESSEE AGREES TO COMPLY WITH ALL APPLICABLE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT OF 1990, 42 U.S.C. § 12101, ET. SEQ. THE TDD NUMBER FOR PUBLIC WORKS IS (414) 286-2025.

As part of the bid each bidder shall submit a list of anticipated subcontractors and the class of work to be performed by each, which list should not be added to nor altered without the written consent of the Commissioner of Public Works.

All contractor(s) and subcontractor(s) are required to furnish or have on file a certificate of insurance in accordance with the insurance provisions of the General Specifications.

All contractor(s) and subcontractor(s) are subject to the prevailing wage rates and hours of labor as prescribed by the Common Council of the City of Milwaukee consistent with provisions of Section 66.293 of the Wisconsin Statutes.

Copies of the actual work classifications and wage and fringe benefit rates enforced on this project are available in Room 506 of the Municipal Building.

Corporate surety will be required on performance and payment bonds for all projects listed in the following Official Notices. All applicable charter and Statutory provisions and ordinances, all the provisions of this official notice, invitation to bid, general and detailed specifications, special provisions, proposal, schedule of fixed prices, addendum and plans for this project and all other contract documents set forth in the invitation to bid will be incorporated and made part of the contract as if therein set forth in full.

Tie bids, when the lowest ones, will be decided by the Commissioner of Public Works.

The Commissioner of Public Works reserves the right to reject any or all bids.

Signed: GHASSAN KORBAN,
Commissioner of Public Works

Countersigned: MICHAEL J. DAUN,
City Deputy Comptroller

CITY OF MILWAUKEE
SPECIFIC OFFICIAL NOTICE NO. 37

Important Notice:

The Invitation to Bid, all bid documents and the Plans & Specifications for the project listed will be available electronically to prospective bidders via http://www.mpw.net/bids/docs/37-2012. Any required addenda or responses related to the listed projects will be posted on said website. Bidders are encouraged to utilize this electronic method of obtaining bid documents as the Department of Public Works intends to solely use this method for future projects. At this time however, a limited number of hard copies of the above documents will also be available at address listed below. IF YOU ONLY PRINT THE DOCUMENTS FROM THE WEBSITE AND WOULD LIKE YOUR COMPANY'S NAME PLACED ON THE PLAN HOLDERS' LIST, PLEASE CALL 414-286-3314.

Sealed bids will be opened on Monday, March 12, 2012 at 10:30 A.M. for the **EECBG MPS SOLAR ELECTRIC AND WATER HEATING PROJECTS**, **located at (Site No. 12) Bay View H.S., 2751 S Lenox St (Site No. 29) and Riverside H.S., 1615 E. Locust St., Milwaukee, WI.**

Bid Security Required: Bond, Certified Check, Cashier's Check, or Cash to accompany bid: 10% of Contractor's Base Bid

Time for Completion: All work on this project shall be completed by Thursday, May 31, 2012. Contractor shall begin immediately upon contract award (Notice to Proceed)

Liquidated Damages, per diem: $399.00

The MWSBE requirement for this project is 0% of the contract base bid.

The residency requirement for this project is 0% of all hours worked on the project.

The apprenticeship requirements for this project are: N/A

The contractor shall specifically note the MWSBE, residency, and apprenticeship forms for this project. If the forms are not filled out properly, it will be cause for rejection of the bid.

Plans and project manual will be furnished to the prospective bidders upon payment of a $10.00 non-refundable fee in room 506, Frank P. Zeidler Municipal Building, 841 North Broadway, Milwaukee, Wisconsin 53202. For general questions call 414-286-3314.

A $10.00 per set additional non-refundable fee is required to obtain bid documents by mail. Plans are sent via U.S. mail unless other arrangements are made by the contractor.

Contractor must comply with all provisions of the CITY OF MILWAUKEE GENERAL OFFICIAL NOTICE TO CONTRACTORS published herein and at http://mpw.milwaukee.gov/services/bids_home

Pre-Bid Meeting: A Pre-Bid Meeting is scheduled for **Monday, March 05, 2012, at 2:00 p.m.** in Room 606 of the Frank P. Zeidler Municipal Building, 841 North Broadway, Milwaukee, Wisconsin. Bidder participation is urged to become familiar with all aspects of the project and bidding requirements.

NOTE: This is a Federally Funded (Department of Energy) Project Financed by the Energy Efficiency & Conservation Block Grant Program (EECBG) and successful bidder must adhere to all regulations of the American Recovery & Reinvestment Act of 2009.

Buy American Act
The project is funded by the American Recovery and Reinvestment Act of 2009 and, as such, is subject to the Buy American provisions in the law. The Buy American Act requires the use of domestically

produced materials.

Davis Bacon Act
Bidders are notified labor undertaken utilizing this funding is subject to the prevailing wage, certified weekly payroll, and all other requirements of the Davis-Bacon Act. Davis Bacon Building Wage rates and the Prevailing Wage Rate Determination shall both apply to this project. Contractor or subcontractor shall be paid no less than the higher of the two wage rate scales.

Signed:

_____
GHASSAN KORBAN
Commissioner of Public Works

SECTION 00100: INSTRUCTIONS TO BIDDERS

See also Instructions to Bidders in the "General Specifications" of the Department of Public Works, City of Milwaukee, Wisconsin, dated January 31, 1992, and all subsequent addenda.

BID FORM:

Submit a lump sum price for the work as indicated on the drawings and specified herein, complete in every respect.

Bids will not be accepted in any form except on the bid form included with this project manual.

The contractor must recognize and abide by the right of the Owner (City of Milwaukee) to accept or reject any or all bids in the best interests of the City.

BASE BID:

Furnishing all material and doing all the work necessary and required for the EECBG, MPS Solar Electric and Water Heating Projects located at (Site No. 12): Bay View H.S.-2751 S. Lenox St. and (Site No. 29) Riverside H.S.-1615 E. Locust St.**,** all in accordance with the plans and project manual.

BASE BID: To consist of:

A. Provide an approximate 2500 therms/year non-residential solar water heating system at Bay View High School which consists of the four rows of panels shown for the southwest and northwest side of the building and all required piping, pumps, tanks, etc. as illustrated in the plans and specifications.

B. Provide an approximate 9,946 kWh photovoltaic non-residential solar electric system at Riverside University High School which consists of the two rows panels (Strings 1, 2, 3 and 4) shown on the Gym roof of the building and all required wiring and controls, etc. as illustrated in the plans and specifications.

ALTERNATES:

Each bidder shall examine the plans and project manual thoroughly to determine what extent the Alternate will affect the bid.

ALTERNATE BID 1: Deduct approximately ½ of the non-residential solar water heating system at Bay View High School shown for the Base Bid. System will now provide an approximate 1250 therms/year non-residential solar water heating system and consist of the two rows of panels shown for the northwest side of the building and all required piping, pumps, tanks, etc. as illustrated in the plans and specifications.

ALTERNATE BID 2: Deduct approximately ½ of the non-residential solar electric system at Riverside University High School shown for the Base Bid. System will now provide an approximate 4,973 kWh photovoltaic non-residential system at Riverside University High School which consists of one row (String 1 and 2) shown on the Gym roof of the building and all required wiring and controls, etc. as illustrated in the plans and specifications.

ALTERNATE BID 3: Deduct the non-residential solar water heating system at Bay View High School shown for the Base Bid.

ALTERNATE BID 4: Deduct the non-residential solar electric system at Riverside University High School shown for the Base Bid.

CONTRACT AWARD:

The Commissioner of Public Works will award the contract on the basis of the Base Bid only or the Base Bid and the Deductive Alternate as selected, and as funds permit.

CONTRACT BREAKDOWN:

Shortly after the award of the contract, each contractor shall submit a list showing the cost breakdown of the items in his contract. This list will be used as a basis for estimates of work completed for partial payment.

SITE VISIT:

All contractors shall visit the site, consult the drawings and project manual, be familiar with the work of other contractors and determine for himself all conditions affecting the work.

Failure by a contractor to be familiar with the project shall not release him from any obligation under this contract to complete the work in strict conformity with the plans and project manual and all City, State and Federal Codes or regulations pertaining to the work.

TIME FOR COMPLETION:

The time allowed for completion is stated in the Specific Official Notice and shall start with the date on the Notice to Proceed which will be sent to the contractor directly following the signing of the contract. The time allowed includes time required for fabricating and procuring material and doing the work at the building site.

ADDITIONAL PLANS/PROJECT MANUALS

The successful contractor will be responsible for furnishing all additional copies of plans, project manuals, addenda, etc., as may be needed by the contractor and subcontractors. The City will cooperate by making originals available to the contractor's printer of choice.

NOTE: This is a Federally Funded (Department of Energy) Project Financed by the Energy Efficiency & Conservation Block Grant Program (EECBG) and successful bidder must adhere to all regulations of the American Recovery & Reinvestment Act of 2009.

Buy American Act
The project is funded by the American Recovery and Reinvestment Act of 2009 and, as such, is subject to the Buy American provisions in the law. The Buy American Act requires the use of domestically produced materials.

Davis Bacon Act
Bidders are notified labor undertaken utilizing this funding is subject to the prevailing wage, certified weekly payroll, and all other requirements of the Davis-Bacon Act. Davis Bacon Building Wage rates and the Prevailing Wage Rate Determination shall both apply to this project. Contractor or subcontractor shall be paid no less than the higher of the two wage rate scales.

SECTION 00700: GENERAL CONDITIONS

1. SCOPE:

A. Index:

1. Scope
2. DPW General Specifications
3. Definitions
4. Control of Work and Materials
5. Samples and Tests
6. Project Coordination
7. Supervision of Work
8. Technical Specifications and Drawings
9. Safety Regulations
10. Code Rules
11. Standard Terms and Conditions for Contracts and Grants Using ARRA Funds

2. Department of Public Works General Specifications:

Provisions of the Department of Public Works General Specifications dated January 31, 1992, and subsequent addenda except as may be modified or expanded upon in this project manual, shall apply to all contractors and subcontractors working on the project. Copies of the General Specifications may be obtained from the Department of Public Works General Office, Room 501 Zeidler Municipal Building, 841 North Broadway, Milwaukee, Wisconsin, or from the Buildings & Fleet Services, Room 602, Zeidler Municipal Building.

3. Definitions:

A. Owner: City of Milwaukee.

B. Facilities Manager: The Facilities Manager of FACILITIES DEVELOPMENT AND MANAGEMENT SECTION.

C. Project Inspector: The authorized representative of the Commissioner assigned to make detailed inspection of any or all portions of the work and materials thereof. These inspections are not a substitute to those required by the Department of Neighborhood Services for permit and code compliance.

D. Addenda: Written or graphic instruments issued prior to the execution of the contract which modify or interpret the bidding documents, including drawings and project manual by additions, deletions, clarifications or corrections. Addenda will become part of the contract documents when the contract is executed.

E. Contract Drawings: Drawings of the work to be done as listed hereafter in Section 00850 Drawing Schedule and/or Section 00870 Plans and Details.

F. Utility: WE Energies.

G. End User: City of Milwaukee

4. Control of Work and Materials:

A. Detail and Shop Drawings: Shop drawings and other additional drawings which may be required for each contract of the work shall be prepared by each respective contractor unless otherwise directed by the Facilities Manager. Prints shall be the same size as contract documents when practical. Prints of each drawing shall be submitted to the Facilities Manager for approval before proceeding with the work. Changes ordered by the Facilities Manager shall be made and revised prints submitted as above. The Facilities Manager's approval of drawings shall not relieve the contractor of responsibility for errors.

B. Primary Lines and Grades: The City of Milwaukee will mark two building corners along a line and will establish a benchmark, with a relative elevation, within close proximity to the site. Once established by the City, the contractor shall preserve all points and benchmark as long as needed during construction. The contractor will bear all costs associated with re-establishing points and benchmark.

C. Construction Lines and Grades: The contractor must bear sole responsibility for the correct transferal of all construction lines and grades from the primary lines and grades points. He shall take such measurements from existing work as may be necessary to insure the proper construction of his work.

D. Material Orders and Shipping Statements: The contractor shall furnish to the Facilities Manager at least two (2) copies of all material orders and shipping statements. Itemized weights of the materials and individual units of finished work shall be shown.

E. Weighing of Materials and Fabricated Units: The weighing of materials and fabricated units such as structural steel, casings, etc., when required, shall be done in the presence of the Commissioner's representative. The contractor shall be responsible for the satisfactory weighing of such materials and units.

F. Consignment and Delivery of Materials: The materials for the work shall be consigned to the contractor and he shall be responsible for the delivery of all materials required for the completion of the contract.

5. Samples and Tests:

A. Method of Sampling: Samples of the materials proposed or furnished for the work may be taken by the Commissioner at any time; at the point of manufacture, point of delivery or site of work. They will be selected, as far as practicable, in accordance with standard methods of sampling such materials as specified in the standard of the American Society for Testing Material. All sampling shall be done by authorized representatives of the Commissioner. Selections will be in an orderly and systematic manner, insuring samples representative of the lot.

B. A.S.T.M. Standards: Wherever the abbreviation A.S.T.M. is used in connection with the number of a standard specification, the specification referred to shall be the Standard of the American Society for Testing Materials, designated by that number, including all revisions in effect on the date of award of the contract. Should a revised or amended standard be issued by the American Society for Testing Materials which, in the opinion of the Commissioner, conflicts with or causes undesirable changes in the standards referred to herein, the Commissioner reserves the right, by means of addenda to the project manual, to continue under the provisions of the pertinent standard referred to herein.

C. Cost of Test Specimens and Samples: All test specimens of metals and all samples of non-metals required for tests shall be furnished by the contractor without cost to the City.

D. Costs of Tests: All tests on test specimens of metals will be made at the expense of the contractor and the original test on samples of non-metals will be made at the expense of the City. In all cases, the testing procedure will be in accordance with Standard A.S.T.M. tests for such materials. Subsequent tests of non-metals requested by the contractor, when such tests are permitted by A.S.T.M. Specifications and approved by the Commissioner or subsequent tests ordered by the Commissioner will be made at the expense of the contractor.

6. Project Coordination:

A. Contractors are required, so far as possible, to arrange work and to dispose of materials so as not to interfere with the work or storage of materials of other contractors or City forces engaged upon the work.

B. Contractors shall give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

C. Where the work of a contractor will be installed in close proximity to the work of other trades, or where there is evidence that the work of a contractor will interfere with the work of other trades, he shall assist in working out space conditions to make satisfactory adjustments.

D. If a contractor installs work before coordinating it with other trades or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the condition without extra charge.

E. Contractors are required to join their work to that of others in a proper manner, and in accordance with the spirit of the plans and project manual, and to perform the work in the proper sequence in relation to that of other contractors, and as may be directed by the Project Inspector.

7. Supervision of Work:

A. Contractors shall furnish the services of an experienced engineer or superintendent.

B. He shall be constantly in charge of the installation of the work together with all subcontractors, skilled workers, helpers, and labor required to unload, transfer, erect, connect up, adjust, start, operate and test each system.

C. He shall be thoroughly acquainted with and be responsible for the various subcontractors' work so that it is properly coordinated and supervised to the satisfaction of the Commissioner of Public Works or his representative.

D. Upon written notice to a contractor of the lack of such coordination and supervision, the Commissioner of Public Works may authorize such services as may be required and deduct the cost of this service at an hourly rate of $60.00 per hour per worker from the contract for the work.

8. Technical Specifications and Drawings:

A. Governing order of Contract Documents:

1. The following provision modifies DPW General Specifications Item 2.1.3.1:

Anything mentioned in the Technical Specifications and not shown on the drawings or

shown on the drawings and not mentioned in the Technical Specifications, shall be as if shown on or mentioned in both. In case of difference between drawings and Technical Specifications, the Technical Specifications shall govern. In case of any discrepancy in drawings or Technical Specifications, the matter shall be immediately submitted to Buildings & Fleet Services for decision. Said discrepancy shall not be adjusted by the contractor.

B. All contractors shall have complete sets of plans and project manuals on the job site at all times.

9. Safety Regulations:

All work shall be done in accordance with the safety requirements referenced in the International Building Code, as adopted and amended by the State of Wisconsin and OSHA.

10. Code Rules:

The rulings, regulations and laws of the following shall be complied with in the completion of this project:

IBC Existing Building Code, as amended and adopted by the State of Wisconsin (Renovations/Remodeling)
International Building Code, as amended and adopted by the State of Wisconsin (New Construction)
Plumbing and Drainage Codes of the City of Milwaukee
Ordinances of the City of Milwaukee
National Board of Fire Underwriters
OSHA
NFPA
FAA
NEC
IEEE
UL

Rev. 3/04

11. Standard Terms and Conditions for Contracts and Grants Using ARRA Funds (Energy Efficiency and Conservation Block Grant Program)

10 CFR chapter 600.236, “Procurement”, Section (i) “Contract Provisions”, numbers 1-13

(i) Contract provisions. A grantee's and subgrantee's contracts must contain provisions in paragraph (i) of this section. Federal agencies are permitted to require changes, remedies, changed conditions, access and records retention, suspension of work, and other clauses approved by the Office of Federal Procurement Policy.

(1) Administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate. (Contracts more than the simplified acquisition threshold)

(2) Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be effected and the basis for settlement. (All contracts in excess of $10,000)

(3) Compliance with Executive Order 11246 of September 24, 1965, entitled “Equal Employment Opportunity,” as amended by Executive Order 11375 of October 13, 1967, and as supplemented in

Department of Labor regulations (41 CFR chapter 60). (All construction contracts awarded in excess of $10,000 by grantees and their contractors or subgrantees)

(4) Compliance with the Copeland “Anti-Kickback” Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR Part 3). (All contracts and subgrants for construction or repair)

(5) Compliance with the Davis-Bacon Act (40 U.S.C. 276a to 276a–7) as supplemented by Department of Labor regulations (29 CFR Part 5). (Construction contracts in excess of $2000 awarded by grantees and subgrantees when required by Federal grant program legislation)

(6) Compliance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327–330) as supplemented by Department of Labor regulations (29 CFR Part 5). (Construction contracts awarded by grantees and subgrantees in excess of $2000, and in excess of $2500 for other contracts which involve the employment of mechanics or laborers)

(7) Notice of awarding agency requirements and regulations pertaining to reporting.

(8) Notice of awarding agency requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.

(9) Awarding agency requirements and regulations pertaining to copyrights and rights in data.

(10) Access by the grantee, the subgrantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.

(11) Retention of all required records for three years after grantees or subgrantees make final payments and all other pending matters are closed.

(12) Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15). (Contracts, subcontracts, and subgrants of amounts in excess of $100,000).

(13) Mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94–163, 89 Stat. 871).

SECTION 00821: INSPECTION CHARGES

The contractor will be charged a fee for inspection for each and every day such inspection is required after the time allowed for completion has expired.

The amount of the fee for inspection shall be $325.00 per day.
Rev. 2/08

The time allowed for completion is stated in the Specific Official Notice and shall start with the date on the Notice to Proceed which will be sent to the contractor directly following the signing of the contract. The time allowed includes the time required for fabricating and procuring material and doing the work at the building site.

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: 201200107

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 MILWAUKEE

PROJECT LOCATION: MILWAUKEE CITY, MILWAUKEE COUNTY, WI

CONTRACTING AGENCY: CITY OF MILWAUKEE-DEPT OF PUBLIC WORKS

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	33.43	19.31	52.74
102	Boilermaker	31.09	21.87	52.96
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): Add $.50 on 6/01/2012; Add $1.45/hr on 6/01/2013 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.	35.58	16.37	51.95
104	Cabinet Installer	29.06	15.16	44.22
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
106	Carpet Layer or Soft Floor Coverer	31.68	18.55	50.23
107	Cement Finisher	30.87	16.33	47.20
108	Drywall Taper or Finisher Future Increase(s): Add $2.20/hr on 6/1/2012	28.97	17.74	46.71
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
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	27.00	0.00	27.00
112	Fire Sprinkler Fitter	36.82	19.03	55.85
113	Glazier	32.25	16.20	48.45
114	Heat or Frost Insulator	33.28	22.45	55.73

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
115	Insulator (Batt or Blown)	23.62	11.55	35.17
116	Ironworker	31.31	21.54	52.85
117	Lather	31.68	18.41	50.09
118	Line Constructor (Electrical)	35.97	18.08	54.05
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	35.53	15.92	51.45
121	Metal Building Erector	21.05	7.82	28.87
122	Millwright	28.30	23.29	51.59
123	Overhead Door Installer	26.53	0.00	26.53
124	Painter Future Increase(s): Add $2.20/hr on 6/1/2012. Premium Increase(s): Add $.20/hr for paperhanging; Add $.35/hr for bridge, iron and drywall; Add $.75/hr for spraying and sandblasting; Add $.60/hr for EIFS work; Add $1.00/hr for lead based paint removal.	28.97	17.74	46.71
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	28.11	23.94	52.05
127	Pipeline Fuser or Welder (Gas or Utility)	30.52	18.84	49.36
129	Plasterer	20.13	1.03	21.16
130	Plumber	36.97	17.47	54.44
132	Refrigeration Mechanic	37.21	19.04	56.25
133	Roofer or Waterproofer Future Increase(s): Add $.50/hr. effective 06/01/2012	29.40	15.05	44.45
134	Sheet Metal Worker	37.20	16.37	53.57
135	Steamfitter	38.26	19.49	57.75
137	Teledata Technician or Installer Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year’s Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	24.65	15.67	40.32
138	Temperature Control Installer	29.63	19.17	48.80
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
141	Tile Finisher	23.76	16.05	39.81
142	Tile Setter	29.95	15.64	45.59
143	Tuckpointer, Caulker or Cleaner	34.30	15.55	49.85
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
147	Siding Installer	36.60	16.37	52.97
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	27.42	15.10	42.52
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	32.32	16.75	49.07
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	33.32	17.60	50.92
205	Pavement Marking Vehicle	19.25	10.84	30.09
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 Premium Increase(s): Add $.11 for mortar mixer, fork lift operator, air and electric equipment and power buggy operators; Add $.22 for jackhammer operator, certified welder, gunite machineman.	28.82	15.61	44.43
302	Asbestos Abatement Worker	21.58	17.83	39.41
303	Landscaper	12.50	2.20	14.70
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	19.14	15.53	34.67
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased) Premium Increase(s): DOT PREMIUMS: Pay two times the hourly basic rate on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	17.24	15.00	32.24
314	Railroad Track Laborer	17.00	1.06	18.06

HEAVY EQUIPMENT OPERATORS
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY

CODE	Fringe Benefits Must Be Paid On All Hours Worked 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).	32.32	18.18	50.50
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).	33.32	17.60	50.92

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	32.32	17.59	49.91
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
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. Premium Increase(s): Crane Operators with CCO certification add $.50/hr. Cranes with boom length over 200 ft. not exceeding 300 ft. OR lifting capacity over 200 ton not exceeding 300 ton add $.50/hr. Over 300 ton OR 300 ft. add $.01/hr. per foot OR ton whichever is greater.	39.16	19.10	58.26

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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). Premium Increase(s): Crane Operators with CCO certification add $.50/hr.	38.66	19.10	57.76
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). Premium Increase(s): Crane Operators with CCO certification add $.50/hr.	38.16	19.10	57.26
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). Premium Increase(s): Crane Operators with CCO certification add $.50/hr.	38.16	19.10	57.26
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.	37.47	19.10	56.57

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	30.44	19.10	49.54
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).	31.26	17.40	48.66
516	Fiber Optic Cable Equipment	25.74	15.85	41.59

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

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	35.53	15.92	51.45
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.	27.14	19.22	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	27.00	0.00	27.00
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	28.11	23.94	52.05
130	Plumber	36.18	16.86	53.04
135	Steamfitter	35.81	19.04	54.85
137	Teledata Technician or Installer	24.65	15.17	39.82

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	34.30	15.55	49.85
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	27.42	15.10	42.52
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	17.54	13.41	30.95
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	17.54	13.41	30.95

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 $1.73/hr on 6/4/2012. Premium Increase(s): Add $1.92 for bottomman; Add $2.03 for concrete manhole builder, bracer, jointman, or pipelayer; Add $4.83 for blaster. Add $2.00 for all tunnel work under 15 lbs. compressed air; Add $2.00 for 0-30 lbs. compressed air; Add $3.00 for over 30 lbs. compressed air.	27.72	15.61	43.33

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
303	Landscaper	12.50	2.20	14.70
304	Flagperson or Traffic Control Person	22.50	12.90	35.40
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.09	14.40	31.49
314	Railroad Track Laborer	17.00	1.06	18.06

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. Premium Increase(s): Crane Operators with CCO certification add $.50/hr. Cranes with boom length over 200 ft. not exceeding 300 ft. OR lifting capacity over 200 ton not exceeding 300 ton add $.50/hr. Over 300 ton OR 300 ft. add $.01/hr. per foot OR ton whichever is greater.	39.16	19.10	58.26
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 $2.05/hr on 6/4/2012. Premium Increase(s): Add $.25/hr for operating tower crane.	33.91	18.55	52.46

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 $2.05/hr on 6/4/2012. Premium Increase(s): Add $.25/hr for operating tower crane.	32.96	18.55	51.51
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	18.12	49.01
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 $2.05/hr on 6/4/2012. Premium Increase(s): Add $.25/hr for operating tower crane.	30.51	18.55	49.06
526	Boiler (Temporary Heat); Forklift; Greaser; Oiler.	29.44	18.10	47.54
527	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 $
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
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

Fringe Benefits Must Be Paid On All Hours Worked

CODE	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 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.	29.33	17.03	46.36
109	Electrician	31.64	23.78	55.42
111	Fence Erector	35.62	0.00	35.62
116	Ironworker	31.31	21.54	52.85
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	27.87	14.39	42.26
125	Pavement Marking Operator	27.87	14.39	42.26
126	Piledriver Premium Increase(s): Add $.65/hr for Piledriver Loftsman; Add $.75/hr for Sheet Piling Loftsman. DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	29.56	24.96	54.52
133	Roofer or Waterproofer	28.85	14.60	43.45
137	Teledata Technician or Installer	24.65	15.17	39.82
143	Tuckpointer, Caulker or Cleaner	34.30	15.55	49.85
144	Underwater Diver (Except on Great Lakes)	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 $
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	33.87	16.10	49.97
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 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	24.91	15.63	40.54
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	23.84	14.70	38.54
206	Shadow or Pilot Vehicle	24.76	15.35	40.11
207	Truck Mechanic	24.91	15.63	40.54

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 $.15/hr for air tool operator, joint sawer and filler (pavement), vibrator or tamper operator (mechanical hand operated), chain saw operator and demolition burning torch laborer; Add $.35/hr for bituminous worker (raker and luteman), formsetter (curb, sidewalk and pavement) and strike off man; Add $.50/hr for line and grade specialist; Add $.65/hr for blaster and powderman; Add $2.01/hr for topman; Add $2.46/hr for bottomman; Add $3.23/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).	24.34	17.85	42.19
302	Asbestos Abatement Worker	22.00	16.86	38.86
303	Landscaper	23.71	15.03	38.74
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.	20.83	17.85	38.68
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.09	14.40	31.49
314	Railroad Track Laborer	17.00	1.06	18.06

HEAVY EQUIPMENT OPERATORS
AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION

Fringe Benefits Must Be Paid On All Hours Worked

CODE	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.	24.39	15.45	39.84
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	35.53	15.92	51.45
105	Carpenter	29.06	15.16	44.22
107	Cement Finisher	27.57	16.33	43.90
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	27.00	0.00	27.00
116	Ironworker	31.31	21.54	52.85
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	28.47	16.74	45.21
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	28.11	23.94	52.05
133	Roofer or Waterproofer	28.85	14.60	43.45
137	Teledata Technician or Installer	24.65	15.17	39.82
143	Tuckpointer, Caulker or Cleaner	34.30	15.55	49.85
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	28.78	14.42	43.20
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	20.00	6.00	26.00
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	20.00	6.00	26.00

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	21.73	17.04	38.77
303	Landscaper	22.96	15.37	38.33
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
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.09	14.40	31.49
314	Railroad Track Laborer	17.00	1.06	18.06

HEAVY EQUIPMENT OPERATORS
CONCRETE PAVEMENT OR BRIDGE WORK

Fringe Benefits Must Be Paid On All Hours Worked

CODE	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.	31.89	18.22	50.11
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

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	24.39	15.45	39.84
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.	38.06	18.10	56.16

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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
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.	31.52	17.50	49.02

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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. 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
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.	24.39	15.45	39.84

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

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	27.00	1.16	28.16
102	Boilermaker	31.09	21.87	52.96
103	Bricklayer, Blocklayer or Stonemason	26.22	13.80	40.02
104	Cabinet Installer	26.00	2.33	28.33
105	Carpenter	31.68	7.03	38.71
106	Carpet Layer or Soft Floor Coverer	21.40	6.01	27.41
107	Cement Finisher	28.00	10.10	38.10
108	Drywall Taper or Finisher Future Increase(s): Add $2.20/hr on 6/1/2012	28.97	17.74	46.71
109	Electrician	31.10	6.01	37.11
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	17.64	4.66	22.30
112	Fire Sprinkler Fitter	36.39	16.97	53.36
113	Glazier	36.23	8.04	44.27
114	Heat or Frost Insulator	29.04	19.73	48.77
115	Insulator (Batt or Blown)	11.00	2.51	13.51
116	Ironworker	23.05	4.06	27.11
117	Lather	28.15	15.14	43.29
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	35.53	15.92	51.45
121	Metal Building Erector	15.19	2.00	17.19
123	Overhead Door Installer	23.00	8.00	31.00
124	Painter	23.00	2.81	25.81

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
125	Pavement Marking Operator	26.00	0.00	26.00
129	Plasterer	30.36	7.15	37.51
130	Plumber	37.42	17.92	55.34
132	Refrigeration Mechanic	25.00	0.51	25.51
133	Roofer or Waterproofer Future Increase(s): Add $.50/hr. effective 06/01/2012	29.40	15.05	44.45
134	Sheet Metal Worker	28.15	15.14	43.29
135	Steamfitter	32.59	11.05	43.64
137	Teledata Technician or Installer	19.23	5.32	24.55
138	Temperature Control Installer	22.00	2.64	24.64
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher	23.96	15.50	39.46
142	Tile Setter	27.00	1.91	28.91
143	Tuckpointer, Caulker or Cleaner	32.50	1.62	34.12
146	Well Driller or Pump Installer	27.60	0.00	27.60
147	Siding Installer	16.00	0.00	16.00

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	16.25	2.25	18.50
203	Three or More Axle	17.00	7.63	24.63
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	17.50	6.16	23.66
302	Asbestos Abatement Worker	17.00	2.21	19.21
303	Landscaper	11.00	2.07	13.07
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.09	14.40	31.49

HEAVY EQUIPMENT OPERATORS RESIDENTIAL OR AGRICULTURAL CONSTRUCTION

CODE	Fringe Benefits Must Be Paid On All Hours Worked 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.	32.56	10.76	43.32
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.	17.40	0.44	17.84

********** END OF RATES **********

DAVIS BACON WAGE SCALE 00823

General Decision Number: WI120001 02/03/2012 WI1

Superseded General Decision Number: WI20100001

State: Wisconsin

Construction Type: Building

Counties: Milwaukee, Ozaukee, Washington and Waukesha Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (Does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	01/06/2012
1	01/13/2012
2	02/03/2012

ASBE0205-001 06/01/2001

	Rates	Fringes
Asbestos Removal worker/hazardous material handler Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not	$ 17.90	4.45

BOIL0107-001 01/01/2012

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 31.09	25.71
Small Boiler Repair (under 25,000 lbs/hr)	$ 26.91	16.00

BRWI0005-001 06/01/2011

	Rates	Fringes
TERRAZZO WORKER	$ 30.70	15.75
TILE LAYER	$ 29.70	15.75

BRWI0008-001 06/01/2011

	Rates	Fringes
BRICKLAYER	$ 35.58	16.07

BRWI0008-003 06/01/2011

	Rates	Fringes
Marble Mason	$ 35.58	16.07

CARP0264-001 06/01/2009

	Rates	Fringes
Carpenter & Soft Floor Layer (Including Acoustical work and Drywall hanging; Excluding Batt Insulation)	$ 31.38	16.03

CARP2337-002 06/01/2009

	Rates	Fringes
MILLWRIGHT	$ 28.30	20.70

CARP2337-008 06/01/2009

	Rates	Fringes
PILEDRIVERMAN	$ 28.11	21.08

ELEC0494-001 06/01/2011

	Rates	Fringes
ELECTRICIAN	$ 31.54	20.88

ELEC0494-003 06/01/2010

	Rates	Fringes
Sound & Communications		
Installer	$ 16.47	13.94
Technician	$ 24.65	15.13

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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* ELEV0015-001 01/01/2012

	Rates	Fringes
ELEVATOR MECHANIC	$ 42.86	23.535

FOOTNOTE:
PAID VACATION: 8% of regular basic for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0139-001 06/01/2011

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 39.16	18.85
Group 2	$ 38.66	18.85
Group 3	$ 38.16	18.85
Group 4	$ 37.47	18.85
Group 5	$ 35.59	18.85
Group 6	$ 30.44	18.85

HAZARDOUS WASTE PREMIUMS:
EPA Level "A" Protection: $3.00 per hour
EPA Level "B" Protection: $2.00 per hour
EPA Level "C" Protection: $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with or w/o attachments with a lifting capacity of over 100 tons; or Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leads, and/or jib lengths measuring 176 feet or longer; Self-Erecting Tower Cranes over 4000 lbs lifting capacity; All Cranes with Boom Dollies; Boring Machines (directional); Master Mechanic. $0.50 additional per hour per 100 tons or 100 ft of boom over 200 ft or lifting capacity of crane over 200 tons to a maximum of 300 tons or 300 ft. Thereafter an increase of $0.01 per ft or ton, whichever is greater.

GROUP 2: Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; or Cranes, Tower Cranes Portable Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leadsand/or jib lengths measuring 175 feet or less; Backhoes (excavators) 130,000 lbs and over; Caisson Rigs; Pile Drivers; Boring Machines (vertical or horizontal), Versi-Lift, Tri-Lift, Gantry 20,000 lbs & over.

GROUP 3: Backhoe (excavator) under 130,000 lbs;Self-erecting

Tower Crane 4000 lbs & under lifting capacity;Traveling Crane (bridge type); Skid Rigs; Dredge Operator; Mechanic; Concrete Paver (over 27E); Concrete Spreader and Distributor; Forklift/ Telehandler (machinery- moving / steel erection); Hydro Blaster, 10,000 psi and over

GROUP 4: Material Hoists; Stack Hoists; Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 5 tons or under (tractor or truck mounted); Hoist (tuggers 5 tons & over); Hydro-Excavators/Daylighters; Concrete Pumps Rotec type Conveyors; Tractor/Bulldozer/End Loader (over 40 hp); Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Rotary Drill Operator and Blaster; Percussion Drill Operator; Air Track Drill and/or Hammers; Gantrys (under 20,000 lbs); Tencher (wheel type or chain type having 8 inch or larger bucket); Milling Machine; Off-Road Material Haulers.

GROUP 5: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machines (road type); Rubber Tired Roller; Concrete Batch Hopper; Concrete Conveyor Systems; Grout Pumps; Concrete Mixers (14S or over); Screw Type Pumps and Gypsum Pumps; Tractor, Bulldozer, End Loader (under 40 hp); Trencher (chain type, bucket under 8 inch); Industrial Locomotives; Rollers under 5 tons; Stump Grinder/Chipper (Large); Timber Equipment; Firemen (pile drivers and derricks); Personnel Hoist, Telehandler over 8000 lbs; Robotic Tool Carrier with or without attachments

GROUP 6: Tampers - Compactors (riding type); Assistant Engineer; A-Frames and Winch Trucks; Concrete Auto Breaker; Hydrohammers (small); Brooms and Sweepers; Hoist (tuggers under 5 tons); Boats (Tug, Safety, Work Barges, Launch); Shouldering Machine Operator; Prestress Machines; Screed Operator; Stone Crushers and Screening Plants; Screed Operators (milling machine), Farm or Industrial Tractor Mounted Equipment; Post Hole Digger; Fireman (asphalt plants); Air Compressors over 400 CFM; Generators, over 150 KW; Augers (vertical and horizontal); Air, Electric, Hydraulic Jacks (slipform); Skid Steer Loaders (with or without attachments); Boiler Operators (temporary heat); Refrigeration Plant/Freeze Machines; Power Pack Vibratory/Ultra Sound Drivers and Extractors; Welding Machines; Heaters (mechanical); Pumps; Winches (small electric); Oiler and Greaser; Rotary Drill Tender; Conveyor; Forklifts/Telehandler 8000 lbs & under; Elevators: Automatic Hoists; Pumps (well points); Combination Small Equipment Operators

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IRON0008-005 06/06/2011

	Rates	Fringes
IRONWORKER	$ 31.31	22.24

LABO0113-001 06/01/2008

	Rates	Fringes

Laborers: (Excluding Blown Insulation; Including Carpenter Tender, Brick Mason Tender, Cement Mason tender, Bottom Man, Pipelayer, Shoveler, stripping and dismantling of forms)

(1) General Laborer	$ 25.52	12.66
(2) Air & Electric Equipment, Power Buggies, Mortar Mixers, Forklift Operator; Scaffold Builder, Erector, and Swing Stage		
(A) Under 75 feet	$ 25.63	12.66
(B) 75 ft to 100 ft	$ 26.13	12.66
(C) Over 100 ft	$ 26.38	12.66
(3) Barco Tamper, Jackhammer Operator, Gunnite Machine man	$ 26.74	12.66
(4) Caisson Worker - Topman.	$ 25.83	12.66
(5) Nozzleman	$ 26.03	12.66
(6) Caisson Work	$ 26.18	12.66

LABO0113-006 06/01/2006

	Rates	Fringes
LABORER		
Plumber Laborer		
First Man (Preparation of trench, shoring of trench, laying pipe)	$ 27.39	11.00
Second Man (does not work in trench)	$ 25.13	11.00

LABO0113-010 06/01/2009

	Rates	Fringes
Asbestos Laborer		
Asbestos Abatement [Preparation, removal, and encapsulation of hazardous materials from non-mechanical systems]	$ 21.53	15.63

PAIN0781-001 06/01/2010

	Rates	Fringes
Painters:		
(1) Brush, Roller	$ 28.47	16.69
(2) Spray & Sandblast	$ 29.22	16.69
(3) Drywall Taper/Finisher.	$ 28.82	16.69

PAIN1204-002 06/01/2010

	Rates	Fringes

GLAZIER	$ 32.25	15.89

PLAS0599-004 05/31/2010

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 30.87	16.33

PLAS0599-005 05/31/2010

	Rates	Fringes
PLASTERER	$ 30.36	16.98

PLUM0075-001 11/28/2010

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 37.42	17.02

PLUM0601-001 12/04/2011

	Rates	Fringes
PIPEFITTER (Including HVAC work)	$ 38.26	19.14

SFWI0183-001 01/01/2012

	Rates	Fringes
SPRINKLER FITTER	$ 37.45	19.25

SHEE0018-001 06/01/2011

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technicians)	$ 37.20	17.01

SUWI2002-002 01/23/2002

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator	$ 25.36	8.37
Laborers:		
Concrete Worker	$ 16.34	3.59
Landscape	$ 8.73	8.40
ROOFER	$ 18.01	3.28
Tile & Marble Finisher	$ 13.89	7.43

TEAM0039-004 05/01/2010

	Rates	Fringes

TRUCK DRIVER		
1 & 2 Axles	$ 25.09	15.20
3 or more Axles	$ 25.24	15.20

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 00850: DRAWING SCHEDULE

The following listed drawings accompany and form a part of the project contract documents along with this project manual and generally illustrate the nature of the work.

GENERAL

SITE – 012 & 029

	COVER SHEET
G-01	INDEX TO DRAWING
G-02	ELECTRICAL ABBREVIATIONS AND PLAN SYMBOLS
G-03	ELECTRICAL ONE-LINE AND SCHEMATIC SYMBOLS

BAY VIEW HIGH SCHOOL

SITE NO. 012 – BAY VIEW HIGH SCHOOL
2751 S. LENOX STREET, MILW., WI 53207-2299

B-A-01	ROOF PLAN
B-P-01	SYMBOLS-PLUMBING
B-P-02	SCHEDULES-BASE-PLUMBING
B-P-03	SCHEDULES-ALTERNATE NO.1-PLUMBING
B-P-04	BASEMENT FLOOR PLAN-BASE-PLUMBING
B-P-05	BASEMENT FLOOR PLAN-ALTERNATE NO. 1
B-P-06	TYPICAL FOR 1^{ST}-4^{TH} FLOOR-BASE-PLUMBING
B-P-07	TYPICAL FOR 1^{ST}-4^{TH} FLOOR-ALTERNATE NO.1-PLUMBING
B-P-08	ATTIC FLOOR PLAN – BASE – PLUMBING
B-P-09	ATTIC FLOOR PLAN – ALTERNATE NO. 1 - PLUMBING
B-P-10	ROOF PLAN - BASE – PLUMBING
B-P-11	ROOF PLAN – ALTERNATE NO.1 – PLUMBING
B-P-12	DETAILS – PLUMBING
B-P-13	DETAILS – BASE – PLUMBING
B-P-14	DETAILS – ALTERNATE NO.1. – PLUMBING
B-E-01	BASEMENT PLAN
B-E-02	TYPICAL FIRST – FOURTH FLOOR PLAN
B-E-03	ATTIC PLAN
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B-E-06	ONE-LINE DIAGRAM

RIVERSIDE UNIVERSITY HIGH SCHOOL

SITE NO. 029 – RIVERSIDE HIGH SCHOOL
1615 E LOCUST STREET. MILW., WI 53211-3298

R-A-01	ROOF PLAN
R-E-01	SECOND FLOOR PLAN
R-E-02	RISER DIAGRAM AND DETAILS
R-E-03	RISER DIAGRAM AND DETAILS ALTERNATE

SECTION 01010: SUMMARY OF WORK:

1. SCOPE:

A. Index:

1. Scope
2. Project Description
3. Work by Others
4. Scheduling of Work

2. PROJECT DESCRIPTION:

A. In general, the project includes all site and building work (unless otherwise noted) necessary for the installation of a non-residential solar water heating system at Bay View H.S. and a non-residential solar electric (photovoltaic) system at Riverside University H.S. as described in the plans and as specified herein.

B. MPS will occupy Site and existing buildings during entire period of construction for conduct of normal operations. Cooperate with MPS during construction operation to minimize conflict and facilitate MPS operations. Contractor shall, at all times, conduct operation to ensure least inconvenience to MPS, other contractors, general public, and operation of the schools.

C. The contractor must coordinate all work with the MPS, DPW, utilities, and all other work forces on site.

D. It is also understood that the submittal of a proposal shall include furnishing all labor, materials, equipment, and incidentals necessary for completion of the work required, including that which may not be directly shown on the drawings or in the specifications, but are necessary for proper operation and approval.

E. Examine Documents and Visit Site:

1. Before submitting a bid proposal, bidders should carefully examine the drawings and specifications; visit the site of work; fully inform themselves as to all existing conditions and limitations including those of labor; and shall include in the bid proposal a sum sufficient to cover the cost of all items contemplated by the construction documents.

2. Each sub-bidder further represents that he has inspected the site of the proposed work to ascertain any obstacles that might be encountered and other matters and conditions relevant to this work.

3. The nature of the work required demands thorough review of all drawings and the project manual, and diligent and careful site inspection by all prospective sub-bidders as a means of determining the extent of work and conditions under which the work is to be performed.

4. Additional charges will not be as considered for work which, prior to bidding, could reasonably be inferred as appropriate by examination of the drawings and specifications, visiting the site, and closely reviewing the work as indicated above. No representations as to subsurface conditions are made.

F. The following outline is intended to serve as a general guide only and not as a complete listing of work, operations, or materials. Consult the Table of Contents for complete listing of items

included. Work includes but is not limited to the following:

1. Provide an approximate 2500 therms/year non-residential solar water heating system at Bay View High School which consists of the four rows of panels shown for the southwest and northwest side of the building and all required piping, pumps, tanks, etc. as illustrated in the plans and specifications.

2. Provide an approximate 9,946 kWh photo voltaic non-residential solar electric system at Riverside University High School which consists of the two rows panels (Strings 1, 2, 3 and 4) shown on the Gym roof of the building and all required wiring and controls, etc. as illustrated in the plans and specifications.

3. **ALTERNATE BID No.1:** Deduct approximately ½ of the non-residential solar water heating system at Bay View High School shown for the Base Bid. System will now provide an approximate 1250 therms/year non-residential solar water heating system and consist of the two rows of panels shown for the northwest side of the building and all required piping, pumps, tanks, etc. as illustrated in the plans and specifications.

4. **ALTERNATE BID No. 2:** Deduct approximately ½ of the non-residential solar electric system at Riverside University High School shown for the Base Bid. System will now provide an approximate 4,973 kWh photo voltaic non-residential system at Riverside University High School which consists of one row (String 1 and 2) shown on the Gym roof of the building and all required wiring and controls, etc. as illustrated in the plans and specifications.

5. **ALTERNATE BID No. 3:** Deduct the non-residential solar water heating system at Bay View High School shown for the Base Bid.

6. **ALTERNATE BID No. 4:** Deduct the non-residential solar electric system at Riverside University High School shown for the Base Bid.

7. Provide warranty, start-up service, O & M Manuals, record as-built drawings and all other specified documentation.

8. All required approvals and necessary permits and fees shall be obtained for this project.

9. All materials used on this project must comply with the Buy American Recovery Act Provisions.

10. Standard Terms and Conditions for Contracts and Grants Using ARRA Funds (Energy Efficiency and Conservation Block Grant Program) are applicable to this project

11. Davis Bacon Building Wage rates and the Prevailing Wage Rate Determination shall both apply to this project. Contractor or subcontractor shall be paid no less than the higher of the two wage rate scales.

12. Make all necessary connections to existing systems.

13. Coordinate with the Building Manager for all systems tie-ins.

14. All work of this project shall comply with City of Milwaukee and State of Wisconsin codes, NEC and the NFPA.

15. Attend regularly scheduled construction meeting until project completion.

16. Demolition, Removal, and Disposal:

    a. Contractor shall be responsible for all costs associated with demolition, removal, and disposal of indicated equipment and material.

    b. Contractor shall be responsible for repairing any damage caused to building or building components through demolition and removal process.

    c. Contractor shall follow all Wisconsin Department of Natural Resources and Environmental Protection Agency, as well as any other state or national regulations, regarding disposal of equipment or materials removed from building.

17. Contractors shall maintain any special security procedures that are in place at the site.

. WORK BY OTHERS:

A. Asbestos (ACM) abatement will be by other contract arranged by MPS prior to the start of this project.

4. SCHEDULING OF WORK:

A. All of the work on this project shall be accomplished between 7:00 AM and 5:00 PM (normal working hours) on regular work days unless it will be disruptive to City personnel (excessive noise, welding, soldering, torching, domestic water shutdown, etc.) then it must be accomplished between 6:00 PM and 6:00 AM on workdays or on weekends.

B. Contractor must notify the City 48 hours in advance before starting work.

C. The contractor shall sign in and identify all personnel working at the site on a daily basis with the supervisor in charge at the site. All personnel leaving the site will sign out prior to departure.

D. Shut downs of existing equipment and connections to existing equipment must be arranged in advance with the Project Inspector from DPW, ISD - Facilities Development and Management Section. Power outages must be scheduled for Saturdays.

E. Dispose of all removed materials in legal manner.

F. The City reserves the right of not allowing the contractor to work when special events are scheduled for the building or noise being created by the contractor is disturbing to personnel working or the general public in the building. These changes in work schedule shall be done at no additional cost to the City.

SECTION 01210: PROJECT MEETINGS

1. SCOPE:

A. Index:

1. Scope
2. Pre-Construction Meeting
3. Progress Meetings

2. PRE-CONSTRUCTION MEETING:

A. Soon after the award of the contract and prior to the start of construction, the contractor shall attend a pre-construction conference with representatives of the City.

B. The contractor shall have at the meeting responsible representatives from subcontractors who are to perform major work on the project.

C. The purpose of the meeting is to discuss in detail the plans and specifications. The discussion shall include:

1. Schedule
2. Equipment
3. Material Storage
4. Traffic Control
5. Inspection Requirements
6. Protection Procedures for the structure, adjacent facilities, environment, and personnel.
7. Hours of Work

D. The contractor shall submit the construction schedule to the architect/engineer at this meeting and a listing of subcontractors and their work. The contractor shall describe, in detail, when each portion of the work is expected to be accomplished. The subcontractors shall participate in the discussion. The architect/engineer will serve to interpret the contract documents should such questions arise.

E. Any other questions that the contractor or his subcontractors have about the work or its scheduling shall be raised at these meetings.

F. Requirements for contract administration and construction operations will be defined for participants.

G. The architect/engineer will determine time, date, and place of the meeting.

3. PROGRESS MEETINGS:

A. Bi-weekly meetings will be held for the purpose of coordinating and expediting the work.

B. Attendance at project meetings by the contractor is mandatory. These meetings shall also be attended by representatives of each subcontractor who is either working at the site or is affected by work being done at the site. The contractor shall submit an updated construction schedule at these meetings and a short narrative should be written, describing the cause of any delays and intended action to remedy these delays.

C. Contractors shall give a verbal report of progress on the project, discuss the work schedule for the coming period, and present all conflicts, discrepancies, or other difficulties for resolution.

SECTION 01300: SUBMITTALS/PERMITS

1. SCOPE:

   A. Index:

      1. Scope
      2. Submittals
      3. Permits
      4. Inspection

2. SUBMITTALS:

   A. Comply with the requirements of the General Conditions and as follows:

      1. Forward Submittals not more than 20 calendar days after the Notice to Proceed date. No work, as indicated on any shop drawing, samples, hardware list, etc., shall be started until those submittals have been reviewed and work authorized.

      2. All submittals must be thoroughly reviewed by the prime contractor for conformance to contract documents, prior to submission to the City, or its agents, for review. Shop drawings and catalog information shall be stamped "Reviewed By" and signed by the contractor's reviewer. The prime contractor shall review all subcontractor submittals prior to submittal to the City for compliance with contract documents and to coordinate all work.

      3. Include with each submittal a transmittal letter signed and dated by the prime contractor containing the following:

         a. Name of Contractor
         b. Name of Project
         c. List of Submittals
         d. Name of Manufacturer or Supplier
         e. Additional information as required for the items being provided.

   B. Shop Drawings, Catalog Information, Calculations, and Samples:

      1. Shop Drawings: Submit one blue/black line print review. The City will notify the contractor in writing and return one copy marked "REVIEWED - NO EXCEPTIONS TAKEN" with minor or no notations. The City will also notify the contractor in writing and return one copy, along with comments, when the drawings are marked either "REJECTED" or "REVISE AND RESUBMIT". For those shop drawings, the contractor will be responsible for resubmitting a new print.

      2. Catalog Information and Calculations: Submit four copies for City's record and additional numbers of copies required for the contractor's purpose. The City will notify the contractor in writing and return the contractor's copies, with or without notation, marked either "REVIEWED - NO EXCEPTIONS TAKEN", "REVISE AND RESUBMIT", OR "REJECTED". Catalog information or calculations marked "REVISE AND RESUBMIT" or "REJECTED" must be resubmitted in the same quantities as originally required.

      3. Samples: Submit two samples of requested materials for the City's records and

additional samples, if desired, to be returned to the contractor. The City will notify the contractor in writing, whether the samples are approved or rejected. If they are rejected, new samples must be resubmitted as originally required.

4. Corrections or comments made on the submittals during the review do not relieve the contractor from compliance with requirements of the contract documents. The check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. Contractors are responsible for conforming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating their work with that of all other trades; and performing their work in a safe manner.

C. "Or Equal": Whenever the words "or equal" or similar term is used, it shall mean as determined by the Commissioner of Public Works or agent. All drawings, data and bulletins necessary to make an "or equal" determination shall be submitted to the Facilities Manager of Buildings & Fleet Services. Such review shall apply to design only and shall in no way relieve the contractor from the responsibilities as outlined in Item 2B above. Evaluation of "or equal" products will be made at the time of shop drawing submission. Any change required in design and coordination between all contractors, subcontractors, or trades due to the use of "or equal" materials shall become the contractor's responsibility. Any costs for detailed engineering reviews and/or any costs to incorporate "or equal" products will be borne by the contractor.

3. PERMITS:

A. The City of Milwaukee will provide the general building and occupancy permits.

B. Contractors shall obtain, from the City of Milwaukee Department of City Development and/or other government or private agencies, all special permits as may be necessary in their work.

C. Contractors shall obtain all permits to occupy or work in the public way as may be necessary for their work.

D. Contractors shall notify the City and/or appropriate utilities when making utility connections as part of the project.

4. INSPECTION:

A. Facilities Development and Management Section will provide daily inspection to verify compliance with contract documents, identify contractors and crews on the job, verify compliance with contract conditions (MWSBE, residency, wage requirements), and record job progress and conditions.

B. Contractors shall arrange with the Department of Neighborhood Services/Construction Trades Division and permit issuing agencies for all code compliance inspections as required by all permits including, but not limited to, the general building and all special permits issued by that agency.

C. Contractors shall arrange with the appropriate City agency for compliance inspections, as required, for all permits including, but not limited to, curb and pavement cuts and patches, and public way occupancy and utility connections.

SECTION 01500: JOB SITE UTILITIES, FACILITIES, AND SECURITY

1. SCOPE:

A. Index:

1. Scope
2. Building Security
3 Temporary or Trial Usage
4. Occupancy During Construction
5. Temporary Hoists, Lifts
6. Temporary Ladders, Scaffolds
7. Electrical Power
8. Temporary Water
9. Toilet Facilities

2. BUILDING SECURITY:

A. General:

The Downtown Complex is open to the public from 8:00 AM until 4:45 PM, Monday through Friday, excluding holidays. Since most contracted work takes place outside normal business hours, it is essential that contractors and their City agents understand and abide by security policy.

B. Scope:

The following building security policy and procedure statement has been provided in this project manual for bid consideration and shall be distributed at the Pre-Construction Meeting. All City agents/officials responsible for engaging contractors, all contractors, and all subcontractors shall be held responsible for following the procedures.

C. City Agents/Officials:

1. Any City agents/officials who commission outside contractors to work in any of the facilities managed by FACILITIES DEVELOPMENT AND MANAGEMENT SECTION shall provide the following information no less than twenty-four (24) hours in advance of the work:

a. The names of any contract or subcontract employees who will be present in the facilities (for the purpose of designing badges appropriate to their work area):

Green – Zeidler Municipal Building, 841 North Broadway
Red – City Hall, 200 East Wells Street
Yellow – 809 North Broadway
Gold – Any outlying buildings

These names must be listed on a sign-in sheet available in the Zeidler Municipal Building, Room 602 (FACILITIES DEVELOPMENT AND MANAGEMENT SECTION support staff – Extension 8222). City agents/officials shall be responsible to ensure the sheet and badges are transported to the appropriate location where the work is to be completed (in the Downtown Complex it would go to the City Hall Information Center, for outlying buildings to the person responsible for controlling access in the facility) the day before work is to begin.

b. A list of keys and/or access cards required for access only to the areas

necessary for work involved in the project. The keys and card will be received from the Security Manager or his designee and signed out to the City agents/officials responsible for the contracted work. The City employee will take the keys and/or access cards to the City Hall Information Center or the person responsible for controlling access in the outlying building where they shall be logged under the name of the contractor's company. When a project is complete, the City agents/officials must retrieve the keys/cards and return them to FACILITIES DEVELOPMENT AND MANAGEMENT SECTION support staff in Room 602 of the Zeidler Municipal Building.

c. The City agents/officials are responsible for communicating the security policy and procedures to contractors. The City agents/officials shall act as liaison for all communication between FACILITIES DEVELOPMENT AND MANAGEMENT SECTION and the contractor.

D. Contractors:

1. Contractors shall abide by City security policy and procedures at all times during the scope of their participation in a project. Failure to comply will result in the contracted employee being escorted from the premises and the resulting lost time and expense shall be deducted from the contractor's invoice or penalties of $50.00 per occurrence as determined by the contracting City agent/official.

a. All access should be provided in advance through the City agent/official. Contractors shall enter and exit only through those doors designated by City agents/officials (the Market Street entrance to City Hall and the doors established by the person responsible for access at outlying buildings). All other exterior doors are locked and alarmed and are not to be used as delivery points unless the City agent/official has been provided 24 hour notification to provide additional security coverage at that point while the delivery is in progress.

b. All of the contractor's employees and all of the employees of any of his subcontractors shall wear at all times while on the site, in a clearly visible location, an identification card. The identification card is to have a minimum 1" x 1" color photo of the head and shoulders. The photo is to have been taken no more than one year previously. The card is to be laminated with clear plastic and is to contain the company name, employee's name, and the

employee's signature, and is to be furnished by the contractor or respective subcontractor.

c. Effective October 1, 2004 – City of Milwaukee Policy Change

The following policy has been established to maintain control of City Property and to ensure the physical protection of the City Hall Complex.

Anyone signing out access cards and/or keys from the Information Center will be following the steps below.

i. Sign in on the sheet assigned to the project you are working on and pull that sheet and provide it to the Operator noting that you will need to sign out City property to access the building.

ii. Provide the Operator your driver's license as collateral for the return of City property.

iii. Sign out the property in the sign out book as per current policy.

iv. The Operator will file your driver's license until such time as you sign in and return the City property at which time your license will be returned.

v. Sign out at the end of your workday on the sign out sheet.

Under NO circumstances will keys or cards be disbursed without the user signing for the property and providing the City Hall Operator their driver's license as collateral.

In the event that keys or cards are not returned daily the contractor in question will have a deduct (security violation) as per the contract. Individuals who loose or fail to return keys will be responsible for the cost of re-keying to the City.

Contractors will sign in on pre-approved forms and also wear the City identification badges (also to be worn at all times on the premises). Keys or access cards will be signed out as provided by the City agent/official and required for the work. These keys, cards, and badges must be returned at the end of each shift before signing out. Failure to do so will result in a $50.00 penalty for each occurrence.

d. Contractors shall not ask custodians or mechanics to unlock doors. All access should be provided in advance through the City agent/official. In the rare case where access is not provided, the City Hall Operator may be contacted to assist in providing access. The contractor shall cooperate with security personnel at all times. The contractor should be prepared to allow searches of equipment when leaving, and should remain only in the areas designated on the sign-in sheets. Security will question a contractor who has an identification badge that indicates a work area other than the area he or she is in.

e. If the contractor requires use of the loading dock in Upper Parking, 24 hour advance notice shall be given to the City agent/official to make arrangements to provide additional security coverage while the delivery is in progress. The contractor or subcontractor shall meet the delivery driver and take delivery at that point. At no time shall a driver be allowed in the facilities without following the access procedure stated above.

f. If after normal business hours work is required in the outlying buildings, all subcontractors and trades will arrange appropriate security measures and lock-up procedures with the contractor in writing. Any work completed at night shall be left "open" for City inspection of the work. The contractor shall notify the City agent/official 24 hours in advance of after-hours work in writing, indicating the type of work to be done and the security measures to be taken by the contractor.

g. The contractor shall provide plywood door and window closures during construction to secure the structure from weather and damage from vandalism. The contractor is responsible to maintain the security of the space where they are working during construction.

h. If proper notification is not provided to the contractor, the subcontractor or trades shall be liable for any subsequent damage/vandalism/inspection cost, etc., due to lack of security/inspection coordination.

i. Use of City materials is strictly prohibited unless pre-arranged through the City employee contact.

j. At no time shall any interior doors that control access or exterior doors be propped open.

3 TEMPORARY OR TRIAL USAGE:

The owner shall have the right to make temporary or trial usage of any mechanical device, machinery, apparatus, equipment, work, material or construction supplied under contract before final completion or acceptance of the work, and the same shall not be construed as evidence of acceptance of the work by the owner.

4. OCCUPANCY DURING CONSTRUCTION:

The owner will occupy the premises while work is in progress. Contractor is to coordinate his work as to not interfere with the owner's operation or compromise building security.

5. TEMPORARY HOISTS, LIFTS

Contractors and subcontractors requiring hoists or lifts shall provide their own and remove upon completion of work.

6. TEMPORARY LADDERS, SCAFFOLDS:

A. Contractors and subcontractors requiring scaffolds, chutes, and ladders shall provide their own and remove them upon completion of their work.

B. Each contractor shall furnish and maintain equipment such as fixed ladders, chutes, and the like as required for proper execution of their work.

7. ELECTRICAL POWER:

Contractor may use existing outlets for power. Contractor to verify power available at site. Contractor is to supply his own lines. OSHA regulations require that employers use either ground fault circuit interrupters or an assured equipment grounding conductor program in addition to any other regulations for equipment grounding conductors. The cost of the current used will be paid for by the City.

8. TEMPORARY WATER:

Water may be obtained from any existing fixture.

9. TOILET FACILITIES:

Designated toilet facilities will be available for contractor’s use. Toilets shall be kept in a clean condition at all times.

SECTION 01505: CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SCOPE:

A. This section specifies requirements for salvaging, recycling and disposing of construction waste for purposes of protecting the environment and reducing project cost.

Requirements include the following:

1. Developing a Construction Waste Management Plan including waste management goals and provisions for waste reduction and recycling.
2. Implementing, monitoring and documenting the waste management plan.
3. Incorporating special programs.
4. Evaluating construction waste management.

1.2 RELATED DOCUMENTS AND SECTIONS:

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

B. Related documents include the following

1. Section 01010 “Summary of Work”
2. Section 01300 “Submittal & Permits”
3. Section 001500 “Utilities, Facilities, and Security” for environmental-protection measures during construction.

1.3 PRECONSTRUCTION MEETING:

A. After award of Contract and prior to the commencement of the Work, schedule and conduct a meeting with the Owner and Architect to discuss the proposed Construction Waste Management Plan and to develop a mutual understanding regarding details of environmental protection.

1.4 CONSTRUCTION WASTE MANAGEMENT PLAN:

A. Construction Waste Management Plan

4. The purpose of the Construction Waste Management Plan is to identify construction wastereduction goals, identify targeted materials, and explain specific waste reduction actions to be taken, by whom, and when.
5. The Contractor shall develop a Construction Waste Management Plan for this Project within 15 working days after Contract award or prior to any waste removal. The Owner and the Architect will furnish the Contractor with information that will assist in the development of the Construction Waste Management Plan. Submit the Construction Waste Management Plan (include document/report form) to the Architect for approval prior to implementing the Plan.

B. The Plan, which should be entered into and generated by WasteCapTRACE, shall include the following:

1. A list of the waste materials expected to be generated from the Project debris.

2. **A list of each material proposed to be salvaged, reused, recycled and discarded. Identify applicable markets for reuse and recycling. At a minimum, all materials required by state law to be recycled shall be recycled (e.g., cardboard, cans, bottles, office paper, fluorescent tubes, refrigerants, mercury, etc.) and scrap metal shall be recycled.**
3. **Separation and materials handling procedures: Description of how waste materials identified above will be separated, cleaned (if necessary) and protected from contamination.**
4. **Educational and Motivational Procedures: Meetings to be held and other proposed methods for educating construction personnel regarding waste reduction and recycling. Construction waster management requirements should be discussed at least monthly at project site meetings.**
5. **Waste Auditing Procedures: Methods of monitoring and enforcing the Plan.**
6. **Documentation Procedures: Methods of documenting materials leaving the Project site as waste, for the reuse or recycling to allow Summary of Waste Progress Reports to be submitted with Applications for Payment.**
7. **The Lead contractor shall distribute copies of the Construction Waste Management Plan to DPW's Project manager.**

C. Progress Documentation: Document solid waste disposal and diversion. Include the date of removal, type of waste removed, quantity by weight and volume, final destination and use (recycled, reused or landfilled), and net cost or income.
   1. Document on the Form acceptable to the Owner and Architect.
   2. With each Application for Payment, submit updated documentation identifying solid waste disposal and diversion.
   3. With each Application for Payment, submit manifests, weight tickets, receipts and invoices identifying the Project and construction waste material.

D. Record Submittals: Submit the following:
   1. Summary of solid waste disposal and diversion. Submit on form acceptable to the Owner and Architect.
   2. End-of-Project recycling rates and landfill rates demonstrating the percentage of construction waste that was recycled or reused.

1.5 WASTE MANAGEMENT GOALS:

A. Develop Construction Waste Management Plan that results in end-of-Project rates for the reuse/recycling of **50%** percent by weight or volume of total waste generated by the Project. Record the total construction waste reduction goal on the Construction Waste Management Plan Form.

B. Reduce: The Project shall generate the least amount of waste and methods shall be used that minimize waste due to error, poor planning, breakage, mishandling, contamination, or similar factors. Promote the resourceful use of materials to the greatest extent possible.

C. Reuse: The Contractor and Subcontractors shall reuse materials to the greatest extent possible. Reuse includes the following:
   1. Salvage reusable materials for resale, for reuse on this Project, or for storage for use on future projects.

   2. Return reusable items (e.g., pallets or unused products) to the material suppliers.

D. Recycle: As many of the waste materials not able to be eliminated in the first place or salvaged for reuse shall be recycled. Waste disposal in landfills shall be minimized to greatest extent possible.

1.6 MATERIALS HANDLING AND SORTING:

A. Handling:

1. Materials that are contaminated prior to placing in collection containers shall be properly cleaned. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling processes.
2. Cover materials with tarps and keep truckloads level so as to prevent spillage.
3. Arrange for collection by or delivery to the appropriate recycling or reuse facility.
4. Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations. If encountered, such waste and materials shall be abated under separate contract.

B. The following sorting methods are acceptable:

1. Sorting recyclable materials at the Project site and transporting them to recycling markets directly from the Project site.
2. Employing haulers who make use of a materials-recovery facility or a transfer station where recyclable materials are sorted from the waste and recycled before disposing of the remainder. If using a hauler or recycling facility to sort out recyclables, verify that the hauler sorts out all construction waste loads and is not limited to those that are not acceptable at the landfill. Also, verify that the hauler or recycling facility recycles at least three types of materials.

1.7 WASTE MANAGEMENT PLAN IMPLEMENTATION:

A. The Contractor shall designate a party (or parties) who shall be responsible for instructing construction personnel and overseeing and documenting results of the Construction Waste Management Plan.

B. Distribution: The Contractor shall distribute copies of the Construction Waste Management Plan to the Project Foreman, each Subcontractor, the Owner, and the Architect

C. Instruction: The Contractor shall provide on-site instruction regarding appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all construction personnel at the appropriate phases of the Project.

D. Separation Facilities: The Contractor shall lay out and identify a specific area on the Project site to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas shall be kept neat and clean, and clearly marked to avoid contamination of materials. Materials for recycling include concrete, non-fibrous wallboard, paper, clean corrugated cardboard (no pizza boxes), non-treated wood, metals (steel, aluminum and copper), and glass bottles (no windows). Provide separate containers, preferably near the job trailer, with smaller containers located at convenient places throughout the job site. Empty smaller containers into larger containers every night or when full. Cover outdoor containers to keep out rain, snow, and wind-driven debris. Lock containers whenever site is not in use to prevent illegal dumping.

E. Hazardous Waste: Hazardous waste shall be separated, stored, and disposed of according to applicable regulations.

F. Application for Payments: With each Application for Payment, the Contractor shall submit a Summary of Waste generated by the Project. **This reporting shall take place using WasteCapTRACE, an online documentation system. There is a fee, to be included in the bid, of two cents per square foot of gross construction for use of WasteCapTRACE.** Failure to

submit this information shall render the Application for Payment void, thereby delaying the Progress Payment. The Summary of Waste shall contain the following information:

1. The amount (in tons and/or cubic yards) of material landfilled from the Project, the identity of the landfill, and the related disposal cost. Include corresponding manifests, weight tickets, receipts, and invoices.
2. For each material recycled from the Project, the amount (in tons and/or cubic yards), the date removed from the Project site, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of recycling. Include corresponding manifests, weight tickets, receipts, and invoices.
3. **Final Payment: Prior to application for Final Payment, the Lead Contractor shall submit a Final Summary of Waste: reuse and recycling results for all prime and subcontractors, including the quantity of each material recycled, reused, or salvaged, the receiving party and the applicable diversion rates. The final report will be generated by WasteCapTRACE based on information entered throughout the project by the Lead Contractor.**

G. Implementing the Plan: The Contractor shall designate a party (or parties) responsible for implementing the Construction Waste Management Plan. This party (or parties) shall explain to Contractor's and Subcontractor's construction personnel, the Plan's goals and methods for achieving those goals.

1.8 SPECIAL PROGRAMS:

A. The Contractor shall be responsible for final implementation of programs involving tax credits, rebates, or similar incentives related to recycling, if applicable to the Project. Revenues or other savings obtained for recycling or returns shall accrue to the Contractor.

B. The Contractor shall be responsible for obtaining information packets related to the special programs prior to commencing Work.

C. The Contractor shall document work methods, recycled materials, etc., as required for the tax credits, rebates, or other savings described above.

END OF SECTION

SECTION 01600: MATERIALS AND EQUIPMENT

1. SCOPE:

   A. Index:

      1. Scope
      2. Materials
      3. Equipment
      4. Hazardous Material Requirements
      5. Material Storage
      6. Protection
      7. Revisions

2. MATERIALS:

   A. Furnish materials of the type, qualities, and characteristics specified. The specification of a trade name and catalog number is intended to establish quality, type, character, and operating characteristics of the material required. Materials by other manufacturers of equal specifications will be accepted, excepting as may be specifically stated otherwise.

   B. Materials shall be delivered adequately protected, in merchantable condition, and in original unbroken packages if normally packaged. They shall be stored and handled so as to protect and maintain their merchantable condition.

   C. The Commissioner of Public Works or his representative shall have the right to reject material not in compliance with the project manual, as well as damaged material, and the contractor shall remove such material from the construction site when and as directed.

3. EQUIPMENT:

   A. Internal combustion engine and compressor shall be equipped with mufflers to reduce noise to a minimum and shall not be operated in enclosed areas without adequate ventilation.

   B. All materials and work procedures used shall be in accordance with all air pollution control regulations in effect at the work site.

4. HAZARDOUS MATERIAL REQUIREMENTS:

   A. The requirements set forth in the OSHA Hazard Communication Standard, 29CFR19101.1200, U.S. Environmental Protection Agency (EPA), and Wisconsin Department of Natural Resources in the Wisconsin Administrative Code NR600, shall be met by each on-site contractor.

      1. Material Safety Data Sheets (M.S.D.S.):

         a. All contractors, which may/may not include the City of Milwaukee, shall provide the M.S.D.S. for all hazardous chemicals to which any person may be exposed at the work site.

         b. A master list will be kept in the office of the Project Supervisor/Construction Manager and updated as materials are delivered.

2. Container Labeling:

a. Each container of hazardous material at the work site shall be clearly labeled with:

(1) Identity of the hazardous chemical(s).

(2) Appropriate hazard warning(s).

(3) Name and address of the manufacturer.

B. The City of Milwaukee reserves the right to stop the work of a contractor if compliance with OSHA regulations is inadequate. Work will not proceed until all applicable safety and health procedures are implemented by the contractor.

5. MATERIAL STORAGE:

A. The storage areas shall be kept in good order and free of all rubbish and debris.

B. Coordinate the delivery and storage of all materials and equipment with the Facilities Development and Management Project Inspector.

C. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

D. Store and protect products in accordance with manufacturers' instructions.

E. Store with seals and labels intact and legible.

F. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

6. PROTECTION:

A. GENERAL:

1. The premises and the work shall be adequately protected from damage from the commencement of work to the date of final acceptance.

2. All construction work and traffic shall remain within the construction area.

3. All damage shall be corrected or repaired by the contractor or contractors causing same at his or their own expense.

4. All open pipes, pipe threads, fittings, and insulation must be protected during construction.

7. REVISIONS:

The right is reserved to make modifications to a reasonable extent as building conditions may require, or as may be required to conform to code rulings, or manufacturer's standards without extra cost to the City.

SECTION 01700: CLEANING AND PROJECT CLOSE-OUT

1. SCOPE:

A. Index:

2. GENERAL:

Article 2.5.4 of the General Requirements of City of Milwaukee Department of Public Works shall be supplemented as specified hereinafter.

3. SAFETY CLEANING:

Safety cleaning: Each contractor is responsible for safety cleaning, which includes but is not limited to the following:

A. Keep work areas, passageways, ramps, stairs, free of debris and scrap.

B. Form and scrap lumber shall have nails withdrawn or bent over and lumber shall be stacked or removed.

C. Remove spills of oil, grease, or other liquids immediately or sprinkle with sand.

D. Hazardous material shall be handled in accordance with Section 01600. Each container of hazardous material at the work site shall be clearly labeled with:

a. Identity of the hazardous chemical(s).
b. Appropriate hazard warning(s).

4. PROGRESS CLEANING:

A. Prime Contractor and subcontractor shall remove his rubbish and debris from building site promptly upon its accumulation, and prior to the contractor's regular Friday general clean up. Contractor shall perform broom cleaning of all appropriate surfaces each Friday afternoon.

B. Combustible waste shall be stored in fire resistive containers and disposed of regularly.

C. Oily, flammable or hazardous wastes such as caustics, acids, harmful dusts, etc., shall be stored in appropriate covered containers.

D. All solvents and cleaners used on this project must be rated as containing low or no volatile organic compounds (VOC's).

5. DISPOSAL:

A. No burning of rubbish or debris will be allowed at site. No rubbish shall be thrown through opening or from heights without proper protection. Where dust will be generated or flying debris is likely to occur, provide dust tight chutes or other means to control dust.

B. Containers: Contractor shall provide mobile industrial type waste containers in the number and size required, placed at adequate locations to handle debris or provide other methods of disposing of debris.

C. Oil, flammable or hazardous wastes such as, but not limited to, caustics, acids, harmful dusts, etc., shall be placed in properly marked containers as necessary and disposed of at a site designed for such wastes.

6. FINAL CLEANING:

A. Immediately prior to substantial completion.

B. Contractors shall expedite or perform thorough cleaning, sweeping, washing and polishing of work to remove from work and equipment provided under his contract, all foreign matter, spots and soil, so as to put all such work and equipment, including finishes, in a complete and finished condition ready for acceptance and use intended.

C. The contractor is responsible for final sweeping and dusting not covered by other subcontractors. This general cleaning shall include all areas and floors of the building, including the site outside the building.

D. All solvents and cleaners used on this project must be rated as containing low or no volatile organic compounds (VOC's).

7. CHARGES:

A. If prime contractors do not remove rubbish or clean building as specified above, owner reserves right to have work done by others at contractor's expense.

B. Employees of the owner who are required to clean up any rubbish or to sweep any floors will record all hours involved to complete such work. The cost incurred by the owner for this special cleaning and sweep-up work shall be charged against the contract price of the contractor as determined by owner.

8. PUNCHLIST

A. At completion of project, Contractor shall notify City Construction Project inspector and Engineer that project is complete in compliance with the Contract Documents and ready for punchlist inspection.

B. At completion of project, Contractor shall sign and return the punchlist prepared by the ***Engineer*** and the Construction Project Inspector, with all items noted with date of completion.

C. The Construction Project Inspector will conduct a walkthrough inspection following receipt of signed punchlist, to verify completion of work for all punchlist items.

D. If any items of work are found to be incomplete during the signed punch list inspection, Project Inspector shall notify Contractor. **A charge of $90.00/hour shall be accessed to the Contractor for any re-inspections**.

All remaining incomplete items shall be completed by Contractor within ten (10) days of notice from Project Inspector, or additional monetary damages may be assessed.

9. CLOSEOUT PROCEDURES

A. Verify that punchlist items have been completed and inspected in accordance with requirements as indicated above.

B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Project Manager's review.

C. Provide all required submittals to construction Project Inspector at completion of all work and prior to submittal of final payment application.

D. Include submittal of all close-out submittals and documents specified in the individual technical specification sections.

10. STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify the Construction Project Inspector seven (7) days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
   1. Submit a written report that equipment or system has been properly installed and is functioning correctly.

11. DEMONSTRATION AND INSTRUCTIONS

A. Where requested in the individual technical specification sections, demonstrate operation and maintenance of products to Construction Project Inspector two (2) weeks prior to date of Substantial Completion.

B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

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

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. Required instruction time for each item of equipment and system is specified in individual sections.

F. Provide training for each system where specifications require training of MPS (Owner) staff. Video tape training session and provide two copies of the training on DVD to Owner. Coordinate training session with MPS representative.

12. RECORD DRAWINGS AND DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Service Orders, Requests for Information (RFI’s) and other modifications to the Contract.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.

3. Changes made by Addenda and modifications.

F. Record Drawings:
1. Request from Construction Project Inspector, a set of the original contract drawings in AutoCAD Release 2009 format or later on disk, for Contractor's use in preparing the record drawings.
2. Record drawings shall consist of the following:
   a. Two (2) sets of final updated prints.
   b. Two (2) disks with the updated electronic CAD drawings.
3. Record drawings and documents shall become the property of MPS, and shall indicate all actual construction, including:
   a. All information requested in the individual specification sections.
   b. Changes or variations from contract drawings, including dimensions and detail.
   c. Measured horizontal and vertical locations of utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

13. OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, in three D-side ring binders with durable vinyl covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, name of school, and subject matter of binder when multiple binders are required.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Certificates.
   c. Photocopies of warranties.

14. MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. City Project Manager will review draft and return one (1) copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with Construction Project Inspector's comments. Revise content of document sets as required prior to final submission.

D. Submit two (2) sets of revised final volumes in final form, in three D-side ring binders within ten (10) days after final inspection.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

I. Additional Requirements: As specified in individual product specification sections.

15. SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by City Project Manager; obtain receipt prior to final payment.

16. WARRANTIES

A. Where guarantees or warranties are required in the individual specification sections, submit one (1) copy to the DPW-Facilities Development and Management prior to final payment.

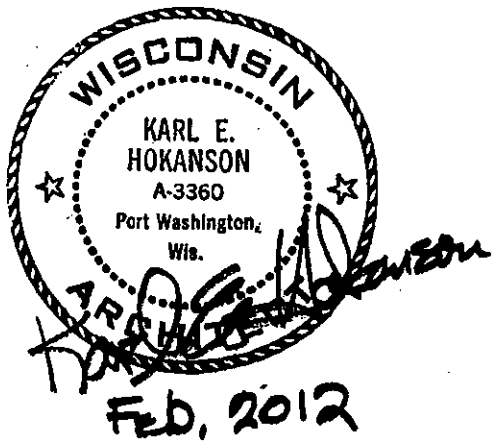
B. Obtain warranties from responsible subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Include Table of Contents and assemble in three D-side ring binder with durable vinyl cover.

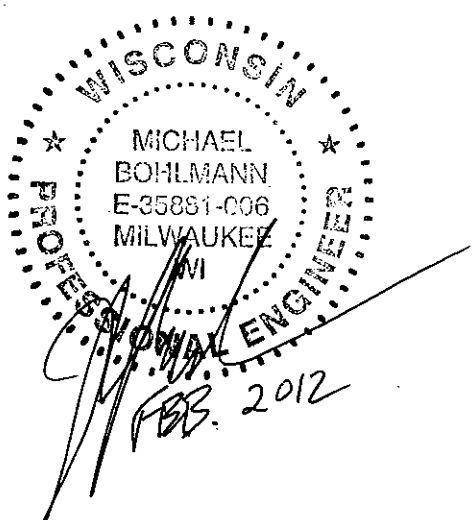
E. Warranty shall be identified with project name and number of Contract Documents, name and address of Contractor or Subcontractor furnishing warranty, material or installation requiring warranty and date warranty goes into effect.

EECBG, MPS Solar Electric and Water Heating Projects



Specification Divisions 2, 3, 6, 7, 9 and 16

AECOM



Specification Division 15

PSJ Engineering, Inc.

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SECTION 02072

MINOR DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section Includes:
   1. Cutting and alterations for completion of the Work.
   2. Protecting items designated to remain.
   3. Removing demolished materials.

C. Related Sections:
   1. Section 01070 - Cutting and Patching.
   2. Section 01500 - Temporary Facilities and Controls: Temporary barriers and enclosures to maintain building security.
   3. Section 01610 - Materials and Equipment.
   4. Section 01700 - Project Closeout: Project record documents.
   5. Section 15400 – General Plumbing Requirements.
   6. Section 16010 – General Electrical Provisions.

1.2 SUBMITTALS

A. Section 01300 – Submittals: Submittal procedures.
   1. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

B. Section 01700 – Project Closeout: Record Drawings.
   1. Accurately record actual locations of capped utilities and substrate obstructions.

1.3 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

D. Hazardous Materials: Refer to Section H – Environmental Compliance.

1.4 SEQUENCING

A. Section 01010 – Summary of Work: Requirements for sequencing.

1.5 SCHEDULING

A. Section 01039 – Coordination and Meetings: Requirements for scheduling.

B. **All work which generates disturbing noise shall be performed before or after school hours, and scheduling shall be coordinated with Construction Project Inspector**.

C. Describe demolition removal procedures and schedule.

D. Coordinate utility and building service interruptions with Owner.

E. Do not disable or disrupt building fire or life safety systems without three (3) days prior written notice to Owner.

F. Schedule tie-ins to existing systems to minimize disruption.

G. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

H. All untagged existing materials requiring removal shall become the property of the Contractor as salvage and shall be removed from the site at no additional cost to the Owner.

1.6 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Cease operations immediately if structure appears to be in danger and notify Construction Project Inspector. Do not resume operations until directed.

C. Notify Construction Project Inspector **IMMEDIATELY** upon discovery of hazardous materials.

D. Maintain existing sidewalks to greatest extent possible.

PART 2 PRODUCTS

2.1 DUMPSTERS

A. Provide enclosed lockable dumpsters, to prevent access to removed materials.

B. Provide one inch thick plywood below dumpster to protect pavement.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices where directed by Construction Inspector including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

D. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.

E. Provide appropriate temporary signage including signage for exit or building egress.

F. Do not close or obstruct building egress path.

3.2 DEMOLITION

A. Conduct demolition to minimize interference and prevent damage to adjacent and occupied building areas.

B. Maintain protected egress from and access to adjacent existing buildings at all times.

C. Conduct demolition operations and the removal of debris to insure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

D. Do not close or obstruct streets, walks, or other occupied or used facilities without permits and permission from the Construction Project Inspector. Provide alternate routes around closed or obstructed traffic ways as required by governing regulations.

E. Cease operations immediately when structure appears to be in danger and notify Construction Project Inspector.

F. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

G. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

H. Remove temporary Work.

I. Any parts of existing construction which are to remain and which are damaged during demolition and preparatory work or new construction work on the project shall be patched to match existing adjacent surfaces. Patching and finishing of such areas shall conform with all applicable requirements of other technical sections of these specifications, and shall match existing work in material, type, finish, etc.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section includes cast-in-place concrete for the following:
   1. Equipment pads.

C. Related Sections:
   1. Section 15500 – General Mechanical Requirements: Concrete equipment pads for mechanical equipment.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 305 - Hot Weather Concreting.
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   4. ACI 308.1 – Standard Specification for Curing Concrete.
   5. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
   5. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
   6. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.

1.3 SUBMITTALS

A. Section 01300 – Submittals and Permits.

B. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Maintain copy of ACI 301 on site.

C. Acquire cement and aggregate from one source for Work.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.

1.7 COORDINATION

A. Section 01039 – Coordination and Meetings: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Portland, grey color.
   1. Type I - Normal.

B. Normal Weight Aggregates: ASTM C33; fine and coarse in accordance with ACI 318.

C. Water: ACI 318; potable and not detrimental to concrete.

2.2 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion.

B. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2400 psi in 48 hours.

2.3 JOINT DEVICES AND FILLER MATERIALS

A. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric neoprene filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; of longest manufactured length at each location, flush mounted.

2.4 CURING MATERIALS

A. Water: Clean and drinkable.

B. Membrane Curing Compound: ASTM C309, Type I, non-yellowing acrylic curing and sealing compound.

C. Clear Sealer: Hardening/sealing type.

2.5 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94, Option A.

B. Concrete shall be deposited at job site within 1 hour after introduction of water in mix. Care shall be taken in transferring concrete from truck or mixer to avoid segregation of aggregates in mixture.

C. Provide concrete to the following criteria:
   1. Equipment Pads:
      a. Compressive Strength (28 days): 3000 psi.
      b. Slump: 3 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 – Coordination and Meetings: Coordination and project conditions.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions. Remove laitance, coatings and unsound materials

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris from formwork, reinforcement and concrete substrates.

D. Fill voids in sleeves temporarily with readily removable material to prevent the entry of concrete into the voids.

3.3 PLACING CONCRETE

A. Notify Construction Project Inspector and testing laboratory minimum 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301.

C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, and joint devices are not disturbed during concrete placement.

D. Install construction joint devices in coordination with floor slab placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

E. Apply sealants in joint devices in accordance with Section 07900.

F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

G. Place concrete continuously fir entire equipment pad.

H. Do not interrupt successive placement; do not permit cold joints to occur.

I. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 feet.

3.4 SEPARATE FLOOR TOPPINGS

A. Prior to placing equipment pads, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.5 CONCRETE FINISHING

A. Finish concrete floor (pad) surfaces in accordance with ACI 301.

B. Edges shall be neatly trimmed with 1/4” radius edging tool. Honeycombed areas shall be pointed with mortar.

C. Apply sealer in accordance with manufacturer's instructions on all exposed interior concrete surfaces. All treatment and cleaning of surface prior to application shall be in strict accordance with manufacturer's instructions.

3.6 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying and mechanical injury.

B. Maintain concrete with minimal moisture loss of relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure surfaces in accordance with ACI 318.

D. Application of curing compound shall not exceed 200 square feet per gallon, in accordance with manufacturer’s instructions.

E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.7 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control: Testing.

B. Field inspection and testing to be performed in accordance with ACI 318 and under provisions of Section 01410.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

F. Strength Test Samples:
   1. Sampling Procedure: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31, cylinder specimens, field cured.
   3. Sample concrete and make one set of three cylinders for every 75 cu yds or less of each class of concrete placed each day.

4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
5. One slump test will be taken for each set of test cylinders taken.
6. Results shall be provided for 7, 14 and 28 day breaks.

G. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.8 PATCHING

A. Allow Construction Project Inspector to inspect concrete surfaces immediately upon removal of forms.

B. Excessively honeycombed or embedded debris in concrete is not acceptable. Notify Construction Project Inspector upon discovery.

C. Patch imperfections as directed in accordance with ACI 301.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Inspector.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Construction Project Inspector for each individual area.

3.10 SCHEDULE – CONCRETE TYPES AND FINISHES

A. Equipment Pads: Minimum 3,000 psi 28 day concrete, form finish with trowelled surface.

END OF SECTION

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SECTION 06105

ROUGH CARPENTRY WORK FOR ROOF WORK

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section includes rough carpentry work related to roof work, including, but not limited to the following:
   1. New roof curbs and roof support trails.
   2. Cants.
   3. Wood blocking and perimeter nailers.

C. Related Sections:
   1. Section 07050 - Preparation For Roof Work.
   2. ***Section 07514 - Built-Up Asphalt Bituminous Roofing.***
   3. ***Section 07536 – SBS Modified Bitumen Sheet Roofing.***

1.2 REFERENCES

A. American Wood-Preservers' Association (AWPA):
   1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
   2. AWPA U1 - Use Category System: User Specification for Treated Wood.

B. ASTM International:
   1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. U.S. Department of Commerce National Institute of Standards and Technology:
   1. DOC PS 1 - Construction and Industrial Plywood.
   2. DOC PS 20 - American Softwood Lumber Standard.

1.3 QUALITY ASSURANCE

A. Lumber: Visible grade stamp, of agency certified by DOC PS 20.

B. Wood Treatment: Provide AWPA grade-stamped pressure-treated wood and plywood, or submit certification by the pressure-treating plant that pressure-treated wood and plywood comply with the specified reference standards.

C. Anchor all wood blocking per National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.

D. Installer: Company specializing in installing the materials indicated in this Section with three years minimum experience.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber: DOC PS 20; graded in accordance with established Grading rules; maximum moisture content of 10 percent; of the following species and grades:
   1. No. 2 grade or better; free from warping and visible decay, S4S, Douglas Fir-Larch, preservative treated for rot resistance.

B. Plywood: APA Rated Sheathing, 1 inch thickness unless otherwise indicated; Grade C-D; Exposure Durability 1.

2.2 ACCESSORIES

A. Fasteners: ASTM A153, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

B. Anchors: Provide the following type for the substrates indicated for proper anchorage; as manufactured by Powers/Rawl, or approved equal:
   1. Concrete: TAPPER Concrete Anchors; Blue Perma-Seal TAPPER; Hex #2726, 1/4 inch x 2-3/4 inch.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): Provide in accordance with AWPA U1 for water-borne preservative treatment. **All treatments shall be compatible with specified roofing material**.

B. Wood nailers and blocking members shall be precut to size and shape before being treated to preclude the need for field cutting and thus exposing untreated surfaces at cut ends.

C. Any members that must still be cut in the field shall be dipped, after cutting, in the same fire-retardant chemical that was used in the pressure treating process.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 – Coordination and Meetings: Verification of existing conditions before starting work.

B. Verify substrate conditions are ready to receive blocking and curbing.

3.2 PREPARATION

A. Coordinate placement of blocking and curbing items.

3.3 INSTALLATION

A. Install treated wood nailers and blocking as detailed.

B. Erect wood blocking and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch.

C. Construct members of continuous pieces of longest possible lengths.

D. Provide blocking indicated.

E. Brush coat surfaces cut after treatment with heavy coat or preservative.

END OF SECTION

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SECTION 07514

BUILT-UP ASPHALT BITUMINOUS ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Project at Bay View High School consists of removal of existing 4-ply built-up roof (no roof warrantee) with silver coating, installation of new roof support rails and curbs and then patching with new insulation and roofing materials to match existing roof system. Also provide insulation roof saddles at roof support rails as required to direct water to roof drains.

C. Related Sections:
   1. Section 06100 - Rough Carpentry: Blocking, curbing and nailers.
   2. Section 15400 – General Plumbing Requirements: Plumbing for roof drain work.
   3. Section 16010 – General Electrical Provisions: Electrical requirements for roof work.

1.2 REFERENCES

A. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

B. Underwriter's Laboratory (UL) - Fire Hazard Classification.

C. Factory Mutual (FM) - Roof Assembly Classifications.

1.3 SYSTEM DESCRIPTION

A. Four-ply built-up asphalt bituminous roof with smooth aluminum coating. The four-ply roof shall consist of four plies of Type IV glass felts.

1.4 SUBMITTALS

A. Section 01300 – Submittals: Submittal procedures.
   1. Materials List: Submit for approval all materials to be used on project, including manufacturer's name, size, thickness, type or grade.
   2. Manufacturer’s Handbook: Include the latest technical information, application and installation techniques, and details.
   3. Shop Drawings: Indicate insulation layout, total insulation thickness, actual location and sizes of all roof drains, vents, protrusions, etc.
   4. Manufacturer's Certificates: Submit certificate from the asphalt manufacturer stating that each load of asphalt delivered meets ASTM D312, Type II or III as specified.
   5. Samples: Shall be submitted upon request.
   6. Personnel List: Submit list of personnel, including emergency contact telephone numbers, for all supervisors, etc., involved with the project. Submit **prior** to start of any work on roof.

1.5 QUALITY ASSURANCE

A. All work of this Section to conform to NRCA Roofing and Waterproofing Manual and the manufacturer's printed instructions, except where superseded by more stringent requirements specified herein.

B. Manufacturer: Company specializing in manufacturing the products specified in this Section with five years minimum documented experience.

C. Applicator: Company specializing in performing the work of this Section five years minimum documented experience and approved by the product manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable State of Wisconsin codes for roof assembly fire hazard requirements.

B. Fire Hazard Classification: UL Class A.

C. Roof Assembly Classification: FM Class I-90 construction, in accordance with the latest FM Construction Bulletin.

1.7 PRE-INSTALLATION CONFERENCE

A. Section 01039 – Coordination and Meetings: Pre-installation meetings.

B. Contractor to schedule a pre-installation conference two weeks prior to commencing work of this Section.

C. The roofing contractor, primary membrane materials manufacturer, and Construction Project inspector shall be in attendance.

D. Review installation procedures and coordination required with related work and other related Sections.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 – Product Requirements.

B. Delivery of Materials:
   1. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. All materials shall be delivered on pallets.
   2. Deliver materials in sufficient quantity to allow continuity of work.

C. Storage of Materials:
   1. Store materials on raised pallets or platforms a minimum of six inches off the ground and moisture. Do not stack pallets or platforms.
   2. Store all roll materials on end. Discard rolls which have flattened, creased or are otherwise damaged.
   3. Provide protective coverings of canvas tarpaulins - manufacturers shrink wrap or polyethylene is not acceptable. Maintain adequate air circulation. Coverings to extend down sides completely and shall be secured. Protect insulation from direct sunlight exposure.
   4. Do not store materials on existing roofing, or load on the roof structure to cause overloading of roof's design capacity.

5. Coordinate allowable areas for storage with Construction Project inspector. Site has limited areas for storage.

1.9 ENVIRONMENTAL REQUIREMENTS

A. **The contractor is to provide and use a "Fume Recovery System" for all asphalt apparatus on the project site**.

B. Do not apply roofing membrane during inclement weather. All work shall be done between temperatures accepted by the roofing membrane manufacturer.

C. Do not apply roofing membrane to damp or frozen substrates.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be waterproofed during the same day.

E. Utilize good weather to the utmost. Plan and schedule all work to occur during least threatening weather. Contractor shall have a standing agreement with all subcontractors and all parties involved, agreeing to proceed as arranged, but also agreeing to adjust to sudden changes of weather

1.10 COORDINATION AND SCHEDULING

A. Section 01039 – Coordination and Meetings: Scheduling of work.

B. Complete all roof deck cleaning and repair, and rough carpentry work and component installations each day, prior to installation of roof membrane.

C. Arrange work sequence to avoid use of newly completed roofing areas for storage, walking surface, or equipment movement.

D. **ALL ROOFING PLIES MUST BE INSTALLED ON THE SAME DAY**.

1.11 WARRANTY

A. Section 01700 – Project Closeout: Warranty requirements.

B. Warranties shall cover damage resulting from failure to resist penetration of water.

C. Repair leaks and replace or repair roofing and membrane flashing exhibiting any defects in either materials or workmanship during the warranty period without charge of any kind.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Glass Fiber Felts: ASTM D2178, Type IV, with minimum tensile strength of 40 lbs. per inch in both directions, minimum 36 inch wide, 500 square foot per roll. Acceptable manufacturers are as follows:
   1. Johns-Manville.
   2. Tamko.
   3. CertainTeed Flintlastic.
   4. GAF GAFGLAS Ply 4.

2.2 BITUMINOUS MATERIALS

A. Asphalt Bitumen: ASTM D312; as manufactured by Continental; type required for the slopes indicated as specified by the roofing manufacturer.

B. Asphalt Primer: ANSI/ASTM D41; non-asbestos cut-back asphalt type, specifically prepared for priming non-wood surfaces.

C. Asphalt Roof Cement/Mastic: ASTM D4586 Type I; non-asbestos, asphaltic cut with fiber fillers.

D. Asphalt Emulsion: ASTM D1227, Type I.

2.3 INSULATION MATERIALS

A. Match existing roof insulation.

B. Patching of existing insulation: Where soft insulation is removed, a variable thickness of perlite board or other approved insulation board shall be installed to match existing thickness.

2.4 FLASHINGS

A. Flexible Flashings: Minimum 180 gram polyester reinforced, smooth surfaced SBS modified bitumen sheet; flashings must be by same manufacturer as roofing membranes specified above), or must be compatible with roofing membrane. Additional acceptable manufacturers are as follows:
   1. SBS: Firestone SBS.
   2. Substitutions: Per General Conditions.

2.5 SURFACING

A. Coating: ASTM D2824 Type III, (Non-Asbestos Type); Asphalt based, fibrated aluminum type, containing 3.8 pounds of aluminum paste per gallon; paste shall be a minimum of 65% pigment; able to be applied without showing brush, roller or streak marks; as manufactured by Lucas #718 - Fibrated Aluminum Roof Coatings - Asbestos Free, or approved equal.

2.6 ROOF ACCESSORIES

A. Provide support rails, roof penetration curbs, etc. as shown. See Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify that deck is clean and smooth, free of depressions, waves, or projections, is supported and secured, and is properly sloped to drains.

C. Verify that deck surfaces are dry and free of snow or ice. Confirm dry wood decks by moisture meter, with 12 percent moisture maximum.

D. Verify that roof openings, curbs, pipes and sleeves, are solidly set, and cant strips and wood nailing strips are in place.

3.2 PROTECTION

A. Protect building surfaces, paving, and landscaping against damage from roofing work. In raising bitumen beside wall surfaces, protect adjoining walls to prevent possibility of splashing and damage.

B. Care must be taken to prevent bitumen from running through roof deck into building.

C. Provide protective covering under asphalt kettle to keep areas clean of bitumen spills.

D. Suspend all application and installation activities during inclement weather.

E. Protect roof deck and insulation from moisture by providing water cut-offs at the end of each day's work or when the weather is threatening. Failure to protect the deck and roofing from moisture will result in the removal of damaged materials or materials containing excessive moisture. Remove water cut-offs prior to start of new work.

F. Keep roof drains covered during daily work, to keep debris from clogging them. Remove protection at end of each day.

3.3 PREPARATION - GENERAL

A. Equivscous Temperature at Point of Application: No more than 25 degrees from bitumen rating indicated on container label. Do not exceed flash point, and do not exceed blowing temperature for more than 4 hours.

B. Provide approved thermometers separate from those mounted on the kettle, and have kettleman in constant attendance. Maintain manufacturer's precautions on overheating, etc. Keep spare thermometer on site.

C. If bitumen is held in a tanker or in storage for more than 48 hours, it should be kept at approximately 325^{o}F or lower.

D. Set cants in place in steep asphalt.

E. Discontinue to apply asphalt where uncharacteristic foaming is noted or appearing.

F. Discard any insulation material that is wet, warped, or otherwise damaged.

3.4 PREPARATION

A. Concrete Decks: Fill surface honeycomb and variations with latex filler and prepare surfaces per roofing system manufacturer's recommendations.

3.5 INSULATION APPLICATION

A. Install per manufacturers and NRCA requirements.

B. Ensure deck (and vapor retarder) is clean and dry.

C. Minimum Total Insulation Thickness: as required to match existing.

D. Provide tapered insulation saddles as required at all locations of curbs, scuttles, etc., where pitch of new roofing is interrupted. Tapered installation to start at 0" above layer below.

E. Apply no more insulation than can be sealed with membrane in same day.

F. After installation, protect insulation from excess foot traffic.

3.6 MEMBRANE APPLICATION

A. Install roofing felts and flashing materials in accordance with manufacturer's current published application instructions.

B. Apply 4 plies of roofing felts in a full and uniform moppings of asphalt at a minimum rate of 25-30 lbs. per square per ply. Install plies perpendicular to slope of roof deck, to ensure water will flow over or parallel to, but never against, exposed edges. Apply felts in same direction, lapping felts as recommended by manufacturer. Felts shall be completely covered and exposed edges thoroughly embedded. Roll felts directly behind mop, brooming-in firmly. All plies of roofing felts must be installed on the same day.

C. Apply felts smooth, free from air pockets, wrinkles, fishmouths, lap joints, or tears. Cut out and re-cement all poorly laid felts.

D. Overlap end laps six (6) inches minimum. Stagger end laps minimum 24 inches.

E. Ply shall never touch ply, even at roof edges, laps and cants.

F. Extend all plies up cant strips and minimum of 6 inches onto vertical surfaces. Extend base ply at roof perimeter edges over top of blocking and down outside vertical face. Secure to nailing strips at 4 inches on center and stripped in with 4" wide cloth, at all vertical and horizontal edges, including corners.

G. Mop and seal two additional plies of felt around roof penetrations.

H. Install two plies of felt and bitumen glaze coat for cut-off at end of day's operation. Extend base sheet felt 6" on to deck and 4" onto insulation. Remove cut-off before resuming roofing.

I. Following installation of last roofing ply, squeege hot asphalt over entire roof area - **mopping of asphalt is not allowed.**

3.7 FLASHINGS AND ACCESSORIES

A. Prime all surfaces from top of finished roofing plies to flashing termination with asphalt primer. Allow primer to dry thoroughly.

B. Apply flexible sheet base flashings to seal felts to vertical elements. Firmly embed one (1) base ply of roofing felt into Type IV asphalt. Eliminate all wrinkles and fishmouths. Extend the base ply from the reglet to not less than 8 inches from the base of the cant onto the roof. Strip in base ply to top of vertical surfaces.

C. Solidly mop modified bitumen sheet over base flashing. Hot air weld all vertical seams of the modified bitumen flashing.

D. Coordinate installation of roof drains, curbs, and related flashings.

E. Seal flanges and flashings of items penetrating or protruding through the roof membrane.

3.8 DAILY WATERSTOP/CUT-OFF

A. At the end of each day's operation:
   1. Remove debris from top ply of felt along termination, minimum 18 inches wide.
   2. Adhere twelve (12) and eighteen (18) inch wide roofing ply sheets from exposed deck to new roofing with a continuous 1/16" thick application of asphalt or tie-off mastic. Glaze cut-off with asphalt or water cut-off mastic. Extend eighteen (18) inch wide felt three (3) inches on both sides of the twelve (12) inch felt.
   3. Install "deadman" insulation filler at insulation staggers.
   4. Extend roofing system at least twelve (12) inches onto prepared area of adjacent roofing. Embed base ply of system into mastic. Seal edge with six (6) inch wide ply embedded between continuous course of tie-off mastic. Remove all voids and wrinkles.

B. Beginning of next day's work:
   1. Remove temporary connection by cutting felts evenly along edge of existing roof system.
   2. Remove "deadman" insulation fillers.

3.9 SURFACING

A. Apply coating to top surface at the rate recommended by roofing manufacturer.

B. Application shall be by mop roller only. **No diluting or spraying of the coating will be allowed**.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by roofing system manufacturer.

B. Manufacturer to verify compliance with manufacturer's specifications. Require site attendance of roofing material manufacturer during installation of the Work.

C. Tapered Insulation Systems shall include the roofing contractor and the Inspector.
   1. A field flood test or inspection within 24 hours of precipitation will determine if the installation is acceptable or corrections are to be made.
   2. Completed roof shall not hold ponded water for more than 24 hours.
   3. Correct identified defects in drainage with additional tapered insulation as required to meet requirements for Certified Drainage system.

3.11 CLEANING

A. In areas where finished surfaces are soiled by asphalt or any other source of soiling caused by the work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

B. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.12 PROTECTION

A. Where traffic must continue over finished roof installation, protect surfaces in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 07536

SBS MODIFIED BITUMEN SHEET ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Project at Riverside University High School consists of removal of existing 2-ply modified SBS roof system (no roof warrantee), installation of new roof support rails and curbs and then patching with new insulation and roofing materials to match existing roof system. Also provide insulation roof saddes at roof support rails as required to direct water to roof drain.

C. Related Sections:
   1. Section 06100 - Rough Carpentry: Blocking, curbing and nailers.
   2. Section 15500 - Heating, Ventilating, and Air Conditioning Work for Reroofing: Prefabricated curbs for mechanical equipment.

1.2 REFERENCES

A. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

B. Underwriter's Laboratory (UL) - Fire Hazard Classification.

C. Factory Mutual (FM) - Roof Assembly Classifications.

1.3 SYSTEM DESCRIPTION

A. One-ply modified bituminous base sheet in asphalt moppings followed by a one-ply heat welded modified bituminous cap sheet.

1.4 SUBMITTALS

A. Section 01300 – Submittals: Submittal procedures.

B. Product Data: Provide manufacturer's name, size, thickness, type or grade for all materials.

C. Manufacturer’s Installation Instructions: Manufacturer's handbook, containing the latest technical information, application and installation techniques, and details.

D. Shop Drawings: Indicate insulation, total insulation thickness, actual location and sizes of all roof drains, etc.

E. Samples: Submit upon request.

F. Personnel List: Include emergency contact telephone numbers, for all supervisors, etc., involved with the project. Submit **prior** to start of any work on roof.

1.5 QUALITY ASSURANCE

A. All work of this Section to conform to NRCA Roofing and Waterproofing Manual and the manufacturer's printed instructions, except where superseded by more stringent requirements specified herein.

B. Manufacturer: Company specializing in manufacturing the products specified in this Section with three years minimum documented experience.

C. Applicator: Company specializing in performing the work of this Section five years minimum documented experience and approved by the product manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable State of Wisconsin codes for roof assembly fire hazard requirements.

B. Fire Hazard Classification: UL Class A.

C. Roof Assembly Classification: FM Class I-90 construction, in accordance with the latest FM Construction Bulletin.

1.7 PRE-INSTALLATION CONFERENCE

A. Section 01039 – Coordination and Meetings: Pre-installation meetings.

B. Contractor to schedule a pre-installation conference two weeks prior to commencing work of this Section.

C. The roofing contractor, primary membrane materials manufacturer, and Construction Project inspector shall be in attendance.

D. Review installation procedures and coordination required with related work and other related Sections.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 – Materials and Products: Requirements for delivery, storage and handling.

B. Delivery of Materials:
   1. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. All materials shall be delivered on pallets.
   2. Deliver materials in sufficient quantity to allow continuity of work.

C. Storage of Materials:
   1. Store materials on raised pallets or platforms a minimum of six inches off the ground and moisture. Do not stack pallets or platforms.
   2. Store all roll materials on end. Discard rolls which have flattened, creased or are otherwise damaged.
   3. Provide protective coverings of canvas tarpaulins - manufacturers shrink wrap or polyethylene is not acceptable. Maintain adequate air circulation. Coverings to extend down sides completely and shall be secured. Protect insulation from direct sunlight exposure.
   4. Do not store materials on new roofing, or load on the roof structure to cause overloading of roof's design capacity.
   5. Coordinate allowable areas for storage with Construction Project Inspector.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during inclement weather. All work shall be done between temperatures accepted by the roofing membrane manufacturer.

B. Do not apply roofing membrane to damp or frozen substrates.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be waterproofed during the same day.

D. Utilize good weather to the utmost. Plan and schedule all work to occur during least threatening weather. Contractor shall have a standing agreement with all subcontractors and all parties involved, agreeing to proceed as arranged, but also agreeing to adjust to sudden changes of weather.

1.10 COORDINATION AND SCHEDULING

A. Section 01039 – Coordination and Meetings: Pre-installation conferences.

B. Arrange work sequence to avoid use of newly completed roofing areas for storage, walking surface, or equipment movement.

C. **ALL ROOFING PLIES MUST BE INSTALLED ON THE SAME DAY**.

1.11 WARRANTY

A. Section 01700 – Project Closeout: Warranties.

B. Warranties shall commence on Date of Substantial Completion.

C. Warranties shall cover damage resulting from failure to resist penetration of water.

D. Repair leaks and replace or repair roofing and membrane flashing exhibiting any defects in either materials or workmanship during the warranty period without charge of any kind.

PART 2 PRODUCTS

2.1 MEMBRANE MATERIALS

A. Approved Manufacturers:
1. Certainteed.

B. Torch-Applied SBS Modified Bitumen Cap Sheet: ASTM D6164, Grade G, Type II, color selected by Owner.
   1. Certainteed Flintlastic GTS.

C. Asphalt-Applied Modified Bitumen Base Sheet: ASTM D6164, Grade S, Type I.
   1. Certainteed Ultra Poly SMS Base Sheet.

D. Penetrations: As recommended by membrane manufacturer.

E. Underlayment: Asphalt-applied modified bitumen base sheet: ASTM D6164, Grade S, Type I.
   1. Certainteed Ultra Poly SMS Base Sheet.

2.2 BITUMINOUS MATERIALS

A. Asphalt Bitumen: ASTM D312 “No Fume” Asphalt manufactured by Continental, steep type III and IV.

B. Asphalt Primer: ANSI/ASTM D41, non-asbestos cut-back asphalt type, specifically prepared for priming non-wood surfaces.

C. Membrane Cold Adhesive: Modified bitumen adhesive, brush grade, trowel grade, and caulk grade, used as recommended by membrane manufacturer, meeting ASTM D3019, Type III.

D. Asphalt Roof Cement/Elastomeric Mastic: Non-asbestos as recommended by membrane manufacturer.

2.3 INSULATION MATERIALS

A. To match existing.

2.4 FLASHINGS

A. Flexible Flashings: As recommended by membrane manufacturer.

2.5 ACCESSORIES

A. Provide support rails, roof penetration curbs, etc. as shown. See Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify that deck is clean and smooth, free of depressions, waves, or projections, is supported and secured, and is properly sloped to drains.

C. Verify that deck surfaces are dry and free of snow or ice. Confirm dry wood decks by moisture meter, with 12 percent moisture maximum.

D. Verify that roof openings, curbs, pipes and sleeves, through roof are solidly set, and cant strips and wood nailing strips are in place.

3.2 PROTECTION

A. Protect building surfaces, paving, and landscaping against damage from roofing work. In raising adhesive beside wall surfaces, protect adjoining walls to prevent possibility of splashing and damage.

B. Care must be taken to prevent adhesive from running through roof deck into building.

C. Provide protective coverings and keep areas clean of adhesive spills.

D. Suspend all application and installation activities during inclement weather.

E. Protect roof deck and insulation from moisture by providing water cut-offs at the end of each day’s work or when the weather is threatening. Failure to protect the deck and roofing from moisture will result in the removal of damaged materials or materials containing excessive moisture. Remove water cut-offs prior to start of new work.

3.3 PREPARATION - CONCRETE DECK

A. Replace any damaged or deteriorated decking with compatible material.

3.4 UNDERLAYMENT APPLICATION

A. Apply a two-ply strip of dry applied felt 18 inches wide over pre-cast concrete deck joints.

B. Apply primer at one gallon per square and allow to dry.

C. Unroll dry base ply membrane on substrate for alignment. Each strip shall have three (3) inch side laps and six (6) inch end laps. Begin at low point of roof.

D. Reroll base ply (halfway) one end at a time in accordance with recommendations of membrane manufacturer onto an approved substrate.

E. Roll the membrane into a full width mopping of asphalt. The membrane must be firmly and uniformly set, without voids, into the asphalt, which is applied at a nominal uniform rate of 23 lbs. per square.

F. The temperature of the asphalt at application should be such that, when the membrane is set its temperature is approximately 20 F above EVT.

G. Application shall provide a smooth surface, free of air pockets, wrinkles, fishmouths or tears.

H. Extend underlayment under cant strips and blocking. Lap flexible flashings over underlayment of wall construction to provide continuity of underlayment envelope.

I. The “mop and flop” technique is not an acceptable installation procedure.

3.5 INSULATION APPLICATION

A. Matching existing and per manufacturer's and NRCA requirements.

3.6 MODIFIED BITUMEN BASE SHEET APPLICATION

A. Apply primer at one gallon per square and allow to dry.

B. Unroll dry base ply membrane on substrate for alignment. Each strip shall have three (3) inch side laps and six (6) inch end laps. Begin at low point of roof.

C. Reroll base ply (halfway) one end at a time in accordance with recommendations of membrane manufacturer onto an approved substrate.

D. Roll the membrane into a full width mopping of asphalt. The membrane must be firmly and uniformly set, without voids, into the asphalt, which is applied at a nominal uniform rate of 23 lbs. Per square.

E. The temperature of the asphalt at application should be such that, when the membrane is set its temperature is approximately 20 F above EVT.

F. Application shall provide a smooth surface, free of air pockets, wrinkles, fishmouths or tears.

G. Extend underlayment under cant strips and blocking. Lap flexible flashings over underlayment of wall construction to provide continuity of underlayment envelope.

H. The “mop and flop” technique is not an acceptable installation procedure.

3.7 TORCH-APPLIED MODIFIED BITUMEN MEMBRANE APPLICATION

A. Verify that all previous sheets are properly adhered to the substrate and is suitable to accept roof membrane.

B. Install modified bitumen membrane materials in accordance with manufacturer's current published application instructions.

C. Torch apply one (1) ply of granulated modified bituminous membrane over base sheet, and firmly roll membrane into place, starting at lowest point of roof areas (at drains). All plies shall be parallel to roof slope.

D. Ensure complete and continuous seal and contact between bitumen and ply sheets, including ends, and edges free from air pockets, wrinkles, fishmouths, lap joints, or tears.

E. Laps: Three (3) inch side laps and six (6) inch end laps minimum.

F. Extend base sheet up cant strips and minimum of twelve (12) inches onto vertical surfaces.

G. All field seams shall be heat welded or torched in place.

3.8 FLASHINGS

A. Flashing Application - To roof support rails and curbs using membrane manufacturer recommendations.

B. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by roofing system manufacturer.

B. Field inspection and testing will be performed by roofing system manufacturer. (Tapered Insulation Systems will include the insulation manufacturer, roofing contractor and the Inspector - See Section 07220).

C. Manufacturer to verify compliance with manufacturer's and project specifications. Require site attendance of roofing material manufacturer during installation of the Work

D. Correct identified defects or irregularities.

3.10 CLEANING

A. In areas where finished interior and exterior surfaces are soiled by adhesive or any other source of soiling caused by the work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

B. Repair or replace defaced or disfigured interior or exterior finishes caused by work of this Section.

3.11 PROTECTION

A. Where traffic must continue over finished roof installation, protect surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07840

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section includes firestopping and through-penetration protection system materials and accessories; firestopping tops of fire rated walls; sealing vertical mechanical chases,and smoke sealing at joints.

C. Related Sections:
   1. Section 07270 - Air Barriers: Air barrier materials to adjacent insulation.
   2. Section 07810 - Applied Fireproofing: Spray applied fireproofing.
   3. Section 15400 - General Plumbing Provisions: Plumbing work requiring firestopping.
   4. Section 16010 – General Electrical Provisions: Electrical work requiring firestopping.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. National Fire Protection Association:
   1. NFPA 70 – National Electric Code.
   2. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.

2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to applicable code and UL for fire resistance ratings and surface burning characteristics.

1.5 SUBMITTALS

A. Section 01300 - Submittals: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance and limitation criteria.

C. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

D. Manufacturer's Installation Instructions: Submit preparation and installation instructions.

1.6 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479; to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

B. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: UL 2079; to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

C. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84 and UL 723.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 – Materials and Products.

B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Single or multiple component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.

5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.
8. ***For Cabling Only: Manufacturers: 3M Fire Protection Products.***
   a. ***Fire Barrier Caulk #CP25 WB+.***
   b. ***Fire Barrier Moldable Putty #MP Stix; for use inside conduits.***

B. Color: As selected from manufacturer's full range of colors.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Backing Material: One inch thick mineral wool.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 – Coordination and Meetings: Coordination and project conditions.

B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install mineral wool backing and damming materials to arrest liquid material leakage.

3.3 APPLICATION

A. Install material at all openings containing penetrating sleeves, conduit and other items, requiring firestopping in accordance with manufacturer’s instructions, UL and NFPA requirements.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

D. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

F. Compress fibered material to maximum 40 percent of its uncompressed size.

G. Place intumescent coating in sufficient coats to achieve rating required.

H. Pipe penetrations:
   1. When sealant is injected into a penetration, the caulk shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The caulk shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the caulk to block the passage of fire and smoke or water.

2. All conduits and sleeves penetrating walls, floors and ceilings shall have fire stop material both inside and around the conduit. The sealant inside the conduit shall remain soft and pliable to allow for the removal and/or addition of cables without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of anything going through the penetration without the seal cracking or crumbling.

I. When damming materials are to remain after the seal is complete then all such materials shall be non-flammable.

3.4 CLEANING

A. Section 01700 – Project Closeout: Final cleaning and protection.

B. Clean adjacent surfaces of firestopping materials.

C. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section Includes:
   1. Preparing sealant substrate surfaces.
   2. Sealant and backing at all dissimilar materials.
   3. Sealant and backing at construction joints between new construction and existing.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   2. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   3. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

1.3 SUBMITTALS

A. Section 01300 – Submittals: Submittal procedures.

B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples: Submit two samples, 4 inch in length, illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

B. Applicator: Company specializing in applying the work of this Section with minimum three years experience.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.6 SEQUENCING AND SCHEDULING

A. Section 01039 – Coordination and Meetings: Coordination and project conditions.

B. Coordinate Work with sections referencing this section.

1.7 WARRANTY

A. Section 01700 – Contract Closeout: Warranty provisions.

B. Provide three year warranty, including coverage of installed sealants and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

A. High Performance General Purpose Exterior (Nontraffic) Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component; color as selected by Construction Project Inspector from manufacturer's standard colors.
   1. Applications: Use for:
      a. Other exterior nontraffic joints for which no other sealant is indicated.

B. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable; color as selected by Construction Project Inspector from manufacturer's standard colors.
   1. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Other interior joints for which no other type of sealant is indicated.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Joints shall not exceed 3/8 inches unless approved by manufacturer.

C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with ASTM C1193.

D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193 and manufacturer's instructions.

B. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

C. Install bond breaker where joint backing is not used.

D. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Tool joints concave.

3.4 CLEANING AND REPAIRING

A. Section 01700 – Contract Closeout: Final cleaning.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Section 01700 – Contract Closeout: Protection of installed work.

B. Protect sealants until cured.

3.6 SCHEDULE

A. Polyurethane: Exterior areas.

B. Acrylic Latex: Interior areas; control joints, gypsum wall board, concrete masonry unit joints.

END OF SECTION

SECTION 09900

PAINT AND COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Drawings and General Provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings, including:
   1. Patching and extending work at removed floors, walls, and ceilings.
   2. See Schedule at end of Section.

C. Related Sections:
   1. Section 02072 - Minor Demolition for Remodeling.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
   2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials

1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.4 SUBMITTALS

A. Section 01300 – Submittals: Submittal requirements.

B. Product Data: Submit data on finishing products.

C. Samples:
   1. Submit a minimum of two paper chip samples, 6 x 6 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Installation Instructions: Submit special surface preparation procedures, and substrate conditions requiring special attention.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 – Project Closeout: Closeout procedures.

B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.6 QUALIFICATIONS

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

B. Applicator: Company specializing in commercial painting and finishing with three years documented experience.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01039 – Coordination and Meetings: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 – Product Requirements: Product storage and handling requirements.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees and maximum of 90 degrees, in ventilated area, and as required by manufacturer's instructions.

E. Paints shall be kept covered at all times and precautionary measures shall be taken to prevent fire hazards and spontaneous combustion.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 – Materials and Equipment.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

D. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.

1.10 REGULATORY REQUIREMENTS

A. Lead paint: Most painted surfaces in MPS Buildings contain lead. Therefore, assume that any painted surfaces that will be disturbed shall be treated as lead-based. All debris that is generated from the painted surface from drilling, cutting, fastening, etc., shall be completely contained, gathered and properly disposed of by the contractor. Contact the DFMS' Environmental Services at 414-283-4626 with all questions. If no scraping or removal is required for preparation of surfaces for repainting, the lead paint abatement procedures will not be required.

B. Deodorizers: It shall be this contractor's responsibility to add a deodorizer material to any paint material that has an odor problem that is unacceptable to the school.

C. Exterior Projects: Notify WE Energies and MPS' Electrical Shop a minimum of three (3) weeks prior to any work that will take place around exterior overhead power lines, in order to verify safety clearances, and to determine if any lines will require temporary disconnection/rerouting.

1.11 SEQUENCING

A. Section 01010 – Summary of Work: Work sequence.

B. Sequence application to the following:
   1. Do not apply finish coats until paintable sealant is applied.
   2. Back prime wood trim before installation of trim

1.12 EXTRA MATERIALS

A. Section 01700 – Project Closeout: Spare parts and maintenance products.

B. Supply one (1) unopened gallon container of each color, type, and surface texture used, also any open containers used on project and store where directed by School Engineer.

C. Supply to MPS Paint Shop (414-283-4609) two (2) copies of material, product and color selection lists of all painted areas using Manufacturer’s name and color number upon completion of project, re: finish schedule

D. Label each container with color, type, texture, and room locations, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Acceptable Manufacturers: The following manufacturer's materials are to be utilized. Each container shall bear specific brand name or number as listed.

B. Interior Latex Primer and Sealer:
   1. Sherwin-Williams Pro Mar 200 B28 W200.
   2. Zinsser 1-2-3 primer.
   3. ICI Ultra-Hide #1020.
   4. Benjamin Moore Fresh Start #02300.
   5. Hallman/Lindsey Primeguard 112.

C. Interior Primer for hard, glossy surfaces:
   1. Benjamin Moore’s Wall Grip #20301.
   2. Zinsser BIN Primer-Sealer.
   3. Zinsser H2Oil Primer-Sealer.
   4. Zinsser Bulls Eye 1-2-3 Primer Sealer.

5. XIM 400-W White.
6. Sherwin-Williams Prep-Rite B-51W50.

D. Interior Latex Eggshell Enamel Finish:
1. Sherwin-Williams Pro Mar 200.
2. ICI Ultra Hide #1412.
3. Benjamin Moore Aqua Velvet #319.
4. Hallman/Lindsey Lustre Kote #285.

E. Interior Latex Waterborne Semi-Gloss Finish:
1. Sherwin-Williams Pro Industrial 6403.
2. ICI Devflex #4206.
3. Benjamin Moore M-29.
4. Hallman/Lindsey Krill Guard Acrylic #316.

F. Interior Latex Waterborne High-Gloss Finish:
1. Sherwin-Williams D.T.M. Acrylic B-66 W100.
2. ICI Devflex #4208.
3. Benjamin Moore M-28.
4. Hallman/Lindsey Krill Guard Acrylic #315.

G. Interior Latex Waterborne Dry Fog Eggshell Finish:
1. Sherwin-Williams B42-W2.
2. ICI Spray Master #1482.
3. Benjamin Moore M-53.
4. Hallman-Lindsay Fast Dry #252.

H. Block Filler (must be same manufacturer as finish coat):
1. ICI Bloxfil #4000.
2. Benjamin Moore Moorcraft 173-01.
3. Sherwin-Williams Prep Rite B25W25.
4. Hallman/Lindsey Fill Kote #181.

I. Exterior Latex Wood Primer:
1. ICI Decrad-Shield #DS 8716.
2. Benjamin Moore 102.
3. Sherwin-Williams A-100 B42 W41.
4. Hallman/Lindsey Prime Guard #112.

J. Exterior Latex Metal Primer:
1. ICI Devflex D.T.M. #4020.
2. Benjamin Moore #363.
3. Sherwin-Williams Kem Kromik Universal Metal Primer.
4. Hallman/Lindsey Metal Guard #332.

K. Exterior Latex Metal Finish Paint:
   1. ICI Devflex W.B. #4208.
   2. Benjamin Moore #363.
   3. Sherwin Williams Industrial Enamel B54 Series.
   4. Hallman/Lindsey Metal Kote #178.

L. Concrete Sealer (interior equipment bases):
   1. 3M Cornerstone.

2.2 COMPONENTS

A. Coatings: Ready-mixed, except field catalyzed coatings. Prepare coatings:
   1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
   2. For good flow and brushing properties.
   3. Capable of drying or curing free of streaks or sags.

B. Accessory Materials:
   1. Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated, but required to achieve the finishes specified; commercial quality.
   2. Deodorizer: Bio-Zapp Laboratories, and distributed by Devoe, Better Paint, or equal.

C. Materials shall be used as they come from the container. If any reduction of the coating's viscosity is necessary, it shall be done in accordance with the manufacturer's label directions.

D. Refer to schedule at end of Section for surface finish schedule.

E. Colors: To be selected by Owner. There may be more than two colors, including accents, used in each room or space.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 – Coordination and Meetings: Coordination and project conditions.

B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Concrete Floors: 8 percent.

3.2 PREPARATION

A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, signage, grilles, and fittings prior to preparing surfaces or finishing. Re-install at project completion.
   1. Mask, cover and protect adjacent surfaces against spatter and overspray. Cover all materials and surfaces, fixtures, and furniture adjoining, below or adjacent to work in progress, with clean drop cloths or canvas.
   2. Include PVC and plastic-coated insulation coverings, valve stems, electrical devices, steam specialties, controls, expansion joint covers, etc.

B. Surfaces: Correct defects and clean all surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.

C. Marks: Seal marks which may bleed through surface finishes, including water stained areas, markers, graffiti, etc., with XIM Paint, BIN Primer-Sealer, or equal.

D. Impervious surfaces: Remove mildew by scrubbing with tri-sodium phosphate or equivalent cleaner. Rinse with clean water and allow to dry.

E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton. Do not paint PVC or plastic-coated insulation coverings.

G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

H. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.

I. Copper Surfaces Scheduled for Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

J. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.

K. Galvanized Surfaces: Remove surface contamination, corrosion, and oils and wash with solvent. Prime with bonding coat primer.

L. Concrete and Unit Masonry Surfaces: Remove dirt, loose mortar, scale, salt or alkali powder and any other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry.

Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

1. Concrete and Unit Masonry Surfaces Scheduled to receive Epoxy Finish: Surfaces must be tested for compatibility of epoxy finish with existing paint finish for adherence, etc., prior to application of any new coating. Incompatible existing surface finishes such as rubber-based products will have to be removed, prior to application of epoxy finish.

M. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

N. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

O. Shop Primed and Previously Painted Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime all metal items, including shop primed items.

P. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. After priming coat is dry, putty all knot holes and other surface blemishes and smooth over with putty knife, flush with surfaces.

3.3 EXISTING WORK

A. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

3.4 APPLICATION

A. Paint shall be applied in strict accordance with manufacturer's instructions. Primer coat materials **must be** compatible with existing finish/surface.

B. All products shall be applied so as to be free from sags, runs, skips, crawls, or other defective brushing. All materials are to be free of skins, lumps, or other foreign matter when used.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. All materials scheduled to receive finish are to be completely finished throughout, wherever surfaces are exposed to view.
   1. Trim is to be painted only where existing trim is painted.

E. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

F. Sand wood surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles with a HEPA VAC. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Prime concealed surfaces of interior and exterior woodwork with primer paint.

I. Finishing Mechanical And Electrical Equipment:
   1. Remove unfinished louvers, covers, and access panels for mechanical and electrical systems from location and paint separately to color of paint adjacent wall or ceiling surface.
   2. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, braces, collars and all supports in finished areas, to match surrounding surfaces.
   3. Replace identification markings or mechanical or electrical equipment when painted accidentally.
   4. Color code equipment, piping, conduit and exposed ductwork in accordance with existing requirements.
   5. Replace all louvers, cover plates, access panels and fittings, prior to completion.

3.5 CLEANING

A. Section 01700 – Project Closeout: Final Cleaning.

B. Collect cotton waste, cloths, and material which may constitute a fire hazard, placed in closed metal containers and remove daily from site.

C. Wipe entire surfaces of glass to remove paint specks, dust and dirt associated with the work of this section.

D. Remove empty paint containers from site.

E. Upon completion of work, remove all staging and scaffolding from site.

3.6 SCHEDULE - INTERIOR SURFACES

A. All interior surfaces shall be finished, excluding the following areas:
   1. Ash Room.
   2. Transformer Room.
   3. Coal Room.
   4. Fan Room.
   5. Water Meter Room.
   6. Elevator Equipment Room.
   7. PVC or plastic-coated insulation coverings.

B. All other existing finished surfaces to be finished unless indicated above.

C. New Steel - Primed:
   1. Touch-up with original primer.
   2. Two coats latex waterborne, satin sheen finish.

D. Existing Steel:
   1. Touch up with rust inhibiting red metal primer.
   2. Two coats latex waterborne satin sheen finish.

E. Exiting Plaster (including cement plaster):
   1. Plaster walls and ceilings in all areas except corridors, toilet rooms, showers, pools, locker rooms, and stair wells:
      a. Touch-up primer sealer.
      b. Two coats latex waterborne enamel finish.
   2. Plaster walls and ceilings in corridors, toilet rooms, showers, pools, locker rooms, and stair wells:
      a. Touch-up primer sealer.
      b. Two coats latex waterborne enamel finish.

F. New Concrete Floors:
   1. Four coats concrete sealer.

G. Existing Concrete Block:
   1. Touch-up existing with compatible primer.
   2. Two coats latex enamel finish.

H. Wood Surfaces:
   1. Existing – Painted:
      a. One coat latex primer sealer.
      b. Two coats latex waterborne, semi-gloss.

I. Ceilings:
   1. Acoustical - Perforated Hardboard:
      a. Touch-up and seal remaining stains XIM.
      b. Paint stained panels to match adjacent panels.
   2. Acoustical (spray applied):
      a. One coat latex, flat. Do not reduce size of holes in perforated surface.
   3. Acoustical - Metal Pan:
      a. Seal all stains with XIM.
      b. One coat enamel, high gloss. Do not reduce the size of the holes in the perforated surface. Tint paint to cover in one coat.
   4. Plaster and Wood, including beams:
      a. One coat primer sealer.
      b. One coat enamel, high gloss.
   5. Boiler and Fan Room:
      a. One coat, spray applied latex waterborne Dry Fog White.

J. Spraying Areas Only:
   1. Boiler Room ceiling and walls to the dado.
      a. Latex Waterborne Dry Fog Semi-Gloss.

K. Boiler Room:
   1. Dado area, steel stairway, landing deck, covered pipes, vacuum pumps, pipes, conduit, boilers, and miscellaneous items:
      a. One coat primer sealer.
      b. One coat high gloss enamel.
      c. Floor is to be kept clean.

3.7 EXTERIOR SURFACES

A. All exterior surfaces shall be painted, excluding the following:
   1. Non-ferrous metals, excluding aluminum.
   2. Masonry.
   3. Galvanized Door Covers: Clean only.
   4. Any paint found on these items shall be removed.

B. Metal - conduit, electrical, water, gas heating pipes, protective devices, fire horns, lintels and roof items, such as ladders, vents, decks, fire escapes, parapet wall caps, expanded metal and galvanized guards, etc.:
   1. Two coats of Direct-To-Metal latex, color to match window trim or brick veneer.

C. Roof Equipment:
   1. Railings and Ladders:
      a. One coat metal primer.
      b. One coat enamel metal paint, gloss.
   2. Roof Vents and Intakes:
      a. One coat metal primer.
      b. One coat enamel metal paint, gloss.
   3. Roof Security Light Poles and Angle Iron Brackets:
      a. One coat metal primer.
      b. One coat enamel metal paint, gloss.

END OF SECTION

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SECTION 15400

PLUMBING GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and Conditions applying to this section.

B. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

C. Included are the following topics:

1. Scope
2. Related Documents
3. Reference Standards
4. General Description of Work
5. Quality Assurance
6. Substitutions
7. Discrepancies
8. Codes and Regulations
9. Permits and Inspections
10. Visiting the Site and Existing Conditions
11. Temporary Utilities
12. Continuity of Existing Services
13. Protection of Work
14. Safety Measures And Accident Prevention
15. Damage
16. Work by Others
17. Roof Work
18. Hazardous Substance - Asbestos
19. Hazardous Substance - Lead Paint
20. Sound Criteria
21. Submittals
22. Guarantees and Warranties
23. Alternate Bids
24. Materials and Products

25. Access Panels and Doors
26. Identification
27. Installation
28. Demolition
29. Delivery, Storage and Handling
30. Excavation and Backfill
31. Concrete Work
32. Cutting, Patching and Painting
33. Ceiling Removal and Replacement
34. Building Access for Apparatus
35. Equipment and Panel Accessibility
36. Coordination
37. Identification
38. Cleaning of Equipment, Materials and Site
39. Lubrication
40. Factory Start-up Of Equipment
41. Training of MPS Personnel
42. Commissioning

1.2 RELATED DOCUMENTS

A. New plans and details.

B. Existing plans used for reference.

C. The plans and specifications of the following divisions:

1. Division 16000 - Electrical

D. The following sections of Division 15400 are considered related documents:

1. Section 15400 - Plumbing General Requirements
2. Section 15401 - Plumbing Pipe and Pipe Fittings
3. Section 15410 - Plumbing Valves
4. Section 15412 - Plumbing Piping Specialties
5. Section 15414 - Plumbing Hangers, Supports And Anchors
6. Section 15415 - Plumbing Openings, Sleeves and Fire Stopping
7. Section 15417 - Plumbing Motors, Starters, Disconnects and Control Wiring
8. Section 15426 - Plumbing Systems Insulation
9. Section 15430 - Plumbing Specialties

10. Section 15440 - Plumbing Fixtures
11. Section 15450 - Plumbing Equipment

1.3 REFERENCE STANDARDS

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

1.	ABMA	American Boiler Manufacturers Association
2.	ACPA	American Concrete Pipe Association
3.	AGA	American Gas Association
4.	AMCA	Air Movement and Control Association
5.	ANSI	American National Standards Institute
6.	ARI	Air Conditioning and Refrigeration Institute
7.	ASME	American Society of Mechanical Engineers
8.	ASSE	American Society of Sanitary Engineering
9.	ASTM	American Society for Testing and Materials
10.	AWWA	American Water Works Association
11.	AWS	American Welding Society
12.	CISPI	Cast Iron Soil Pipe Institute
13.	CGA	Compressed Gas Association
14.	CS Office	Commercial Standards, Products Standards Sections, of Engineering Standards Service, NBS
15.	DOC	State of Wisconsin Department of Commerce
16.	EPA	Environmental Protection Agency
17.	FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
18.	GAMA	Gas Appliance Manufacturers Association
19.	IAPMO	International Association of Plumbing & Mechanical Officials
20.	IEEE	Institute of Electrical and Electronics Engineers
21.	ISA	Instrument Society of America
22.	MCA	Mechanical Contractors Association
23.	MICA	Midwest Insulation Contractors Association
24.	MSS	Manufacturer’s Standardization Society of the Valve & Fitting Industry, Inc.
25.	NBS	National Bureau of Standards
26.	NEC	National Electric Code
27.	NEMA	National Electrical Manufacturers Association

28. NFPA National Fire Protection Association
29. NSF National Sanitation Foundation
30. PDI Plumbing and Drainage Institute
31. SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
32. STI Steel Tank Institute
33. UL Underwriters Laboratories Inc.

B. These Specific Standards:

1. ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete
2. ASTM D1557 Standard Test Method for Moisture-Density Relations of Soils
3. Standard Specifications for Road and Bridge Construction, State of Wisconsin, Dept. of Transportation
4. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
5. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
6. UL1479 Fire Tests of Through-Penetration Fire-stops
7. UL723 Surface Burning Characteristics of Building Materials
8. NFPA 70 National Electric Code (NEC)
9. NFPA 72 Smoke Detection
10. NFPA 54 Gas Piping
11. NFPA 96 Commercial cooking equipment ventilation systems.
12. NFPA 211 Gas Vents

1.4 GENERAL DESCRIPTION OF WORK

A. See Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The intent of these construction documents is to indicate a 100% complete plumbing system as specified herein and as shown on the drawings.

C. Minor demolition work is expected to be part of this project other than connection points to existing systems.

D. The project installs a solar thermal system to preheat domestic cold water. The base bid is for a 32 collector pressurized system and the alternate bid is for a 16 collector pressurized system in lieu of the 32 collector system.

1.5 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Unless specifically stated elsewhere, all equipment, materials and articles incorporated in the Work are to be new and of the best grade of their respective kinds for the purpose.

C. All equipment requiring electrical connections must be rated by some third party testing agency, such as Underwriters Laboratories.

1.6 SUBSTITUTIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.7 DISCREPANCIES

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.8 CODES AND REGULATIONS

A. Comply with the following codes and standards for all Plumbing work:

1. Wisconsin Administrative Code
2. DSPS Chapter 382 for Design, Construction, Installation, Supervision and Inspection of Plumbing
3. DSPS Chapter 384 for Plumbing Products
4. City of Milwaukee Code
5. Department of Public Works
   a) Milwaukee Water Works
   b) Milwaukee Sewer Department
6. Milwaukee Metropolitan Sewage Department (MMSD)

1.9 PERMITS AND INSPECTIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Furnish one (2) copies of all permits and certificates to the Construction Project Inspector who will:

1. Keep one on site and turned-over to MPS at the completion of the project.
2. Turn over one to the MPS Plan Room for their records.

C. Prior to beginning work, the Contractor shall provide one (1) set of stamped; City approved drawings to the Construction Project Inspector to be kept in the Construction Office or other agreed sites.

D. If Section 15400 Contractor performs any of the Work, knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer or the Construction Project Inspector, that Contractor then shall bear all costs associated from the violation.

1.10 VISITING THE SITE AND EXISTING CONDITIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. MPS does not guarantee the integrity of existing valves and/or stops at the site. If it becomes necessary to modify existing valves or install additional valves to assure the integrity of the system during construction, it shall be the responsibility of this Contractor to pay for such modifications or additions.

1.11 TEMPORARY UTILITIES

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.12 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Construction Project Inspector.

B. If an interruption is required, coordinate the down-time with the Building Engineer and the Construction Project Inspector to minimize disruption of the building's activities.

C. Refer to "Standard General Conditions of the Contract", specifically Article 23.

D. Unless specifically stated in writing, all work involved in interrupting or changing existing services is to be done during normal working hours.

E. To minimize disruption to the school, any interruption to the services of the school must be completed during hours when the school is unoccupied. Verify school schedule with Construction Project Inspector.

F. This Contractor must include all fees, overtime, etc., to complete the project according to the schedule indicated.

1.13 PROTECTION OF WORK

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.14 SAFETY MEASURES AND ACCIDENT PREVENTION:

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.15 DAMAGE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.16 HAZARDOUS SUBSTANCE - ASBESTOS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The presence, location and quantity, of known asbestos materials are contained in the MPS Management Plan, located in the Building Engineer's Office. It shall be the responsibility of all Contractors involved in this project to review this document prior to submitting their respective bid.

C. Airborne asbestos fibers and similar dust have been determined to be hazardous to your health.

1.17 HAZARDOUS SUBSTANCE - LEAD PAINT

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The existing building finishes may contain lead based paint, which, if improperly handled, could be a potential health hazard.

1.18 SOUND CRITERIA

A. All equipment to be installed as part of this project shall meet or be less then the sound criteria indicated in individual specification sections.

B. Refer to the ANSI Standard S12.60-2002 - Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools. Maximum background sound level of 35 dBA for classrooms less or equal to 20,000 FT^3 and 40 dBA for classrooms greater than 20,000 FT^3.

C. Equipment located outside shall comply with the City of Milwaukee ordinance 80-63 through 80-74 with regards to noise.

D. Where equipment or fixtures will not meet the City of Milwaukee noise ordinance, additional sound shielding shall be provided at no additional cost to MPS.

1.19 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. See Section 01300, “Submittals”.

C. See Section 01700, “Project Closeout”.

D. Shop Drawings

1. Shop drawings must be sent within 30 days of receipt of the purchase order. Final (approved or conditionally approved) shop drawings must be sent within 60 days of receipt of the purchase order. Failure to meet indicated deadlines may result in rejection of equipment or fixtures and/or materials.
2. Submit for all equipment, fixtures and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment, fixtures by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.
3. **For all equipment submit complete custom tailored made shop drawings** showing all required field wiring, piping connections, all auxiliary equipment and device locations, safety device locations, etc.
4. Shop drawings for equipment and fixtures must include data concerning dimensions, capacities, materials of construction, ratings, weights, manufacturer's written installation requirements, manufacturer's performance limitations, and appropriate identification.
5. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the electrical drawings and existing electrical requirements at the building.
6. Not more than two weeks after award of contract, but before any shop drawings are submitted; contractor shall submit the piping system data sheet for each piping service on the project. List material type, service, ASTM number, schedule or pressure class, joint type, manufacture and model number where appropriate.
7. As a minimum, submit sufficient quantities of shop drawings to allow the following distribution:

a)	Operating and Maintenance Manuals	2
b)	MPS Records – Joe Gorecki	1
c)	Engineer	2
d)	Contractor	2

8. Provide additional sets of shop drawings, diagrams, etc. as required by the other Contractors.

E. Operating And Maintenance Instructions:

1. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment or fixtures.

2. In addition to the data indicated in the General Requirements, include the following information:

a) Copies of all approved shop drawings.
b) Copies of "Record Drawings" drawings. (See Record Drawings in this section)
c) Copies of Owner Purchased equipment or fixtures O&M Manuals and Shop Drawings.
d) Manufacturer's wiring diagrams for electrically powered equipment.
e) Records of tests performed to certify compliance with system requirements.
f) Certificates of inspection by regulatory agencies.
g) Temperature control record drawings and control sequences.
h) Parts lists for manufactured equipment or fixtures.
i) Valve schedules.
j) Lubrication instructions, including list/frequency of lubrication done during construction.
k) Warranties.
l) Additional information as indicated in the technical specification sections.

F. Record Drawings

1. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

2. Include copies of these record drawings with the Operating and Maintenance manuals.

3. As-built record Drawing, showing dimensions, locations and depth of all buried and concealed piping, plugged outlets and equipment shall be kept up-to-date, Master copy shall be kept on the job.

1.20 GUARANTEE AND WARRANTIES

A. All materials, components, devices, etc. provided and/or installed shall be guaranteed for a period of one year from the date of acceptance. Should any trouble develop during this period due to defective materials, components, devices, etc or faulty workmanship, this Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner.

B. All equipment and fixtures provided and/or installed shall be guaranteed for a period of one year from the date of acceptance of the work. Should any trouble develop during this period due to defective equipment, fixtures and/or components, the equipment or fixtures manufacturer or representative shall furnish all necessary components, labor, materials and replacement equipment or fixtures to correct the trouble without any cost to the Owner.

C. Any defective equipment, fixtures, materials, components, devices, etc. noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

D. The guarantee date for equipment and fixtures placed in operation shall be mutually agreed to by the Contractor and the Owner.

E. Provide extended warranties as specified in the individual technical sections.

1.21 ALTERNATE BIDS

A. See Bid Form.

B. For systems and equipment or fixtures specified as alternate bids, provide all associated piping, valves, specialties, accessories, insulation, water treatment, controls, control wiring, motor starters, etc.

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

2.2 ACCESS PANELS AND DOOR

A. **Lay-In Ceilings**: Sufficient for access.

B. **Concealed Spline Ceilings**: Removable sections of ceiling tile held in position with metal slats or tabs compatible with the existing ceiling system.

C. **Metal Pan Ceilings:** Removable sections of ceiling tile held in position by a pressure fit compatible with existing ceiling system.

D. **Plaster Walls and Ceilings**: 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, U.L. listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment or fixture needing service; minimum size is 12” x 12”.

E. If access panel is to be installed in a fire rated wall or ceiling, the access panel shall have the same rating.

F. Provide access panels and as required.

2.3 IDENTIFICATION

A. Equipment and Devices above accessible ceilings

1. For equipment and devices above accessible ceilings, provide and install self adhesive plastic tape with ½" high black letters indicating item, on accessible ceiling t-bars, adjacent to item according to the following schedule:

Item	Label
Shut-off Valve	VALVE
Circuit Setter/Balance Valve	FLOW CONTROL

2. Provide a minimum of 10 extra stickers of each designation to the "Building Engineer" and a written designation of what each sticker represents at the Training session.

B. Equipment in Mechanical Rooms/Basement Tunnel

1. Plates shall be equal to Setonply Style 2060 by Seton or similar style by W.H Brady or MSI.
2. Engraved white letters on a black or red background, 1/16" thick plastic laminate, beveled edges with screw or rivet mounting.
3. All plates must be similar per project. Locate nameplates at or near "eye-level" (66" above floor). Nameplates must match equipment schedule on drawings. If self-adhesive plates are used, provide additional screws or rivets to assure panels will not fall off equipment.

C. Piping

1. Label and banding shall be equal to W.H. Brady, MSI or Seton.
2. Letters shall be a minimum of ¾" high and state pipe size, contents and directional flow arrows (Example: 2" COLD WATER →). Banding tape color code piping according to the industry standard. Identification shall be applied after pipe and/or covering is painted Tape shall completely circumference the pipe with a 3" minimum overlap.
3. Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both sides of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location.

D. Valves:

1. Tags shall be equal to those manufactured by EMED Co., Seton MSI or W. H. Brady.
2. Provide round brass tags with ½ inch numbers or round color coded PVC tags with ½ inch white engraved numbers, ¼ inch system identification abbreviation, 1¼ inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem.

3. Identify valves with brass tags bearing system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms to be framed under clear plastic.

E. Starters and Control Panels:

1. Nameplates shall be equal to those manufactured by W.H. Brady, MSI or Seton.

2. Engraved ¾" high white letters on a black or red background, 1/16" thick plastic laminate, beveled edges with screw or rivet mounting.

3. Nameplates must match the equipment they serve. If self-adhesive plates are used, provide additional screws or rivets to assure panels will not fall off equipment.

F. **Access Panels and Doors:** Provide and install self-adhesive plastic tape with ½" high black letters. Label shall match the equipment of item for which the panel or door has been provided.

G. **Exposed equipment, not in mechanical rooms** such as backflow preventers, pumps, water heaters, etc. with self adhesive plastic tape with ½" high black letters. Labels must match equipment schedules on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all fixtures, equipment and materials in accordance with manufacturer's written instructions.

B. Field verify all existing conditions. Do not proceed with work if existing conditions are different than what is shown on the drawings. Notify the Construction Observation Inspector of all discrepancies between actual field conditions and what is shown on the drawings.

C. Avoid installing fixtures, equipment, piping, etc. which interferes with service clearances of existing or new electrical equipment and panels. Comply with all service clearance requirements of the National Electric Code.

3.2 DEMOLITION

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Perform all demolition as indicated on the drawings to accomplish new work. All demolition work shall be accomplished by workmen skilled in the trade involved, i.e., electrical work by licensed electricians, piping by steamfitters, etc.

C. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Construction Observation Inspector to minimize disruption to the existing building occupants.

D. All pipe, fixtures, equipment, wiring and associated conduit, insulation, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise.

E. MPS reserves right of first refusal on ALL discarded fixtures, and related trim unless specified. Contact the Construction Observation Inspector to allow the shop to mark or otherwise indicate which fixtures, etc. will be set aside for reclamation. All care possible must be exercised when removing prearranged indicated (saved) items, to minimize breakage. The Demolition contractor must prearrange a site of recovery for saved items.

3.3 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The Contractor shall confine his equipment, apparatus, the storage of materials and operations of his workmen to limits indicated by law, ordinances, permits, or Construction Observation Inspector and shall not encumber the premises with his materials. In general, all material and equipment shall be stored in such manner as to avoid damage to living trees, shrubs, lawns and other ornamental growths. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its integrity.

C. Contractor shall confine his equipment; storage of materials and operations of his workmen to limits indicated by directions of the Construction Project Inspector and shall not bring materials onto the site until reasonably required for progress of the Work.

D. Owner assumes no responsibility for materials, tools, equipment, and rentals stored in buildings or on site. Contractor assumes full responsibility for damage due to storing of any type of materials and equipment.

E. Promptly inspect shipments to insure that the material and equipment are undamaged and comply with specifications.

F. Cover all materials to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

G. All equipment must be storage in a facility, which provides shelter from the weather.

H. Protect all materials, pipe, tube, fittings, equipment, components, etc. so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect materials, fittings, flanges, unions, components shipped loose, etc. by storage inside or by durable, waterproof, aboveground packaging.

I. Store and handle equipment in accordance with manufacturer's instructions.

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

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

L. Install lines passing under foundations with minimum of 1½" clearance to concrete and insure there is no disturbance of bearing soil.

M. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.

N. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.4 CUTTING, PATCHING AND PAINTING

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Provide all cutting and patching as necessary to permit installation of piping, equipment or any other part of the work under this Section.

C. See Section 15415, Plumbing Openings, Sleeves and Firestopping.

D. Patching includes repairing the openings remaining from the removal or relocation of existing system components and painting the surface to match existing surfaces unless indicated to be done by other trades.

E. Painting means covering the entire patched surface equal to the surrounding surfaces unless indicated to be done by other trades.

F. Paint all exposed piping, fittings, supports, fasteners, etc. install on or near floor, located outside or installed in a moisture-laden environment with (2) coats of rustproof paint.

3.5 CEILING REMOVAL AND REPLACEMENT

A. Provide all removal and replacement of existing ceilings, lighting, etc., required for the installation of the plumbing work in unremodeled areas.

B. In areas with accessible ceilings, ceiling tile shall be removed and stored to prevent damage of soiling and reinstalled after completion of the work. Soiled or damaged tiles shall be replaced subject to the approval of the Construction Project Inspector.

C. In areas with drywall or plaster ceilings, the ceiling shall be removed as required for the work and repaired and refinished equal to existing subject to the approval of the Construction Project Inspector.

3.6 BUILDING ACCESS FOR APPARATUS

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

3.7 EQUIPMENT AND PANEL ACCESSIBILITY

A. Install all piping, conduit, and accessories to permit access to equipment and panels for maintenance as required by code and as recommended by the equipment manufacturer.

B. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties.

C. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor for installation.

D. See individual specifications sections, specifically Section 15440, for exact access panel locations.

3.8 COORDINATION

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

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

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

D. There may be other work being completed concurrently in the building and possible future projects to be completed in phases in the building. Therefore, this Division must coordinate with other contractors in the building, which are not necessarily working on this project or under this scope of work.

3.9 IDENTIFICATION

A. Provide the appropriate identification as indicated in this section for all new and existing to be reused, remodeled or modified piping, controls, control panels, equipment, starters, valves, ceiling tiles, access panels, etc.

B. See schedules on drawings for appropriate labeling of equipment and associated controls, starters, etc.

3.10 CLEANING EQUIPMENT, MATERIALS AND SITE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his operations. The Contractor shall remove all dirt, rubbish or debris resulting from his Work, from time to time as the building operations progress and as often as may be directed by the Construction Project Inspector. On the failure, retardation, or refusal of the Contractor to remove said rubbish, dirt and debris promptly, or if majority of the final cleaning up consists of rubbish from several or all Contractors, by the Construction Project Inspector, shall cause same to be removed and the prorated cost thereof shall be charged against the several Contractors responsible and retained out of the contract price. At the completion of the Project, the Contractor shall remove all tools, equipment, and surplus materials and leave the Project "broom clean" or its equivalent.

C. General Cleaning: Contractor shall remove his rubbish and debris from site promptly upon its accumulation and when requested by the Construction Project Inspector. **Do not use MPS disposal containers**.

D. Final Cleaning: At final completion of Work and immediately prior to final inspection, Contractor shall remove all tools, debris, equipment, protection, unused materials, and shall remove from Work and equipment provided under the Contract Agreement all foreign matter, spots and soils, so as to put all such Work and equipment, including finishes, in a complete and finished condition to the satisfaction of the Construction Project Inspector.

E. Install temporary covers, caps, etc. over equipment and piping to minimize dust contamination during construction.

F. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.

3.11 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Record lubricant used in maintenance log.

B. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by MPS. Maintain a log of all lubricants used and frequency of lubrication (Running Hours/Relubrication); include this information in the Operating and Maintenance Manuals at the completion of the project.

3.12 FACTORY START-UP AND TRAINING

A. Factory Start-Up and Training may be completed consecutively but proper notification must be made to required parties.

B. Equipment Start-Up

1. Provide factory authorized start-up for all new equipment as specified in individual sections.
2. See individual Sections for additional start-up instructions.
3. When scheduled a minimum of (2) working days in advance with the MPS Representative and the installing Contractor, the manufacturer's qualified Field Engineer then shall start the equipment, in accordance with manufacturer's start-up instructions and in the presence of the Installing Contractor and Construction Project Inspector.
4. The field engineer shall inspect the entire installation of piping, wiring, panels, controls, alarms, intakes, venting, etc., and verify that everything required for a complete operating installation has been provided per manufacturer's recommendations.
5. The field engineer then shall start the equipment, in accordance with manufacturer's start-up instructions and in the presence of the Installing Contractor and the Construction Project Inspector.
6. Field engineer shall test and adjust the controls and demonstrate compliance with the specified operation requirements.
7. The equipment shall be adjusted for maximum efficiency.
8. Any damage or malfunctioning controls and equipment shall be replaced.

C. Provide factory/manufacturer's representative training as specified in individual sections.

1. See individual sections for additional start-up instructions.

2. When scheduled a minimum of (5) working days in advance with the Construction Project Inspector, the equipment manufacturer or manufacturer's representative shall furnish the services of a person thoroughly familiar with construction, installation and safety of equipment for a period of time to completely cover all required training material.

3. This person shall be qualified for, and capable of explaining the construction, operation and maintenance procedures to personnel unfamiliar with this type of **equipment**.

4. The minimum required bound copies of installation operation and maintenance instructions should have been furnished to the Installing Contractor for O&M Manuals as specified under "Submittals". Coordinate with Installing Contractor so that O&M Manuals are turned over to the Construction Project Inspector at or prior to the (5) day notification period.

5. Instructions shall include factory or factory representative direction, where each member of MPS' Maintenance Staff is afforded the opportunity of physically performing required tasks in correct sequence and will be required to offer a running commentary as to the reason for each sequential step taken and how each operation is to be carried out.

6. MPS must be afforded the opportunity to videotape any training sessions.

7. If the training session is videotaped, a copy of the training videotape shall be turned-over to the Construction Project Inspector 48 hours after the end of the training secession.

D. After completion of start-up, test, adjustment and training, provided for each piece of equipment, a certified written test report shall be filled out and minimum of (6) copies shall be submitted as specified under "Submittals".

E. The written report shall be presented to the Installing Contractor before final acceptance of the installed equipment, certifying that the equipment installation conforms to all specified requirements; that the equipment has been adjusted and placed in satisfactory operation; that all operating and safety controls have been tested and found to be in good working order and that the equipment is safe to operate.

3.13 TRAINING FOR INSTALLED PLUMBING SYSTEMS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. When scheduled a minimum of (5) working days in advance with Construction Project Inspector, the Installing Contractor shall furnish the services of a person thoroughly familiar with construction, installation and safety devices for the installed systems for a period of not less than (**8**) hours.

C. This person shall be qualified for, and capable of explaining the construction, operation and maintenance procedures to personnel unfamiliar with these types of **systems**.

D. O&M Manuals must be turned over to Construction Project Inspector at or prior to the (5) day notification period.

E. Instructions shall include factory or factory representative direction, where each member of MPS' Maintenance Staff is afforded the opportunity of physically performing required tasks in correct sequence and will be required to offer a running commentary as to the reason for each sequential step taken and how each operation is to be carried out.

F. MPS and its designated representatives reserve the right to videotape hands-on sessions. (If the training session is videotaped, a copy of the training videotape shall be turned-over to the Construction Project Inspector 48 hours after the end of the training session.)

G. Before final acceptance of the installed systems, (6) copies of a dated written report shall be presented to the Construction Project Inspector, by the Installing Contractor, for routing as specified under “Submittals”, certifying that the entire system installation conforms to all specified requirements; that the installed system has been adjusted and placed in satisfactory operation; that all operating and safety controls have been tested and found to be in good working order; that the entire installation is entirely safe to operate and that MPS’s operating personnel has been properly instructed as to how the installation should be operated.

3.14 COMMISSIONING

A. See individual specifications sections.

B. This Contractor shall inspect, test and repair or replace any defective part or component of the systems and equipment installed or affected by the performed work.

END OF SECTION

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SECTION 15401

PLUMBING PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SCOPE

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

B. Provide, install, extend, remove and remodel all required pipe and associated fittings, accessories, sealants, etc. of types, qualities, sizes, lengths, etc. for plumbing systems as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Design Criteria
8. Delivery, Storage and Handling
9. Domestic Water Piping
10. Solar Supply and Return Piping
11. Unions and Flanges
12. Installation
13. Cleaning of Piping System
14. Pipe System Leak Test

1.2 RELATED WORK:

A. Section 15400 - Plumbing General Requirements

B. Section 15412 - Plumbing Piping Specialties

C. Section 15414 - Plumbing Hanger, Supports and Anchors

D. Section 15430 - Plumbing Specialties

1.3 REFERENCE STANDARDS

A. The following Copper Piping standards and organizations are referenced in this and other sections:

1. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
2. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
3. ASTM B88 Seamless Copper Water Tube

B. The following piping standards and organizations are referenced in this and other sections:

1. AWWA C651 Disinfecting Water Mains
2. ANSI B16.5 Pipe Flanges and Flanged Fittings
3. ASTM B32 Solder Metal
4. AWS A5.8 Brazing Filler Metal

1.4 DESCRIPTION

A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide a fully functioning piping system as provided for in these specifications and on the drawings.

B. Pipe, tube and fittings furnished as part of factory fabricated equipment are specified as part of equipment assembly in other sections.

1.5 QUALITY ASSURANCE

A. All pipe and pipe fittings shall be in accordance with respective standard specified in the section.

B. Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

C. All piping materials and solders must be lead free. Lead free is defined as less than 0.2% lead.

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

E. Manufacturer regularly engaged in manufacture of pipe, tube and fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

F. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

1.6 SUBMITTALS

A. Refer to Section 15400 - Plumbing General Requirements.

B. Submit catalogue cuts, specifications, installation instructions, and dimensioned drawings for each type of pipe, tube, and fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, joint type and pressure rating for each piping system.

C. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

1.7 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

E. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor’s option. Where the grade or type is not specified, Contractor may choose from those commercially available.

F. Where ASTM B88, type L hard (drawn) temper copper tubing is specified, ASTM B88, type K hard (drawn) temper copper tubing may be substituted at Contractor’s option.

1.8 DELIVERY, STORAGE AND HANDLING

A. See Section 15400, “Delivery, Storage and Handling”.

B. Protect all materials, pipe, tube, fittings, equipment, components, etc. so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect materials, fittings, flanges, unions, components shipped loose, etc. by storage inside or by durable, waterproof, above ground packaging.

PART 2 PRODUCTS

2.1 DOMESTIC WATER

A. Above Ground:

1. Type L copper water tube, hard (drawn) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (< 0.2%) solder, ASTM B32; flux, ASTM B813. Mechanically formed brazed tee connections may not be used in lieu of specified tee fittings.

2.2

2.3 Solar Supply and Return Piping

A. Above Ground:

1. Type L copper water tube, hard (drawn) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (< 0.2%) solder, ASTM B32; flux, ASTM B813. Mechanically formed brazed tee connections may not be used in lieu of specified tee fittings.

2.4 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 PSIG at 180^{o}F.

B. Copper piping

1. 2" and smaller: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

PART 3 EXECUTION

3.1 DEMOLITON WORK

A. Remove all obsolete pipe, fittings, etc. as indicated on drawings or as determined to be obsolete.

B. Cap any piping to remain due to demolition work within existing wall, floor or ceiling locations. Cover capped piping with appropriate chrome plated piping caps or escutcheons to conceal piping caps within walls or floors.

3.2 GENERAL

A. Install pipe and pipe fittings as indicated on drawings in accordance with reference standards and recognized industry practices.

B. Make any and all connections to plumbing equipment, fixtures, etc. and any HVAC equipment requiring domestic water connections.

3.3 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs.

B. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.4 RESTRICTIONS

A. Do not route piping through transformer, Elevator Equipment Rooms, vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment as based on NFPA 70-1987, U384-4 and U450-47.

B. Install drip pans under piping that must be routed through electrical spaces.

3.5 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights, which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Wherever possible in finished and occupied spaces, conceal piping from view by locating in column enclosures, hollow wall construction or above suspended ceilings.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties. Locate insulated piping for 1 inch clearance outside insulation.

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

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

H. Do not route piping through transformer, Elevator Equipment Rooms, vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment as based on NFPA 70-1987, U384-4 and U450-47.

I. Install drip pans under piping that must be routed through electrical spaces.

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

3.6 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces.

B. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop.

C. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

D. Copper piping must be wiped free of residual flux and solder after the soldering process has been completed on that pipe section immediately, to prevent corrosion.

3.7 MECHANICALLY FORMED TEE FITTINGS

A. The use of mechanically formed tee fittings is not allowed on this project.

3.8 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

C. Disinfecting and Flushing:

1. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until no chlorine remains.

2. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfecting and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.9 SOLAR SUPPLY AND RETURN PIPING

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install interior piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install piping within exterior walls.

3.10 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items, which may require removal for maintenance, repair, or replacement.

B. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.11 CLEANING OF PIPING SYSTEMS

A. All piping shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves and similar items shall be thoroughly cleaned. Remove and thoroughly clean and install all liquid strainer screens after the system has been in operation ten days.

B. When connections are made to existing systems, this Contractor shall do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.

3.12 PIPING SYSTEM LEAK TESTS

A. Conduct pressure test with test medium of water for all systems except natural gas. On metal piping systems test medium of air may be used with prior approval of Engineer. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

B. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested. Underground water mains should be backfilled between joints prior to testing. If underground water mains are completely backfilled prior to testing, the Contractor is responsible for the location and repair of any leaks found during testing. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. The piping system exclusive of possible localized instances at pump or valve packing shall show no evidence of leaking.

E. Measure natural gas system test pressure with a water manometer or an equivalent device calibrated in increments not greater than 0.1" W.C. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

F. All pressure tests are to be documented and submitted to the Engineer upon request.

G. Test Procedure: All systems are to be tested with water unless stated otherwise.

Piping System	Pressure	Duration	Remarks
Above Ground Domestic Water	100 PSIG	8 hr	
Solar Supply and Return Piping	100 PSIG	8 hr	

END OF SECTION

SECTION 15410

PLUMBING VALVES

PART 1 GENERAL

1.1 SCOPE

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

B. Provide, install, extend, remove, relocate and remodel all required valves and accessories of type, quality, size, etc. for plumbing piping systems and equipment as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Quality Assurance
4. Submittals
5. Design Criteria
6. Water System Valves / Solar Piping Valves
    a) Ball Valves
    b) Gate Valves
    c) Butterfly Valves
    d) Swing Check Valves
    e) Spring Loaded Check Valves
    f) Balance Valves
    g) Drain Valves
    h) Diverting Valve
7. Specialty Valves and Valve Accessories
    a) Gauge Valves
    b) Safety Relief Valves
    c) Valve Handle Extensions
8. Installation

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Pipe Fittings

C. Section 15412 - Plumbing Piping Specialties

D. Section 15426 - Plumbing Systems Insulation

E. Section 15430 - Plumbing Specialties

F. Section 15450 - Plumbing Equipment

1.3 REFERENCE STANDARDS

A. ANSI B16.34-81: Butt Welded and Flanged Valves

B. ANSI B16.37-80: Hydrostatic Testing of Valves

1.4 QUALITY ASSURANCE

A. Refer to Division 1 and General Conditions for equals and substitutions.

B. All valves must comply with respective standards reference in this section.

C. To assure uniformity and compatibility:

1. All new valves for project must be from the same manufacture

1.5 SUBMITTALS

A. Refer to Division 1, Submittals. Submit in accordance with Section 01300.

B. Refer to requirements of Section 15400, Submittals.

C. Submit catalogue cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Submit schedule of all valves indicating type of service, dimensions, materials of construction, accessories and pressure and temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.6 DESIGN CRITERIA

A. Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Engineer.

B. Valves to be line size unless specifically noted otherwise.

PART 2 PRODUCTS

2.1 WATER SYSTEM VALVES / SOLAR PIPING VALVES

A. All water system / solar piping valves valves to be rated at not less than 125 PSIG working pressure at 240^{o}F unless noted otherwise. Water system valves through 4” to be rated for the following minimum C_v factors:

1.	Size:	¾”	1”	1¼”	1½”	2”	3”	4”	5”<
2.	C_v:	na	18	35.5	61	107	175	255	340

B. Ball Valves:

1. 2½” and smaller:

a) Ball valves shall be equal to Nibco T/S-595-Y or Apollo (Conbraco) BV-BRZ-3PC-FP.

b) Valves shall have a three piece bronze body; sweat ends, stainless steel ball and stem; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 PSIG WOG.
c) Provide valve stem extensions for valves installed in insulated pipe.

2. 3" and larger: Use butterfly valves. Ball valves will not be accepted in sizes over 2½".

C. Gate Valves:

1. 2" and smaller:

a) Shall be equal to Crane 431UB, Hammond IB629, Lunkenheimer 3151, Milwaukee 1151(M), Nibco T134, Powell 2714, Stockham B120.
b) Valves shall have a bronze body, bronze trim, threaded ends, solid wedge, rising stem, union bonnet, malleable iron hand wheel, suitable for 125 PSIG steam at 360°F.

2. 2½" and larger:

a) Shall be equal to Crane 465-1/2, Hammond IR1140, Lunkenheimer 1430, Milwaukee F2885, Nibco F617-O, Powell 1793, Stockham G623.
b) Valves shall have an iron body, bronze trim, bolted bonnet, O.S. & Y., solid wedge, flanged, suitable for 125 PSIG steam at 360°F.

D. Butterfly Valves:

1. 3" and larger:

a) Butterfly valves shall be equal to Centerline LT series, DeZurik 632, Grinnell Series 8000, Milwaukee M or C Series, Nibco LD2000, Watts BF-03 or Victaulic Vic-300 Masterseal,
b) Valves shall have a cast or ductile iron body; stainless steel shaft; bronze, copper or teflon bushings; EPDM resilient seat; EPDM seals; bronze, aluminum-bronze or stainless steel disc. Valve assembly to be bubble tight to 175 PSIG with no downstream flange/pipe attached. Provide valve neck extensions if needed for valves installed in insulated pipe.
c) Use tapped lug type valves with cap screws for all applications, permitting removal of downstream piping while using the valve for system shutoff.
d) Provide 10 position locking lever handle actuators for valves 6" and smaller. Provide worm gear operators with external position indication for valves 8" and larger.

E. Swing Check Valves:

1. 3" and smaller:

a) Swing check valves shall be equal to Crane 1342, Hammond IB941, Nibco S413B, Watts CVYS.
b) Valves shall have a bronze body, sweat ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward.

F. Spring Loaded Check Valves:

1. 2” and smaller:

a) Spring-loaded check valves shall be equal to ConBraCo 61 series, Mueller 203BP, Nibco S480Y, Val-Matic S1400 series.

b) Valves shall have a bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available.

G. Balancing Valves:

1. Shall be equal to Armstrong CBV, Bell & Gossett Circuit Setter Plus, Flowset AccuSetter, Illinois 6000 series, Taco Circuit Setter or Tour & Anderson (TA) Circuit Balancing Valve.

2. Bronze body with calibrated brass orifice, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded ends, with or without integral unions, pressure taps with integral check valves and seals, adjustable memory stop, suitable for 125 PSIG water working pressure at 240°F.

H. Drain Valves:

1. Use ¾ inch ball valve with threaded hose adapter.

2. Provide threaded cap on hose adapter for drain valves not located in mechanical rooms.

I. Diverting Valve

1. Motorized three way diverting valve. Caleffi or engineer approved equal.

2.2 SPECIALTY VALVES AND VALVE ACCESSORIES

A. Gauge Valves: Use ¼” ball valves. Needle valves and gauge cocks will not be accepted.

B. Safety Relief Valves:

1. Safety relief valves shall be as manufactured by Bell & Gossett, A. W. Cash, Conbraco, Watts, Wilkins.

2. Valves shall have a bronze body, temperature and pressure actuated, stainless steel stem and spring, thermostat with non-metallic coating, test lever, suitable for 125 PSIG water working pressure at 240°F, ASME stamped with valve capacity on metal label.

C. Handles

1. All shut-off valves must be provided with handles unless specifically indicated otherwise.

2. Provide valve handle extensions as required so handle, when turned, clears pipe covering and insulation a minimum of ½”.

PART 3 EXECUTION

3.1 GENERAL

A. Properly align piping before installation of valves. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

B. Mount valves in locations, which allow access for operation, servicing and replacement.

C. Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

D. Prior to flushing of piping systems, place all valves in the full-open position.

3.2 SHUT-OFF VALVES

A. Install shut-off valves where indicated on plans, at each piece of equipment, at each branch take-off from mains for isolation and/or repair.

B. Install shut-off valves at termination point of plumbing work for any HVAC equipment requiring domestic water connections. See plan for exact locations.

3.3 BALANCING VALVES

A. Install where indicated on the drawings and details for balancing of pumped systems. Retain the shipping container for use as removable insulation in non-plenum applications.

B. Upon project completion, adjust each valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature throughout building.

3.4 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems.

B. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

3.5 SPRING LOADED CHECK VALVES

A. Install a spring loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

3.6 SWING CHECK VALVES

A. Install swing check valves in recirculation branch lines and elsewhere as indicated. Provide weighted swing check valves at sanitary sump pump discharges.

3.7 PRESSURE REDUCING VALVES

A. Provide ball valve and strainer at inlet and ball valve at outlet. Install pressure gauges to indicate inlet and outlet pressure at each pressure-reducing valve.

3.8 SAFETY RELIEF VALVES

A. Install relief valves on all pressure vessels and elsewhere as indicated. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger. Pipe discharge to drain where indicated or to floor.

END OF SECTION

SECTION 15412

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, extend, remove, relocate and remodel all required plumbing piping accessories of types, qualities, sizes, lengths, etc. for plumbing systems as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Delivery, Storage And Handling
8. Thermometers And Accessories
9. Pressure Gauges And Accessories
10. Strainers
11. Thermostatic Mixing Valve
12. Installation
13. Thermometers And Accessories
14. Pressure Gauges
15. Strainers
16. Thermostatic Mixing Valve
17. Commissioning

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Fittings

C. Section 15410 - Plumbing Valves

D. Section 15426 - Plumbing Systems Insulation

E. Section 15450 - Plumbing Equipment

1.3 REFERENCE STANDARDS

A. ASTM B650 - Electrodeposited Engineering Chromium coatings on Ferrous Substrates

B. Underwriters Laboratories for Materials Test Standards

1.4 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions) for equals and substitutions.

B. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 PSIG unless specifically indicated otherwise.

1.5 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Refer to requirements of Section 15400, Submittals.

C. Submittals are required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.6 DESIGN CRITERIA

A. All piping specialties shall be of size, quantity and type as specified in this section, indicated on drawings, and as understood to be standard industry practice.

1.7 DELIVERY, STORAGE AND HANDLING

A. See Section 15400.

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

PART 2 PRODUCTS

2.1 THERMOMETERS AND ACCESSORIES

A. Thermometers shall be as manufactured by Winters, Wiess, Wika Weksler or Trend.

B. Solar Powered Digital Thermometers shall have passivated glass thermistor sensor, a LCD display with 3/8" digits, be adjustable for viewing from any angel, constructed with a high impact ABS casing, switchable between ^{o}F and ^{o}C, with accuracy of 0.10^{o} for a temperature range of -19.9/199^{o}F (-28/93^{o}C), updating a minimum of every 10 seconds. Thermometer shall be capable of operating in a 100% relative humidity and -30/140^{o}F (-35/60^{o}C) environmental conditions.

Service	Scale Range (°F)	Increment (°F)
Water	-40 - 300	0.10

C. **Thermometer sockets** shall be constructed of brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks as required for insulated piping systems.

D. **Test wells** shall be similar to thermometer sockets except with a brass cap that thread into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.2 PRESSURE GAUGES AND ACCESSORIES

A. Pressure gauges shall be as manufactured by Ametek/U. S. Gauge Division, Ashcroft, Marsh, Taylor, H. O. Trerice or Weiss.

B. Pressure gauges shall have a cast aluminum case of not less than 4.5"Ø, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

Service	Scale Range, PSIG	Increment (PSIG)
Water	0 - 100	1
Solar Water	0 - 100	1

C. **Pressure snubbers** shall be ¼" size, constructed of brass with 300 PSIG working pressure.

D. **Gauge valves** shall be ¼" size ball valves constructed of brass bronze or steel with 500 PSIG working pressure at not less than 300°F.

2.3 STRAINERS

A. Strainers shall be as manufactured by Armstrong, Hoffman, Keckley, Metraflex, Mueller Steam, or Sarco.

B. For water systems with design pressures of less than 150 PSIG strainers shall be Y type with cast iron body with stainless steel screens, bolted or threaded screen retainer tapped for a blowoff valve, threaded body in sizes through 2" and rated at not less than 175 PSI WOG, flanged body in sizes over 2" and rated at not less than 125 PSI WOG at 240°F. Screen to be 20 mesh for line sizes 2" and less, 0.125" perforations for line sizes 2½" through 4", and 0.25" perforations for line sizes 5" and larger.

2.4 THERMOSTATIC WATER MIXING VALVES

A. System Mixing Valves

B. System thermostatic mixing valves shall be as manufactured by Powers, Holby or Symmons.

C. Mixing valves shall be ASSE 1017, manually adjustable with bronze body.

D. Valve shall complete with check-stop and union on hot water and cold water supply inlets and fully adjustable dial-type outlet temperature setting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all piping specialties as indicated on drawings and as recommended by unit manufacturer.

3.2 THERMOMETERS AND ACCESSORIES

A. Install stem type thermometers in piping systems as indicated on the drawings and/or details using a separable socket in each location.

B. Install thermometers on inlets and outlets of hot and chilled water piping serving all coils, heat exchangers, heating equipment and cooling equipment.

C. **Install thermometer sockets** at each point where a thermometer or temperature control sensing element is located in a pipeline.

D. **Install test wells** in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.3 PRESSURE GAUGES

A. Install in locations where indicated on the drawings and/or details, including any gauge piping, with scale range appropriate to the system operating pressures.

B. Install multiple pressure gauges or a single gauge across pumps, water filters, suction diffusers, cooling equipment and heating equipment.

C. **Install pressure snubbers** in gauge piping for all gauges used on water services.

D. **Install gauge valves** at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

3.4 STRAINERS

A. Install all strainers as indicated on the drawings, allowing sufficient space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

B. Install strainers before all pumps, control valves and steam traps.

C. In water and solar piping systems install a ball valve or a drain valve in the tapped screen retainer; valve to be the same size as the tapping.

D. In low and high pressure steam systems, install a ball valve or a drain valve in the tapped screen retainer; valve to be the same size as the tapping.

3.5 THERMOSTATIC WATER MIXING VALVES

A. Install mixing valves in serviceable locations as indicated on drawings.

B. Install valve between hot and cold water system and provide shut-off valves on hot and cold water piping before mixing valve.

C. Adjust outlet temperature to 120°F and lock adjusting nut.

D. Do not install thermostatic mixing valve until system has been flushed. Repair any damaged parts as a result of dirt or debris entering the mixing valve.

3.6 COMMISSIONING

A. Demonstrate that all piping specialties are functioning properly. Replace all defective components and devices.

B. After testing of piping systems as directed in Section 15401, clean all strainers and water filters.

END OF SECTION

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SECTION 15414

PLUMBING HANGERS, SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, extend, remove, relocate or remodel all required hangers, supports,, anchors of types, qualities, sizes, lengths, etc. for all required plumbing equipment and piping systems as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Design Criteria
8. Pipe Hanger and Support Manufacturers
9. Structural Supports
10. Pipe Hangers and Supports
11. Beam Clamps
12. Concrete Inserts
13. Anchors
14. Installation
15. Hanger and Support Spacing
16. Vertical Riser Clamps
17. Concrete Inserts and Continuous Insert Channels
18. Anchors

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Pipe Fittings

C. Section 15412 - Plumbing Piping Specialties

D. Section 15426 - Plumbing Systems Insulation

1.3 REFERENCE STANDARDS

A. MSS SP-58: Pipe Hangers and Supports - Materials, Design and Manufacture.

B. MSS SP-59: Pipe Hangers and Supports - Selection and Application.

C. American Welding Society Standards.

1.4 DESCRIPTION

A. These are devices that are used to hang, support and/or anchors piping and equipment.

1.5 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Provide all supporting devices as required for the installation of mechanical equipment and materials.

C. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

D. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

1.6 SUBMITTALS.

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Refer to requirements of Section 15400, Submittals.

C. Submittals are required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges and identification as referenced in this section and/or on the drawings.

D. Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference Section 15401.

1.7 DESIGN CRITERIA

A. Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

B. Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.

C. Piping supported by laying on the bottom chord of joists or trusses will not be accepted. Pipes shall not be routed through existing concrete joists.

D. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

E. Allow sufficient space between adjacent pipes for insulation, valve operation, routine maintenance, etc.

PART 2 PRODUCTS

2.1 HANGER AND SUPPORT MANUFACTURERS

A. Hangers and supports shall be as manufactured by B-Line, Fee and Mason, Grinnell, Kindorf, Michigan Hanger, Unistrut, or approved equal.

B. Grinnell figure numbers are listed below; equivalent material by other manufacturers is acceptable.

2.2 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of plumbing equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

2.3 HANGERS AND SUPPORTS

A. Adjustable Steel Yoke Pipe Roll Hangers shall be equal to Grinnell figure 181 Cast iron roll, carbon steel yoke, roll rod and hex nuts with black finish.

B. Adjustable Clevis Hangers for Steel Pipe shall be equal to Grinnell figure 260, carbon steel, adjustable, clevis, and black finish.

C. Multiple or Trapeze Hangers shall be steel channels with welded spacers and hanger rods if calculations are submitted.

D. Wall Supports shall be welded steel bracket with hanger/support suitable for the application.

E. Vertical Riser Supports shall be equal to Grinnell figure 261 for steel pipe, figure CT121 for copper pipe, carbon steel riser clamp, copper plated when used with copper pipe.

F. Floor Support for Pipe Sizes Through 4" shall be cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

G. Floor Support for Pipe Sizes 5" and Over shall be adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

H. Copper Pipe Supports shall be carbon steel ring, adjustable, copper plated or polyvinylchloride coated.

I. Insulation Protection Shields:

1. Shall be equal to Grinnell figure 167, galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2½" and larger. Minimum shield length is 12".
2. As an option, insulation protection shields may be constructed of formed galvanized sheet metal of gauge thickness as indicated in Section 15580.

J. Insulation Protection Saddles shall be shall be equal to Grinnell figure 160, carbon steel saddle for use on insulated pipe supported by roll hangers. Saddle shall be the same thickness as the associated pipe insulation. Minimum length of saddle is 12".

K. Steel Hanger Rods:

1. Threaded both ends, threaded one end, or continuous threaded, cadmium plated finish.
2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Provide rods complete with adjusting and lock nuts.
4. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (Inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

2.4 BEAM CLAMPS

A. MSS SP-69 Type 23 shall be equal to Grinnell figure 86, malleable black iron clamp for attachment to beam flange to 0.62" thick for single threaded rods of 3/8"Ø, ½"Ø, and 5/8"Ø, for use with pipe sizes 4" and less. Furnish with a hardened steel cup point set screw.

B. MSS SP-69 Type 28 or Type 29 shall be equal to Grinnell figure 228, forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1½"Ø but limited in application to pipe sizes 8" and less without prior approval.

2.5 CONCRETE INSERTS

A. MSS SP-69 Type 18 wedge type or universal concrete inserts.

B. Wedge type shall be equal to Grinnell Fig. 281 constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8"Ø. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity.

C. Universal type shall be equal to Grinnell Fig. 282 constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8"Ø.

D. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.

2.6 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.7 CUSTOM FABRICATED EQUIPMENT STANDS

A. Use contractor fabricated stand consisting of structural steel members welded together and supported by Schedule 40 pipe stand supports with base flange fittings suitable for mounting to floor.

B. Height of supports shall be as indicated on drawings.

2.8 CORROSIVE ATMOSPHERE COATINGS

A. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.

B. Corrosive atmospheres include the following locations:

1. Exterior locations

2. Swimming pool equipment rooms (Basement tunnel)

PART 3 EXECUTION

3.1 INSTALLATION

A. Install supports to provide for free expansion of the piping systems. Support all piping and equipment from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment or piping to prevent excess stress, and allow for proper expansion and contraction.

D. Coordinate hanger and support installation to properly group piping and equipment of all trades.

E. Protect insulation at all hanger points; see Related Work above.

F. Where piping and equipment can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel.

G. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

H. Provide roller hangers and saddles to support all piping systems with operating temperatures above 212°F. Weld saddles to piping systems so saddle moves with piping.

I. Coordinate with Section 15426 for installation of insulation protection shields.

J. Paint all exposed hangers, supports, anchors, components, fasteners, etc. with a coat of paint to match surfaces hanger, support or anchor is fastened to.

K. Paint all exposed hangers, supports, anchors, components, fasteners, etc. in high humidity areas, such as boiler rooms, janitor’s closets, mechanical rooms, etc. with two coats of gray rust-proof paint, prior to assembly. Apply additional coats after assembly as required for tough-up.

3.2 HANGER AND SUPPORT SPACING

A. Place a hanger within 12” of each horizontal elbow, valve, strainer, or similar piping specialty item.

B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

C. Support riser piping independently of connected horizontal piping.

D. Adjust hangers to obtain the slope specified in the piping section of this specification.

E. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Spacing
Copper	½" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

3.3 VERTICAL RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure at each floor.

B. Piping 5" and above, of lengths exceeding 30', shall be additionally supported on base elbows secured to the building structure, with flexible supporting hangers provided at top of riser to allow for pipe expansion.

3.4 CONCRETE INSERTS

A. Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Locate continuous insert channels on 8'-0" maximum centers and 2'-0" from corners. Furnish inserts to the General Contractor for placement in concrete formwork. Use insets for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

B. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with the slab.

3.5 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

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SECTION 15415

PLUMBING OPENINGS, SLEEVES AND FIRE STOPPING

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, remove and remodel all required openings, sleeves and firestopping and associated fittings, accessories, sealants, etc. of types, qualities, sizes, lengths, etc. for plumbing openings through and in building surfaces as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Design Criteria
8. Mineral Wool
9. Urethane Caulk
10. Pipe Sleeves
11. Pipe Setting Grout
12. Pipe Penetrations Fire Stopping Assembly And Systems
13. Escutcheons
14. Installation
15. Coordination
16. Pipe Penetrations Through Interior Surfaces
17. Pipe Penetrations Through Exterior Surfaces

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Pipe Fittings

C. Section 15412 - Plumbing Piping Specialties

D. Section 15414 - Plumbing Hangers, Supports and Anchors

E. Section 15426 - Plumbing Systems Insulation

1.3 REFERENCE STANDARDS

A. ASTM E814 - Fire Tests of Through-Penetration Fire Stops

B. ASTM E119-73 – Fire and Hose Stream Test Requirements

C. UL 263 - Fire Test for Building Construction and Materials

D. NEC – National Electrical Code (Specifically Article 300-21)

1.4 QUALITY ASSURANCE

A. All fire stopping of pipe penetrations must be UL Listed.

B. All fire-stopping systems shall be provided by the same manufacturer.

1.5 DESCRIPTION

A. Provide all service, devices and materials as required for the any and all penetrations of building surfaces.

B. Sealing and fire-stopping of sleeves/openings between piping and the sleeves, in structural or partition openings, shall be the responsibility of this Contractor.

C. Division 15400 Contractor responsible shall hire and pay for individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and firestopping occupation.

1.6 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Refer to requirements of Section 15400, Submittals.

C. Submittals are required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

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

1.7 DESIGN CRITERIA

A. Plumbing Contractor shall provide all openings, sleeves and patching required to permit installation of piping or any other part of the work under this section.

B. All existing slab on grade concrete floor areas which are required to be removed, shall be saw cut and removed by the this Section.

C. All required patching of floors, walls and ceiling including concrete floors shall be provided by this Section, unless otherwise noted.

PART 2 PRODUCTS

2.1 MINERAL WOOL

A. See Section 15426 - Plumbing Systems Insulation

2.2 URETHANE CAULK

A. Equal to that as manufactured by 3M with color to match associated wall color.

2.3 PIPE SLEEVES

A. **Above Ground and Below Ground Existing Masonry Construction:** ASTM A53, Type F, standard weight, Schedule 40, black steel pipe.

B. **Above Ground Existing Non-Masonry Construction:** PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564

C. Sleeves through floors shall be ¾" longer than the floor depth.

D. Sleeves shall be one size larger than carrier pipe or insulated pipe.

E. Wall sleeves length shall be as necessary to fully span the wall width.

2.4 PIPE SETTING GROUT

A. Hydraulic setting, non-shrink grout shall be as that manufactured by Quickcrete or Rapidset.

2.5 PIPE PENETRATIONS FIRE STOPPING ASSEMBLY AND SYSTEMS

A. Use appropriate pipe sleeve.

B. Fire stopping shall be as manufactured by 3M, STI/SpecSeal, Tremco, Proset or Hilti.

C. Contractor shall be responsible for selecting the appropriate UL tested fire stop system for each application required on the project and must submit this to the Engineer for review.

D. Use a product that has a rating not less than the rating of the wall or floor being penetrated.

E. Contractor shall use fire-stop putty, caulk sealant, intumescent wrapstrips, intumescent fire-stop collars, fire-stop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

F. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

2.6 ESCUTCHEONS

A. Escutcheons plates shall be as manufactured by Grinnell or equal and shall be constructed of steel with chromium plate finish.

B. Size escutcheons plates to accommodate insulation, where applicable.

C. Floor escutcheons plates shall be steel with concealed hinge and held in place by spring action.

D. Ceiling escutcheons plates shall be steel with concealed hinge and held in place by spring action and set screw.

PART 3 EXECUTION

3.1 INSTALLATION

A. Penetrations through structural support members such as load bearing walls, beams, planks, etc. are not allowed without written consent of the Engineer of Record.

B. All round openings and holes that are cut through existing reinforced concrete shall be carefully cored so as to avoid spawling and unnecessary damage or weakening of any structural member; chopping or breaking out shall not be permitted.

C. All non round openings that are through existing reinforced concrete shall be carefully cored at the corners so as to avoid over cutting and unnecessary damage or weakening of any structural member; chopping or breaking out shall not be permitted.

3.2 COORDINATION

A. Coordinate the location of all building surface penetrations with the appropriate Contractors. Furnish sleeves, inserts, and other devices that are to be built into the structure to the General Contractor prior to performing that work.

B. All openings in construction unless the openings are detailed on the Architectural or Structural drawings shall be by this Section, unless specifically noted otherwise.

C. Make all arrangements with other Contractors for any special framing, spacing or chases.

D. All the penetrations in the structure made required by Division 15400 and provided by the General Contractor shall be in locations as directed by this Section.

3.3 PIPE PENETRATIONS THROUGH INTERIOR SURFACES

A. **Rated pipe penetrations:** Core drill opening through wall or floor. Where possible turn over carrier conduit to General Contractor of installation in new construction. Install appropriate sleeve. Install and appropriate fire-stopping assembly. Seal penetration in accordance with fire-stopping manufacturer's recommendations.

B. **Floor pipe penetrations:** See rated pipe penetrations above. Top of sleeve shall extend ¾" above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert sleeve and grout area around sleeve with grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

C. **Non-rated pipe penetrations:** Core drill opening through partition. Install the appropriate pipe sleeve. Pack mineral wool in annular space between sleeve and pipe and/or insulated pipe and sleeve and wall penetration. Seal wall penetration with urethane caulk.

D. Where pipe penetration is exposed, cut sleeve flush with wall. In masonry construction grout area around sleeve to provide a smooth clean finish.

E. Install escutcheons plates around pipes where pipes are exposed or where indicated.

3.4 PIPE PENETRATIONS THROUGH EXTERIOR SURFACES

A. Roof penetrations:

1. Drill or saw cut penetration one size larger than the carrier pipe. Fill annual space between pipe and penetration with mineral wool insulation. Where penetration is exposed, install an escutcheon plate and fasten plate to roof construction.
2. If multiple pipes are to pass through a single penetration, following direction as indicated for a single pipe and where penetration is exposed, install a custom fabricated 20 gauge sheetmetal plate with required holes and fasten plate to roof construction.

B. Above grade penetrations in masonry construction:

1. Pipes < 1½" in size: Carefully core drill penetration in existing construction one size larger than anticipated pipe. Directly set pipe in hydraulic setting grout. Seal both ends and annual space with hydraulic setting, non-shrink grout to provide a watertight assembly.
2. Pipe sizes ≥ 2" in size: Carefully core drill penetration in existing construction one size larger than anticipated. Set appropriate pipe sleeve in hydraulic grout and assemble and seal with link type seal to provide a watertight assembly in accordance with manufacturer's instructions.

C. **Above grade penetrations in non-masonry construction:** Saw cut opening one pipe size larger than pipe. Mount appropriate pipe sleeve in existing construction. Fill annual spaces between sleeve and wall with closed cell waterproof insulation and caulk water tight. Install piping flanges on both sides of the sleeve and fasten flanges to wall. Seal around flanges to caulk to provide a watertight seal.

D. Install escutcheons plates around pipes where pipes are exposed or where indicated.

END OF SECTION

SECTION 15417

PLUMBING MOTORS, STARTERS, DISCONNECTS AND CONTROL WIRING

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, extend, remove, relocate and remodel all required motors, motor starters, disconnects, etc. of types, qualities, sizes, etc. for plumbing systems and equipment as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Coordination
7. Design Criteria
8. Delivery, Storage and Handling
9. Three Phase, Single Speed Motors
10. Single Phase, Single Speed Motors
11. Motors Used for Reduced Voltage Starting
12. Motor Starters
13. Disconnects
14. Control Conduit and Fittings
15. Control Wiring Conductors
16. Control Wiring Joints, Taps and Splices
17. Control Wiring Junction Boxes
18. Installation
19. Coordination
20. Control Conduit and Fittings
21. Control Wiring Conductors
22. Control Wiring Joints, Taps and Splices
23. Control Wiring Junction Boxes
24. Commissioning

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Division 16000 - Electrical wiring requirements.

1.3 REFERENCE STANDARDS

A. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators

B. ANSI/NEMA MG-1 - Motors and Generators

C. ANSI/UL 1004-1988 - Electric Motors

D. ANSI/NFPA 70 - National Electrical Code

E. DOC Chapter 63 - Motor Efficiencies at Various Speeds

F. NEC - National Electrical Code

1.4 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions) for equals and substitutions.

B. Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by U.L. for the service specified.

C. Provide all control wiring and associated electrical devices in accordance with the requirements of Division 16000 specification sections.

D. All electrical work shall be in accordance with the National Electric Code, State and Local codes.

1.5 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Refer to requirements of Section 15400, Submittals.

C. Include with the equipment, which the motor drives, the following motor information: motor manufacturer, horsepower, voltage, phase, hertz, speed, and full load efficiency. Include project wiring diagrams prepared by the contractor specifically for this work.

D. Include manufacturer's instructions in the manuals with the specific equipment to which they apply. Also include the following information if not previously documented on shop drawings: full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.6 COORDINATION

A. **Prior to ordering any and all equipment which require electrical connections, coordinate with Division 16 for the correct voltage at the site. The cost associated with any equipment ordered with the wrong voltage will be the responsibility of Plumbing Contractor to correct.**

B. Work By Division 15400:

1. Furnish control wiring for all equipment.
2. Furnish control transformers for all low voltage control wiring. Power supplies for control wiring shall be 24 VAC, 10VDC, or 120 VAC as called for in the individual technical sections.
3. Provide and install all low voltage 24 Volt control devices serving equipment.
4. Furnish project specific wiring diagrams to Division 16000 Contractor for all equipment and devices furnished by this Contractor and indicated to be wired by the Division 16000 Contractor.

C. Work By Division 16000:

1. Provide line voltage control and power wiring for all equipment
2. Furnish and install all disconnect switches for equipment.
3. Install and wire all starters for equipment.
4. Install and wire all disconnect switches, not factory installed, for equipment.
5. Wire all line voltage control devices serving equipment.

1.7 DESIGN CRITERIA

A. Select motors for conditions in which they will be required to perform; i.e., general purpose, splash proof, explosion proof, standard duty, high torque or any other special type as required by the equipment or motor manufacturer's recommendations.

B. Furnish motors for starting in accordance with utility requirements and compatible with starters as specified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. See Section 15400, “Delivery, Storage and Handling”.

B. Cover motors, starters, disconnects, etc. to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store equipment and components directly on grade. Protect motors, starters, disconnects so they are not damaged. Where storage containers are provided or specified, take precautions so the items remain in containers.

PART 2 PRODUCTS

2.1 THREE PHASE, SINGLE SPEED MOTORS

A. Use NEMA rated 208/3/60, 240/3/60, 480/3/60 motors for all motors 1/2 HP and larger unless specifically indicated.

B. Use NEMA general purpose, continuous duty, Design B, normal starting torque, T-frame or U-frame motors with Class B or better insulation unless the manufacturer of the equipment on which the motor is being used has different requirements. Use open drip-proof motors unless totally enclosed fan-cooled, totally enclosed non-ventilated, explosion-proof, or encapsulated motors are specified in the equipment sections.

C. Use grease lubricated anti-friction ball bearings with housings equipped with plugged/capped provision for lubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt centerline at the end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

D. All motors shall have a 1.15, or higher, service factor.

E. Full load nominal motor efficiency by motor size and speed shall be as indicated in State of Wisconsin DSPS Chapter 363 Table 363.32.

2.2 SINGLE PHASE, SINGLE SPEED MOTORS

A. Use NEMA rated 120/1/60 motors for all motors 1/3 HP and smaller.

B. Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class A insulation. Service factor to be not less than 1.35.

2.3 MOTOR STARTERS

A. All starters, not factory installed and wired as part of the packaged piece of equipment, shall be manufactured by **Allen-Bradley** and shall be size “0” or larger.

B. Provide appropriate NEMA sizes for maximum motor horsepower ratings.

C. See Motor Starter Schedule or equipment list on drawings for motor sizes, electrical loads and specific motor starter requirements.

D. Starter Enclosures:

1. Provide NEMA 4X, surface mounted enclosures for all starters.

B. Starter Accessories:

1. All manual and magnetic starters controlled from a remote signal shall have a built-in “HAND-OFF-AUTO” selector switch.

2. All manual and magnetic starters, which are not controlled from a remote signal, shall have a built-in "ON-OFF" switch or push button station.
3. Provide control transformers with fused primary and secondary for all magnetic starters with motor voltages 200 volts and above.
4. Provide overload relays and heater elements for all starters.
5. Provide pilot lights for all starters.
6. Provide two normally open auxiliary contacts and one normally closed auxiliary contact for all magnetic starters.
7. Provide a deceleration relay for all two speed magnetic starters.

C. Combination Magnetic Starters:

1. Combination magnetic starters for **single speed motors shall be Allen-Bradley Bulletin 512** non-reversing full voltage magnetic single speed motor starter complete with three phase, three pole forms, three leg protection, 120 volt holding coil, and a built-in fusible disconnect switch.
2. Combination magnetic starters for **two speed separate winding motors shall be Allen-Bradley Bulletin 522** non-reversing full voltage magnetic two speed motor starter for separate winding motors complete with three phase, six pole forms, six leg protection, and 120 volt holding coil and a built-in fusible disconnect switch.
3. Combination magnetic starters for **two speed single winding consequent pole motors shall be Allen-Bradley Bulletin 522** non-reversing full voltage magnetic two speed motor starter for single winding consequent pole motors complete with three phase, eight pole forms, six leg protection, and 120 volt holding coil and a built-in fusible disconnect switch.

D. Magnetic Starters:

1. Magnetic Starters for **single speed motors shall be Allen-Bradley Bulletin 509** non-reversing full voltage magnetic single speed motor starter complete with three phase, three pole forms, three leg protection, and 120 volt holding coil.
2. Magnetic Starters for **two speed separate winding motors shall be Allen-Bradley Bulletin 520** non-reversing full voltage magnetic two speed motor starter for separate winding motors complete with three phase, six pole forms, six leg protection, and 120 volt holding coil.
3. Magnetic Starters for **two speed single winding consequent pole motors shall be Allen-Bradley Bulletin 520** non-reversing full voltage magnetic two speed motor starter for single winding consequent pole motors complete with three phase, eight pole forms, six leg protection, and 120 volt holding coil.

E. **Manual starters shall be Allen-Bradley Bulletin 600 TAX** manual starters for single or two speed single-phase motors, complete with one pole or two-pole toggle switch, single phase. Maximum 1 HP rating.

2.2 DISCONNECTS

A. **Integral Disconnects in Equipment with Motors Under ½ HP** shall be manufacturer's standard UL rated disconnect switch.

B. **All non-integral disconnects serving equipment with motors under ½ HP shall be an Allen-Bradley Bulletin 600 TAX-109.** Disconnect shall be furnished by the Plumbing Contractor and field installed by the Division 16000 Contractor.

C. Integral and Non-Integral Disconnects in Equipment with Motors ½ HP and Larger

1. All integral and non-integral disconnects serving equipment with motors ½ HP and larger shall be manufactured by Square D.
2. Disconnects shall be heavy-duty single throw non-fusible safety disconnect switches for all motors. Units shall be rated for motor horsepower and complete with number of poles compatible with motor voltage, disconnect switch, operating handle, and connecting rod. Provide NEMA enclosure appropriate for duty similar to starter enclosures described above.
3. All disconnect switches shall be rated to withstand available fault current. Coordinate with Division 16000.

2.3 CONTROL CONDUIT AND FITTINGS

A. **Electrical Metallic Tubing (EMT):** Standard lengths and size with Minimum conduit size shall be ½ inch.

B. **Electrical Metallic Tubing (EMT) Fittings:** Galvanized or Cadmium Plated Steel, Threaded, Insulated throat, Gland compression type, Rain and concrete tight, Set screw type steel fittings are permissible only in completely inaccessible locations (example; inside a wall) or for conduits sizes ≥ 2", when installed ≥ 10' -0" A.F.F. , All fittings shall be water-tight located in Boiler Rooms and Pool equipment rooms.

C. **Flexible Conduit:** Galvanized flexible steel of standard conduit sizes with minimum size ½" with the exception that 3/8" diameter may be used in lengths not to exceed 24".

D. **Flexible Conduit Fittings:** Galvanized or Cadmium Plated Steel, Threaded, Grounding type, Insulated throat, Externally Secured

E. **Liquid Tight Flexible Conduit:** Galvanized flexible steel with an outer liquid tight, nonmetallic sunlight resistant jacket of standard conduit sizes with minimum size ½" with the exception that 3/8" diameter may be used in lengths not to exceed 24".

F. **Liquid Tight Flexible Fittings:** Galvanized or Cadmium Plated Steel, Threaded, Grounding type, Insulated throat, Liquid tight, Externally Secured

2.4 CONTROL WIRING CONDUCTORS

A. All conductors shall be copper and have an insulation rating of 600 volts.

B. In mechanical rooms, light fixtures and other high temperature applications, the insulation shall be rated 90°C or greater. Others areas shall use insulation rated min. 75°C unless stated otherwise in other parts of these specifications and drawings.

C. Conductors installed in wet locations and areas with high humidity shall be type THW, THHN or THWN.

D. All conductors must be suitable for the application intended. Conductors #10 and larger must be stranded. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:

1. All conductors terminated with crimp type devices must be stranded.
2. Stranded conductors may only be terminated with UL or ETL listed type termination or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device if a terminal screw is used or must be terminated in an approved back wired method.

2.5 CONTROL WIRING JOINTS, TAPS AND SPLICES

A. Conductors No. 10 AWG and Smaller: “Ideal” spring type solderless wire-connectors (or equal) with plastic cover. **IDC (Insulation Displacement Connector) type connectors are not an approved equal.**

B. Joints, Taps, and Splices for Conductors No. 6 AWG and larger shall be made utilizing one of the following methods:

1. Solderless compression type connectors, tool and die applied, of a type that will not loosen under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.
2. Each tap, joint, or splice shall be taped with two half-lap layers of varnished cambric tape plus two half-lap layers of Scotch 33 tape and where required by code, or specified herein a finish wrap of color coding tape.
3. “Multi-Cable Connector Blocks” Manufactured by NSI.

C. Split bolt connectors are not acceptable.

2.6 CONTROL JUNCTION BOXES

A. Acceptable manufacturers of electrical boxes shall be Appleton, Steel City, Rayco, Wiremold or Bell

B. Size boxes as required by code for number of conduits and conductors entering and leaving box.

C. Fabricate boxes of code required gauge galvanized steel and provide with covers held in place by corrosion resistant machine screws.

D. Minimum box size 4” square.

E. Provide boxes as required to accommodate the device indicated by symbol on the drawings.

F. Multi-gang galvanized boxes shall be provided for all devices indicated adjacent to one another on the plans.

G. Wiremold style box without outlet can be minimum size 4-3/8”x2-7/8”x15/16”, such as V5748S.

H. **Wet locations:** Single or multiple ganged moisture-proof cast aluminum boxes with threaded hubs.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount motors on a rigid base designed to accept a motor, using shims if required under each mounting foot to get a secure installation.

B. When motor will be flexible coupled to the driven device, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Using a dial indicator, check angular misalignment of the two shafts; adjust motor position as necessary so that the angular misalignment of the shafts does not exceed 0.002” per inch diameter of the coupling hub. Again using the dial indicator, check the shaft for run-out to assure concentricity of the shafts; adjust as necessary so that run-out does not exceed 0.002”.

C. When motor will be connected to the driven device by means of a belt drive, mount sheaves on the appropriate shafts in accordance with the manufacturer's instructions. Use a straight edge to check alignment of the sheaves; reposition sheaves as necessary so that the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so that the belt(s) can be added and tighten the base so that the belt tension is in accordance with the drive manufacturer's recommendations. Frequently recheck belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

3.2 COORDINATION

A. Turnover all switches, starters, detectors, electric heaters, etc. to Division 16000 Contractor for installation and wiring.

B. Division 16000 Contractor must install starters where indicated on drawings. Failure to do so will result in additional control wiring cost, which will become the responsibility of the Division 16000 Contractor.

3.3 CONTROL WIRING

A. Install, extend, and remodel all required control wire conductors, cables and connectors as indicated on the drawings.

B. Install all low voltage control wiring with in a control panel shall be terminated or interconnected with a labeled terminal strips. No wire nuts or daisy chaining will be permitted.

C. Any control wiring or terminals, which are to be connected to in field, must be properly tagged with labels specifically designed for identifying conductors.

D. Run wire and cable in conduit, unless otherwise indicated on drawings.

E. Pull all conductors into a raceway at the same time. Use Listed "Wire Pulling Lubricant" for pulling 4 AWG and larger wires and for other conditions when necessary.

F. Cable splices No. 6 AWG and larger shall be made only in distribution and junction boxes.

G. **Splices are allowed** on 24 VAC power wiring where it feeds terminal equipment remote controllers above ceilings, but only where such splices are required for joining a tap to the main power feed. No other mid wire run splices are allowed. Splices must be made in a junction box.

H. Wire Colors:

1. Use "Phase A black" and "Phase B red" for single phase circuits at 120/240 volts, use "Phase A black", "Phase B red" and "Phase C blue" for circuits at 120/208 volts single phase or three phase.

2. Ground Conductors: Green or green with yellow stripes or bare.

3.4 CONTROL CONDUIT AND FITTINGS

A. Install all **line voltage** control wiring in as directed in Division 16000.

B. Do not use existing raceways or conduits in the building.

C. In classrooms, offices and other finished areas, surfaced mounted conduit or wiremold shall be finished with paint of a color to match attached surface color and approved by Construction Project Inspector.

D. Exposed control and data wiring in mechanical rooms shall be installed in galvanized EMT conduit with final connections to boxes, panels, etc. with liquid-tight conduit for wet areas and sight-tight for dry areas. Maximum length of flexible conduit is 24".

E. Make all line and control wiring connections to motorized and vibrating equipment with a length on flexible conduit..

F. All 24 VAC transformers must be in enclosed in panels. Exposed transformers are not allowed. The secondary must be grounded on one leg.

G. Conduit:

1. Install conduit in accordance with NEC and in accordance with recognized industry practices.
2. Interior conduits may be electrical metallic tubing (EMT) except as otherwise directed on the plans. Do not use electrical metallic tubing (EMT) for exterior conduits.
3. The conduit installation shall be complete prior to installing conductors and cables.
4. Conduits installed under this project shall be continuous from outlet to outlet and from outlets to cabinets, junction, or pull boxes, and shall enter and be secured to boxes in such a manner that each system shall be electrically continuous from point of service to outlets.
5. Use flexible metal or liquid tight flexible conduit for **final** connections to junction boxes of equipment, panels and fixtures. Do not use flexible conduit for connecting conduits to each other or from box to box except at expansion joints.
6. Cut joints shall be square, reamed smooth, and drawn up tight.
7. Keep conduit plugged, clean, and dry during construction.

H. Conduit Fittings

1. Install conduit fittings in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that fittings serve intended purposes.
2. Rigidly secure connectors at cabinets and boxes with galvanized lock nut and bushing.
3. Seal conduits at both ends that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.
4. Install conduit expansion fittings complete with bonding jumper in following locations:
   a) Conduit runs which cross a structural expansion joint.
   b) Conduit runs where movement perpendicular to axis of conduit may be encountered.
5. Locate conduit bodies so as to assure accessibility of electrical wiring.

3.5 CONTROL JUNCTION BOXES

A. Install electrical boxes as indicated, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes serve the intended purposes.

B. Provide boxes as required to accommodate the device indicated by symbol on the drawings.

C. Install knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes so as to assure accessibility of electrical wiring.

E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers, as required.

G. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

H. Do not burn conduit holes or use hole saws; use knock-out punches only.

I. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings, etc. within the box. Do not use box extensions to create additional volume to meet N.E.C. requirements for the number of conductors contained in a box.

J. Install all wiring in metal or flexible liquid tight (not Greefield) conduit, in accordance the National Electrical code.

3.6 COMMISSIONING

A. Verify the proper rotation of each three-phase motor as it is being wired or before the motor is energized for any reason.

B. Lubricate all motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

END OF SECTION

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SECTION 15426

PLUMBING SYSTEMS INSULATION

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, extend, remove and remodel all required thermal insulation systems and associated accessories, sealants, jackets, etc. of types, qualities, sizes, thicknesses, lengths, etc. for all plumbing systems and equipment as indicated on drawings and specified herein for this project.

C. Thermal Insulation Work Due to Abatement

1. Insulate any existing and remodeled piping and equipment that have been abated.
2. In general, any and all plumbing surfaces in the basement affected by the connection to the existing domestic cold water piping, but required due to removal of obsolete insulation under asbestos abatement work, must be insulated.
3. The scope includes but is not limited to the following: domestic hot, cold and hot water return piping, roof and storm drain piping and drain bodies, and all associated valves, fittings.
4. Contractor should anticipate involvement in the identification of plumbing piping, ductwork and equipment covering requiring abatement due to new or demotion work

D. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Definitions
6. Submittals
7. Delivery, Storage and Handling
8. Materials
9. Insulation
10. Jackets
11. Accessories
12. Installation
13. Piping, Valve and Fitting Insulation

14. Equipment Insulation

1.2 RELATED SECTIONS

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Pipe Fittings

C. Section 15414 - Plumbing Hangers, Supports and Anchors

1.3 REFERENCE STANDARDS

A. ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate

B. ASTM C165 Test Method for Compressive Properties of Thermal Insulation

C. ASTM C177 Heat Flux and Thermal Transmission Properties

D. ASTM C195 Mineral Fiber Thermal Insulation Cement

E. ASTM C240 Cellular Glass Insulation Block

F. ASTM C302 Density of Preformed Pipe Insulation

G. ASTM C303 Density of Preformed Block Insulation

H. ASTM C449 Mineral Fiber Hydraulic Setting Thermal Insulation Cement

I. ASTM C518 Heat Flux and Thermal Transmission Properties

J. ASTM C533 Calcium Silicate Block and Pipe Thermal Insulation

K. ASTM C534 Preformed Flexible Elastomeric Thermal Insulation

L. ASTM C547 Mineral Fiber Preformed Pipe Insulation

M. ASTM C552 Cellular Glass Block and Pipe Thermal Insulation

N. ASTM C553 Mineral Fiber Blanket and Felt Insulation

O. ASTM C578 Preformed, Block Type Cellular Polystyrene Thermal Insulation

P. ASTM C591 Preformed Rigid Cellular Polyurethane Thermal Insulation

Q. ASTM C610 Expanded Perlite Block and Thermal Pipe Insulation

R. ASTM C612 Mineral Fiber Block and Board Thermal Insulation

S. ASTM C921 Properties of Jacketing Materials for Thermal Insulation

T. ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation

U. ASTM E84 Surface Burning Characteristics of Building Materials

V. MICA Midwest Insulation Contractors Association

W. NFPA 225 Surface Burning Characteristics of Building Materials

X. UL 723 Surface Burning Characteristics of Building Materials

1.4 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions) for equals and substitutions.

B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Owner's Representative.

C. Insulation Contractor must have a proven track record of installing insulation systems and associated materials as indicated in these specifications for a minimum of 5 years.

D. Label all insulating products delivered to the construction site in properly marked boxes with the manufacturer's name and description of materials.

1.5 DEFINITIONS

A. **Concealed** refers to shafts, furred spaces, spaces above ceilings (except supply air plenums), utility tunnels and crawl spaces.

B. **Exposed** refers to all other areas not indicated as concealed, including walk-through tunnels and supply air plenums.

1.6 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Refer to requirements of Section 15400, Submittals.

C. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 15400, "Delivery, Storage and Handling".

B. Insulation must come in properly marked **waterproof boxes** or storage containers. Take precautions so the insulation remains in containers until installation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less except as specified otherwise.

C. Pipe insulation, which is not located in an air plenum, may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.2 INSULATION AND JACKETS

A. Insulation and insulation jackets shall be as manufactured by Armstrong, Certainteed Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, IMCOA, Knauf, Owens-Corning, Partek, Pittsburgh Corning, Rubatex, Schuller.

B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

C. Jackets shall have puncture resistance based on ASTM D-781 test methods. Vapor barriers, where required, shall have perm ratings based on ASTM E-96 procedure A.

2.3 RIGID FIBERGLASS INSULATION:

A. Rigid fiberglass insulation shall have a minimum nominal density of 3 LBS/FT^3, and thermal conductivity of not more than 0.23 at 75°F, minimum compressive strength of 25 LBS/FT^2 at 10% deformation, rated for service to 450°F.

B. Equal to Owens-Corning "ASJ-SSL", or Manville "AP-T".

C. Insulation applied to piping shall have a white kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

2.4 ELASTOMERIC INSULATION:

1. Elastomeric insulation shall be flexible closed cell, minimum nominal density of 5.5 LBS/FT^3, thermal conductivity of not more than 0.27 at 75°F, minimum compressive strength of 4.5 PSI at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20°F to 220°F on piping and 180°F where adhered to equipment.

2. Equal to Armstrong AP Armaflex or Armaflex II, Rubatex, or Halstead F/R Insul-Tube insulation.

2.5 PVC FITTING COVERS AND JACKETS:

A. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas.

B. PVC Fitting covers and jackets thickness to be 0.03” (30 mil).

C. End to end joints must be lapped a minimum of 2” and be sealed with welding solvent recommended by jacket manufacturer.

D. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction.

2.6 ACCESSORIES

A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. Insulation bands to be ¾” wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.020” for aluminum and 0.020” for stainless steel.

D. Staples to be clinch style.

E. Fiberglass cloth shall be equal to that as manufactured by Chill Glass or MPS approved equal.

F. Canvas fabric reinforcing shall have a minimum untreated weight of 6-oz./sq. yd.

G. Vapor barrier mastic coatings to be non-shrinking, permanently flexible, non-flammable, fire resistant, polymeric resin equal to white Vimasco WC-7.

H. Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating

I. White latex finish for elastomeric and polyolefin shall be equal to Rubatex #374.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install insulation, jackets and accessories in accordance with manufacturer’s instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.

B. All insulation shall be installed by a qualified Insulation Contractor.

C. Do not insulate systems or equipment, which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.

D. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted.

E. Provide neatly beveled and coated termination's at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.

F. Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

G. Insulation shall be continuous through sleeves and openings except where fire rated penetration materials require interruption of insulation. Vapor barriers shall be maintained continuous through all penetrations.

H. Provide a complete vapor barrier for insulation on the following systems:

1. All water piping
2. Any equipment with an operating surface temperature below 65°F.

3.2 PIPING, VALVE, AND FITTING INSULATION

A. Hanger and Supports:

1. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation.
2. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration.
3. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

B. Insulation Saddles:

1. Insulation saddles will be installed on piping systems as specified in Section 15414 by the Section 15414 Contractor.
2. Section 15426 Contractor must coordinate saddle locations and required insulation cut-outs for saddles.

C. Insulation Inserts And Pipe Shields:

1. Provide inserts of heavy density insulation and galvanized sheet metal shields at hanger or support locations. Select inserts for full support without compression or deformation of insulation or jacketing. Inserts on hot piping to be calcium silicate or cellular glass; on cold piping calcium silicate treated with water repellent, extruded polystyrene or cellular glass.

Insulation inserts to be preformed for the pipe size and same thickness as adjoining pipe insulation. Cover the bottom 180° of the pipe. On piping 4" and smaller, insert may cover the bottom 60° of the pipe. Piping secured with hold down clamps, straps or U-bolts must have full 360° insert. Wood blocks will not be accepted.

2. Sheet metal shields must be installed on all insulated piping at hanger or support locations. Insulation inserts and galvanized sheet metal shields shall not be less than the following lengths and gauges:

Pipe Size	Length	Gauge
Through 2½"	12"	22
to 6"	12"	20

3. On low temperature systems, use pre-manufactured insulated pipe riser clamps equal to Pipe Shields E1000 and E2000 series.

D. Fittings And Valves:

1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation.
2. On systems requiring vapor barrier, use vapor barrier mastic.
3. Insulate chilled water and cold-water valves up to the packing nut.

E. **Fiberglass Insulation**: Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.

F. **Elastomeric**:

1. Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. Apply full bed of adhesive to both surfaces.
2. Finish exterior insulation with (2) coats of gray "Rubatex" or equal for ultra-violet protection.
3. Finish interior insulation with (2) coats of white "Rubatex" or equal for moisture protection.

G. PVC Protective Jacket:

1. Provide a protective PVC jacket for all pipe, valves and fittings covered with fiberglass as specified.
2. Do not cover piping insulation other than fiberglass with a PVC jacket unless specifically specified otherwise.
3. PVC Jacket Requirements shall be as follows:
   a) A PVC jacket will not be required on piping insulation in return air plenums.

b) Piping insulation in supply air plenums and tunnels shall be covered with a PVC jacket to prevent deterioration of the insulation.

c) Except as specified otherwise, a PVC jacket will be required on any exposed piping below 10 feet above the finished floor. If the insulated pipe penetrates the 10-foot plane, the entire pipe shall be covered with a PVC jacket.

d) **All exposed piping** (above & below 10 feet), located in the following locations, must be covered with a PVC jacket: Gyms, Cafeterias, Pool Equipment Rooms, Swimming pool rooms, Shower and Locker Rooms, Boiler Rooms, Greenhouses, Dishwashing Rooms and Kitchens.

e) Dead or plugged ends of all piping required PVC end caps.

4. Lap seams and joints a minimum of 2" and continuously seal with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used.

5. Secure PVC fitting covers with 1½" PVC vinyl tape and 1½" band of mastic over ends, throat, seams or penetrations.

6. **Tack fasteners are not allowed.**

H. Metal Jacket:

1. Provide a protective metal jacket for all exterior pipe installations.

2. Lap seams a minimum of 2". Secure with metal bands for end-to-end joints, and rivets or sheetmetal screws for longitudinal joints. Rivets, screws, and bands to be constructed of the same material as the jacket. Locate seams on bottom for exterior applications.

I. Do not insulate piping unions for systems not requiring a vapor barrier. Provide a removable insulated cover over unions on piping requiring a vapor barrier.

J. **Pipe Insulation Schedule:** Insulate new, existing, remodeled and abated piping according to the following schedule.

Insulation Thickness by Pipe Size

Service	Type	< 1"	1¼" to 2"	2½" to 4"	5" to 6"	>8"	Jacket
Hot Water Supply/Return	Rigid Fiberglass	1"	1"	1"	1½"	1½"	PVC
Cold Water	Rigid Fiberglass	1"	1"	1"	1"	1"	PVC
Solar Thermal Supply	Rigid Fiberglass	1½"	1½"	2"	2"	3½"	PVC/ Metal
Solar Thermal Return	Rigid Fiberglass	1½"	1½"	2"	2"	3½"	PVC/ Metal

3.3 EQUIPMENT INSULATION

A. **Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps**. Bevel and seal insulation at these locations.

B. Semi-Rigid Fiberglass:

1. Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface.
2. Use vapor barrier mastic on systems requiring a vapor barrier.
3. Provide a protective covering consisting of 2 coats of vapor barrier mastic with 6-ounce canvas.
4. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2".
5. Install canvas covering for all tanks, vessels and water softeners.

C. **Equipment Insulation Schedule**: Insulated new, existing, relocated and abated equipment according to the following schedule:

Service	Type	Thickness	Finish
Water Storage Tanks	Semi-Rigid Fiberglass	2"	PVC

END OF SECTION

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SECTION 15450

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of the Contract, including Bidding Requirements, General Requirements, and Conditions applying to this Section.

B. Provide, install, extend, remove and remodel all required plumbing equipment and associated accessories, tanks, pumps, motors, controls, etc. of types, qualities, sizes, lengths, etc. as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Hot Water System Circulating Pump
8. Expansion Tanks
9. Solar Thermal Water Storage Tanks with Heat Exchangers
10. Solar Thermal System Circulation Pumps
11. Solar Thermal Collector Panels
12. Solar Thermal Controllers
13. Fluid Cooler
14. Installation
15. Solar Thermal Sequence of Operation
16. Commissioning
17. Training

1.2 RELATED WORK

A. Section 15400 - Plumbing General Requirements

B. Section 15401 - Plumbing Pipe and Pipe Fittings

C. Section 15410 - Plumbing Valves

D. Section 15412 - Plumbing Piping Specialties

E. Section 15417 - Plumbing Motors, Starters, Disconnects and Control Wiring

F. Section 15426 - Plumbing Systems Insulation

G. Division 16000 - Electrical

1.3 REFERENCE STANDARDS

A. NFPA-54: National Fuel Gas Code.

B. NFPA-70: National Electric Code.

C. ASHRAE 90.1: Energy Efficient Design of New Buildings.

D. ASNI/ASME PTC25.3-1998 for Relief and Safety Valves

E. AGA: American Gas Association

F. U.L. 795 Commercial-Industrial Gas Heating Equipment

G. ANSI/UL 1453-1987: Electric Booster and Commercial Storage Water Heaters

1.4 QUALITY ASSURANCE

A. Plumbing products requiring approval by the State of Wisconsin DOC must be approved or have pending approval, at the time of shop drawing submission.

B. Acceptable manufacturers shall be companies regularly engaged in the manufacture of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories (U.L.) and comply with NEMA standards.

D. Comply with NFPA No. 70 as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

E. Comply with ASME Boiler and Pressure Vessel Code for construction and stamp with ASME Code symbol:

1. When the following apply:

a) The tank volume exceeds 120 gallons
b) The temperature exceeds 210^{o}F.
c) The internal heat gain into the tank exceeds 200,000 BTU/HR

2. For the following equipment:

a) Water tanks.

1.5 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions) for submittal requirements.

B. Refer to requirements of Section 15400, Submittals.

C. Include data concerning dimensions, rated capacities of selected models, materials of construction, ratings, weights, pump curves with net positive suction head requirements, furnished specialties, accessories, manufacturer's installation requirements, piping and wiring connections, required clearances, manufacturer's performance limitations, and appropriate identification.

D. Include manufacturer's instructions, including maintenance data and parts lists for each item of plumbing equipment. Include troubleshooting maintenance guides.

E. Submit wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring for solar controller. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of solar thermal system. Differentiate between portions of wiring that are factory installed and portions that are to be field installed. Include sequence of operation for solar controller and solar thermal system.

F. Submit certificates of shop inspection and data report as required by provisions of the ASME Boiler and Pressure Vessel Code.

1.6 DESIGN CRITERIA

A. All equipment sizes, capacities, pressures and operating characteristics shall be as specified or as indicated on drawings.

B. Pumps

1. Pumps shall meet or exceed operating efficiencies scheduled or indicated.
2. Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on all pumps unless specified otherwise. Service of base mounted pumps shall not require breaking piping connections or removal of motor.
3. Where a pump is specified for parallel operation, the scheduled conditions are for that pump with both pumps operating; i.e., total system flow rate is twice that scheduled for a single pump. When only one of the parallel pumps is operating, the operating point of that pump must fall within the manufacturer's recommended operating range.
4. Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 RPM unless specified otherwise.
5. Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.
6. Test all pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.
7. All pumps to operate without excessive noise or vibration.
8. After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

1.7 WARRANTY

A. Submit a written warranty, executed by manufacturer, agreeing to repair or replace water heater units and water storage tanks that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, tanks, heat exchangers, and burners. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 PRODUCTS

2.1 EXPANSION TANKS

A. Expansion tanks shall be as manufactured by Amtrol/Thrush, Armstrong Pumps, Bell and Gossett, Taco or Wessels.

B. Bladder Type expansion tanks shall be constructed of steel, tested and stamped in accordance with Section 8D of the ANSI/ASME Code and furnished with the National Board Form U-1, rated for not less than 125 PSIG working pressure, precharged with air to the initial fill pressure indicated on the drawings, butyl diaphragm suitable for fluid temperatures to 220°F, and furnished with a tank drain connection, system connection, mounting saddles for horizontal installation or base for vertical installation, prime coated, size/capacity as indicated on the drawings. Tank and bladder construction must allow field replacement of the bladder on its failure.

2.2 SOLAR THERMAL WATER STORAGE TANKS

A. Solar thermal water storage tanks shall be as manufactured by Badgerland Tanks or MPS approved equal

B. Provide each water storage tank with the following:

1. Tanks shall be of sizes, capacities, tappings, etc. as indicated on schedule and constructed in accordance with Section IV of the ASME Code for a designed for a working pressure of 150 PSI. Tank shall be registered with the National Board of Boiler and Pressure Vessel Inspectors and Certificate of Shop Inspection shall be furnished.
2. Glass lined interior self supporting steel tank with 2”T R-17 insulation with PVC jacket
3. Tappings of sizes and in locations as indicated and required including:
   a) Tank top domestic hot water and cold water connections
   b) Relief and drain valve connections
4. ASME rated temperature and pressure relief valve
5. Full port drain valve with hose connection
6. Anode rod
7. Surface mounted aqua stat suitable for field connections

2.3 SOLAR HOT WATER SYSTEM CIRCULATING PUMP

A. Solar hot water system circulating pump(s) shall be as equal to B&G PL Series, Grundfos UP Series or Taco

B. Pump shall be of sizes and capacities as indicated on plans

C. Pump shall be bronze, inline style, centrifugal, single-stage, permanently oil lubricated, maintenance free, rated for 150 PSIG working pressure and 2225oF continuous water temperature.

2.4 HEAT EXCHANGER

A. Brazed plate with stainless connections and plates.

B. Maximum pressure drop of 3 psig.

2.5 SOLAR THERMAL COLLECTOR PANELS

A. Solar thermal collector panels shall be as manufactured by Alternate Energy Technologies, Aquarius, Gull Industries, Heliodyne, Solar Skies SS Series, or MPS approved equal

B. Panels shall be SRCC rated with sizes, weights, capacities, etc. as indicated on drawings.

C. Panels shall have the following construction:

1. Aluminum extruded batten ribbed extrusions and a smooth compressed EPDM gasket provide water tightness
2. Architectural aluminum corner bracket angles inside with pin grip rivets insure high stability.
3. Embossed aluminum back panel cover
4. Low-iron tempered glass with an iron oxide content of less than 1% and total solar energy transmission of greater than 91%.
5. Glass coating to provide $\alpha \approx 0.945 - 0.96$ and $\varepsilon \approx 0.06 - 0.09$
6. Glass gasket to be EPDM channel with molded corners
7. Full Copper Absorber forge welded to piping
8. Foil-faced Poly-Isocyanurate insulation and Thermax sheathing
9. EPDM Grommets

D. Panels shall come complete with a completely compatible and matching mounting aluminum frame system and mounting hardware tested to wind load conditions of 181mph as required for the installation configuration indicated on the drawings.

2.6 SOLAR THERMAL SYSTEM CONTROLLERS

A. Solar thermal system controllers shall be as manufactured by IMC Instruments, Inc. Model Eagle 2, Tekmar Model 155 or Solarnetix #Deltasol BS3.

B. Controller shall come with all required sensors and must be compatible with aqua stat temperature sensors on water storage tanks.

1. Thermistor Sensors; bolt on for collector, immersion for storage tank. Industrial Rated for 400 °F(204°C) 10K , +/- 1 °F accuracy. (RTD's are not acceptable).

2. Sensor Wiring - PLTC" Belden # 9322 (22ga) or 9320 (20ga).

C. Controller shall be capable of :

a) Diverting flow to the fluid cooler to prevent the system from overheating.
b) Adjustable setpoint of storage tank temperature.
c) Pump "ON/OFF" control for both circulation pumps
d) System energy production based on flow rate and water temperature difference
e) Connection to a RS-232 data port for interconnection to MPS intranet (IP Address by MPS)

D. Control panel face shall have a LCD read out with clear indications of all sensor values, pump "ON/OFF", System Power, and System Alarm or Fault.

E. BTU METER

1. Local readout and dry contacts for connection to the building automation system. Flow and temperature sensors. Metrima F2 or engineer approved equal.

2.7 FLUID COOLER

A. Cabinets shall be constructed of heavy-gauge, corrosion resistant galvanized steel. All end panels, center supports and partitions shall have collared tube holes. The coils shall be constructed of 1/2" outside diameter seamless copper tubing on a staggered tube pattern. Tubes shall be mechanically expanded into continuous full-collared plate-type aluminum fins for permanent metal-to-metal contact. Headers are supplied with drains and vents. All fans shall be aluminum propeller blade type with painted steel hubs. Fans shall be dynamically balanced and factory tested before shipping to ensure quiet operation. Fans shall have dual square head set screws spaced 90 degrees apart which seat onto one flat and keyway on the motor shaft. Fan diameters shall not exceed 30 inches. Fan guards shall be heavy-gauge, close-meshed steel wire with vinyl coating for maximum rigidity, and long life. Fan motors are heavy type PSC or three phase open drip-proof type with permanently lubricated ball bearings and built-in overload protection. All motors shall be factory wired with leads terminating in a weather-tight enclosure located opposite the header end on the unit and mounted on 12 gage galvanized steel base rails. Leads on units having five (5) or more fans shall terminate at a power block. All units to be UL & CUL and MEA as well as ETL listings.

B. Provide mounting channels for roof mounting on rails supplied by the mechanical contractor per drawings.

C. Include option for “Fan cycling with motor fusing option”.

PART 3 EXECUTION

3.1 GENERAL

A. Install plumbing equipment where indicated and in accordance with manufacturer's recommendations.

B. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances.

C. Locate equipment and arrange plumbing piping to provide access space for servicing all components.

D. Coordinate with Division 16000 for electrical requirements at site and specific locations of receptacles, starters, power connection points, etc.

E. Connect equipment to water piping and drain piping with unions or flanges and isolation valves as directed in Section 15401 and Section 15410.

F. Install temperature and pressure relief valves and route to floor drain or floor as indicated and required by Code.

G. Set and connect units in accordance with manufacturer's written installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Orient so controls and devices needing servicing are accessible.

H. Where piping connections are dissimilar metals, make connections with dielectric fittings or dielectric unions specified in Section 15401 Plumbing Piping and Fittings.

I. Extend relief valve discharge to closest floor drain.

3.2 WATER TANKS

A. Install water tanks in domestic water system and where shown on drawings with all isolation shutoff valves, unions, etc.

3.3 EXPANSION TANKS

A. Install tanks where indicated on the drawings, coordinating concrete base installation with the General Contractor or fabricating steel supports to suit the application. Install all specified tank accessories.

B. Bladder Tanks: Verify proper air charge; recharge as necessary. Install an isolation valve in the piping connecting the tank to the system. In the piping between the tank and the isolation valve, install a pressure gauge and a drain valve with a hose adapter. Install a drain valve with hose adapter in the drain connection of the tank. Make sure that all drains are accessible and a hose can be attached.

3.4 SOLAR THERMAL SYSTEMS

A. Level and install **Solar Thermal Water Storage Tanks** where indicated on plans. Connect tanks to domestic cold and hot water systems with a single set of shut-off valves and by-pass valve.

B. Install the **Solar Thermal System Circulation Pump** in solar thermal system above the elevation of the heat exchangers with shut-off isolation and check valves.

C. Mount **Solar Thermal System Controller** on wall. Connect panel to transformer provide by Div. 16000. Install temperature sensors in the sensor well located in the supply and return piping from the solar panels. Route control wiring conduit from all sensors in piping, in aqua stats of storage tanks and circulation pump.

D. Securely install **Solar Thermal Collector Panels** with framing system and hardware to roof support rails. Connect each panel to the next in an array of up to (8) panels wide. Connect array to solar supply and return piping as indicated on plans.

E. Solar Contractor to provide a Focus on Energy recognized modeling report - equivalent to RetScreen – demonstrating the solar energy delivered. Collector pitch at 60° and orientation is due South. Estimated energy offset by the system is 1,962 therms / year.

F. The contractor performing the solar work shall be on the Focus on Energy full service installers list within one month of the actual installation.

G. The Focus on Energy rebate will be completed and submitted by this contractor. This contractor is also required to provide breakdown of cost for the labor and material of the solar water heating system. Assist owner with the Focus on Energy Notice of Installation (NOI) paperwork

H. The Solar collector panel array must be Grounded directly to an earth ground line.

I. Provide all rails, mounting feet, rear legs, cross bracing and hardware. Racking and rails shall be designed and approved for IBC 90 mph wind loading.

J. Securely attach all panel brackets using stainless steel hardware. All bolts to Uni-Strut racking shall be through bolts. Uni-Strut spring clips are not allowed.

K. Support piping adjacent to panels such that no weight is carried by the header pipe.

L. Follow manufacturer’s guidelines for assembly of panel arrays.

M. Where more than one piping system material is specified, use compatible system components and joints.

N. Use non-conducting dielectric connections whenever jointing dissimilar metals

O. Install flanges, unions, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections.

P. Install full port ball valves for shut-off and panel array isolation.

Q. Install 3/4 inch ball valves with cap for drains at low points of piping, bases of vertical risers and at equipment.

R. Install the collectors and make connections between collectors within the arrays.

S. Provide sensor wiring, conduit and an array ground between the collectors and the solar station. All arrays need to be commonly grounded.

T. Provide sensor wiring, conduit between the storage tank and the solar station.

U. Contractor to provide all solar loop field piping as shown on the plans.

V. Contractor to provide final connections to each array (four array's equals 8 -1" connections).

W. Contractor to provide the domestic field piping as shown on the plans and connect to the solar station shut-off valves.

X. All exterior piping to be water tight, metal jacketed, and protected from ultra violet radiation

Y. Heat Transfer Fluid

1. Circulate and clean piping

2. Fill system with appropriate amounts of High temperature Propylene glycol to provide burst protection to at least -20 degrees F (9 degrees F "no slush" condition).

3. Fill the system with heat transfer fluid.

3.5 FLUID COOLER

A. Securely install Fluid Cooler on roof support rails a minimum of 18" high.

3.6 SOLAR THERMAL SEQUENCE OF OPERATION

A. A device called a differential controller measures the temperature of the solar collectors.

B. The differential controller also measures the temperature of the stored water in the solar storage tank.

C. The differential controller will compare these two temperature readings.

D. If the solar collectors are at least 15° warmer than the water in the storage tank the differential controller will turn on the solar lift pump. This pump will circulate a heat transfer fluid through the collectors, where it will pick up heat from the collectors.

E. The heated heat transfer fluid then travels to the heat exchanger where it will give off its heat to the potable water on the cold side of the heat exchanger.

F. This all happens in a “closed loop”, meaning the heat transfer fluid that goes through the collectors and back to the heat exchanger never comes in contact with the water in the solar collection tank.

G. This solar pump will continue to run as long as the collectors stay at least 4° warmer than the stored water in the solar collection OR if the stored water in the storage tank reaches a set point temperature of 180° .

H. When the solar system can’t or does not want to make any more hot water (set point reached or off differential is met) the solar pump is turned off and the heat transfer fluid stops flowing. The heat transfer fluid is comprised of food grade propylene glycol, so it will not freeze in extreme conditions.

I. If the max set point is reached and the heat transfer fluid stops flowing, it is possible the glycol could reach its maximum temperature range. To prevent this from happening we circulate the glycol through a heat dump until the system cools to within safe temperatures.

J. Since we can’t count on the sun to provide 100% of our hot water needs, we need to have a backup water heater.

K. The solar storage is plumbed up stream of the existing water heating system. If the potable water going into the existing water heater is hot enough, your existing water heater will not have to heat that water up anymore.

3.7 COMMISSIONING

A. Start-up and test all equipment adjusting operating and safety controls for proper operation.

3.8 WARRANTY

A. Flat plat collectors must be fully warranted to be free from defects in both material and workmanship for a total period of ten (10) years from date of installation acceptance.

B. Storage Tanks must be fully warranted to be free from defects in both material and workmanship for a total period of five (5) years from date of installation acceptance.

C. Heat Exchanger must be fully warranted to be free from defects in both material and workmanship for a total period of five (5) years from date of installation acceptance.

D. Balance of System components must be fully warranted to be free from defects in both material and workmanship for a total period of one (1) years from date of installation acceptance.

E. Installation must be fully warranted to be free from defects in workmanship for a total period of two (2) years from date of installation acceptance.

3.9 TRAINING

A. The field engineer shall be qualified for, and capable of, explaining the construction, operation and maintenance procedures to personnel unfamiliar with this type of equipment.

B. Instruction shall be thorough and shall cover normal operation, emergency conditions and routine maintenance procedures.

C. Instructions shall include hands-on sessions, where each member of MPS's Maintenance Staff is afforded the opportunity of physically performing required tasks in correct sequence and will be required to offer a running commentary as to the reason for each sequential step taken and how each operation is to be carried out.

D. A written report shall be presented to the Installing Contractor and MPS, before final acceptance, certifying that the entire installation conforms to all specified requirements and that MPS's operating personnel has been properly instructed as to how the installation should be operated.

3.10 INSPECTION AND REPORT FOR EXISTING EQUIPMENT TO BE REUSED

A. The Contractor shall provide cleaning and inspection and report on condition of existing water heaters to be reused as follows:

1. Inspect piping connections, tanks, pumps, valves, vent stacks, etc. and report deficiencies found.
2. Lubricate and check for proper operation of pumps.
3. Relight pilots.

B. After completion of inspection of existing units, Contractor shall submit to the Architect a written report on the condition of the units. The report shall contain the following:

1. Unit manufacturer and model number.
2. Location of unit and area of building served unit serves.
3. Describe general condition of units including heat exchanger, pumps, motor, controls, etc.
4. Identify any deficiencies and include recommendations and cost estimates for repair and replacement.

C. After review of report and recommendations, MPS will determine which if any repairs are to be made.

END OF SECTION

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SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General conditions apply to this section.

B. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

C. Included are the following topics:

1. Scope
2. Related Documents
3. Reference Standards
4. Definitions
5. Quality Assurance
6. Dimensions And Definite Locations
7. Substitutions
8. Discrepancies
9. Codes and Regulations
10. Permits and Inspections
11. Visiting the Site and Existing Conditions
12. Continuity of Existing Services
13. Protection of Work
14. Safety Measures And Accident Prevention
15. Damage
16. Work by Other Divisions
17. Hazardous Substance - Asbestos
18. Hazardous Substance - Lead Paint
19. Submittals
20. Materials and Products
21. Identification
22. Installation
23. Delivery, Storage and Handling
24. Cutting, Patching and Painting

25. Ceiling Removal And Replacement
26. Building Access for Apparatus
27. Equipment and Panel Accessibility
28. Coordination
29. Identification
30. Cleaning of Equipment, Materials and Site
31. Commissioning, Tests and Acceptance

1.2 RELATED DOCUMENTS

A. New plans and details.

B. Existing plans used for reference.

C. The plans and specifications of the following divisions:

1. Division 15400 - Plumbing

D. The following sections of Division 16000 are considered related documents:

1. Section 16010 - General Electrical Provisions
2. Section 16111 - Raceway, Conduit and Fittings
3. Section 16113 - Openings, Sleeves and Fire Stopping
4. Section 16120 - Wires, Cables and Connectors
5. Section 16122 - Branch Circuits
6. Section 16130 - Electrical Boxes
7. Section 16170 - Grounding and Bonding
8. Section 16190 - Hangers, Support Systems and Anchors
9. Section 16440 - Motor and Circuit Disconnects
10. Section 16800 - Photovoltaic Power Generation Systems
11. Section 16810 - Photovoltaic Power Generation System Inverters

1.3 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1.	NEMA	National Electrical Manufacturers Association
2.	DOC	State of Wisconsin Department of Commerce
3.	EPA	Environmental Protection Agency
4.	IEEE	Institute of Electrical and Electronics Engineers
5.	ISA	Instrument Society of America
6.	NBS	National Bureau of Standards

7. NFPA National Fire Protection Association
8. UL Underwriters Laboratories Inc.

B. These Specific Standards:

1. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
3. UL1479 Fire Tests of Through-Penetration Fire-stops
4. UL723 Surface Burning Characteristics of Building Materials

1.4 DEFINITIONS:

A. **Provide:** Furnish, install and wire complete and ready for service.

B. **Exposed:** Exposed to view in any room, corridor or stairway.

C. **Code:** National, State and Local Electrical codes including OSHA requirements.

D. **Equals:** Manufacturers or methods listed by name in the specifications, on the drawings or in an addendum are considered to be equals.

E. **Substitution:** Any manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

F. **Shop Drawings:** Hard copy documentation of any material, equipment, item, finish, device that will be installed as part of this project.

1.5 QUALITY ASSURANCE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Unless specifically stated elsewhere, all equipment, materials and articles incorporated in the Work are to be new and of the best grade of their respective kinds for the purpose.

C. All equipment requiring electrical connections must be rated by some third party testing agency, such as Underwriters Laboratories.

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

1.6 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of such equipment and devices shall be established in the field, **prior to installation,** in accordance with instructions from the Construction Project Inspector and/or as established by manufacturer's installation drawings and details.

B. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring electrical connections to verify rough-in and connection locations.

C. Should any change in drawings or specifications be required to comply with local regulations and/or field conditions, the Contractor shall refer same in writing to the Construction Project Inspector for approval before any work which deviates from the original requirements of the drawings and specifications as stated.

D. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.

1.7 SUBSTITUTIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Substitutions (see definitions) are not permitted.

1.8 DISCREPANCIES

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. In the event of a conflict between the drawings and specifications, this Contractor shall base his bid on the greater quantity, cost or quality of the item in question, unless such conflict is resolved by an addendum.

1.9 CODES AND REGULATIONS

A. Comply with the following codes and standards for all Electrical work:

1. Nation Electrical Code (NEC)
2. National Fire Code (NFC)
3. International Building Code (IBC)
4. International Energy Conservation Code (IECC), as Modified by Chapter DCOM 63
5. Wisconsin Administrative Code (Department of Commerce - DCOM)

6. City of Milwaukee Code
7. American with Disabilities Act (ADA)

1.10 PERMITS AND INSPECTIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Division 16000 Contractor shall secure and comply with and pay for all permits and licenses necessary for the prosecution of their respective Work, unless otherwise provided; and shall give all notices, pay all fees, and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work including but not limited to those required by:

1. State of Wisconsin Department of Commerce
2. City of Milwaukee Department of Building Inspection
3. Department of Public Works for work in the public right-away

C. Furnish two (2) copies of all permits and certificates as follows:

1. To the Construction Project Inspector. One to be kept on site and turned-over to MPS at the completion of the project and one to the MPS Plan Room for their records.

D. If Division 16000 Contractor performs any of the Work, knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer or the Construction Project Inspector, that Contractor then shall bear all costs associated from the violation.

1.11 VISITING THE SITE AND EXISTING CONDITIONS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.12 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Construction Project Inspector.

B. If an interruption is required, coordinate the down-time with the Construction Project Inspector to minimize disruption of the building's activities.

C. The existing building complex shall remain in service during construction. Power outages and interruptions in building systems shall be held to a minimum and shall be done at a time convenient to the Construction Project Inspector. The time of all outages shall be scheduled with the Construction Project Inspector at least ten working days in advance. All demolition work shall be scheduled at periods and times acceptable to the Construction Project Inspector.

D. To minimize disruption to the school, any interruption to the services of the school must be completed during hours when the school is unoccupied. Verify school schedule with Construction Project Inspector.

E. This Contractor must include all fees, overtime, etc., to complete the project according to the schedule indicated.

1.13 PROTECTION OF WORK

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.14 SAFETY MEASURES AND ACCIDENT PREVENTION:

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.15 DAMAGE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

1.16 WORK BY OTHER DIVISIONS

A. See Division 15400, Section 15417 Plumbing Motors, and Electrical Work

1.17 HAZARDOUS SUBSTANCE - ASBESTOS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The presence, location and quantity, of known asbestos materials are contained in the MPS Management Plan, located in the Building Engineer's Office. It shall be the responsibility of all Contractors involved in this project to review this document prior to submitting their respective bid.

1.18 HAZARDOUS SUBSTANCE - LEAD PAINT

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The existing building finishes may contain lead based paint, which, if improperly handled, could be a potential health hazard.

1.19 SUBMITTALS

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. See Section 01300, "Submittals".

C. See Section 01700, "Project Closeout".

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. See "Quality Assurance" in Part 1 this Section 16010.

2.2 IDENTIFICATION

A. Refer to individual specification sections for specific identification requirements.

B. Switchboards, Panelboards, Substations, Transformers, Disconnects, Starters, Breakers, etc.:

1. Plates shall be equal to Setonply Style 2060 by Seton or similar style by MSI or W.H Brady.
2. Engraved ½" (min) white letters on a black or red background, 1/16" thick plastic laminate, beveled edges with screw or rivet mounting. Text may be smaller in order for label to fit on device or equipment but must be readable from a distance of no less than 5 feet.
3. All plates must be similar per project. Locate nameplates at or near "eye-level". Nameplates must match equipment schedule on drawings. If self-adhesive plates are used, provide additional rivets to assure panels will not fall off equipment.
4. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all equipment and materials in accordance with manufacturer's written instructions.

B. Field verify all existing conditions. Do not proceed with work if existing conditions are different than what is shown on the drawings. Notify the Construction Project Inspector of all discrepancies between actual field conditions and what is shown on the drawings.

C. Avoid installing new equipment, conduit, wiring, boxes, panelboards, etc. which interferes with service clearances of existing or new electrical equipment and panels. Comply with all service clearance requirements of the National Electric Code.

D. The installation of all work shall be made so that its several component parts will function as a workable system complete with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The work shall be executed in conformity with the best accepted standard practice of the trade so as to contribute to efficiency and appearance. It shall also be executed so that the installation will conform and adjust itself to the building structure, its equipment and its usage.

E. Electrical equipment, conduit, boxes, panelboards, etc. in conflict with construction shall be removed and relocated as indicated on drawings, as directed, or required.

F. Do not reuse any removed electrical equipment, boxes, circuits, etc. except as specifically directed on the drawings.

3.2 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. The Contractor shall confine his equipment, apparatus, the storage of materials and operations of his workmen to limits indicated by law, ordinances, permits, or directions of the Construction Project Inspector and shall not encumber the premises with his materials. In general, all material and equipment shall be stored in such manner as to avoid damage to living trees, shrubs, lawns and other ornamental growths. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its integrity.

C. Contractor shall confine his equipment; storage of materials and operations of his workmen to limits indicated by directions of the Construction Project Inspector and shall not bring materials onto the site until reasonably required for progress of the Work.

D. Owner assume no responsibility for materials, tools, equipment, and rentals stored in buildings or on site. Contractor assumes full responsibility for damage due to storing of any type of materials and equipment.

E. Promptly inspect shipments to insure that the material and equipment are undamaged and comply with specifications.

F. Cover all materials to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

G. All equipment must be storage in a facility, which provides shelter from the weather.

H. Protect all materials, pipe, tube, fittings, equipment, components, etc. so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect materials, fittings, flanges, unions, components shipped loose, etc. by storage inside or by durable, waterproof, aboveground packaging.

I. Store and handle equipment in accordance with manufacturer’s instructions.

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

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

3.3 CUTTING, PATCHING AND PAINTING

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Provisions for openings, holes, and clearances through walls, floors, ceilings, and partitions shall be made in advance of construction.

C. Provide cutting and patching as necessary for the installation of electrical systems, subject to the approval of the Construction Project Inspector.

D. The Electrical Contractor shall secure the approval of the Construction Project Inspector for all anticipated floor sleeves for the installation of electrical conduits, prior to starting any such work. Embedded conduits shall be located by the Electrical Contractor during core drilling in existing floors. Ground detector systems will be acceptable.

E. Patching of holes, openings, etc. resulting from the work of this branch shall be the responsibility of this Contractor.

F. All painting of patched surfaces shall be as described in section 09900.

G. Provide all cutting and patching as necessary to permit installation of conduit or equipment or any other part of the work under this Section.

H. Patching includes repairing the openings remaining from the removal or relocation of existing system components and painting the surface to match existing surfaces unless indicated to be done by other trades.

I. Painting means covering the entire patched surface equal to the surrounding surfaces unless indicated to be done by other trades.

J. Paint all exposed piping, fittings, supports, fasteners, etc. install on or near floor, located outside or installed in a moisture-laden environment with (2) coats of rustproof paint.

3.4 CEILING REMOVAL AND REPLACEMENT

A. Provide all removal and replacement of existing ceilings, lighting, etc., required for the installation of the work in remodeled areas.

B. In areas with accessible ceilings, ceiling tile shall be removed and stored to prevent damage of soiling and reinstalled after completion of the work. Soiled or damaged tiles shall be replaced subject to the approval of the Construction Project Inspector.

C. In areas with drywall or plaster ceilings, the ceiling shall be removed as required for the work and repaired and refinished equal to surrounding areas, subject to the approval of the Construction Project Inspector.

3.5 BUILDING ACCESS FOR APPARATUS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. Building access must be provided by this Contractor. Restore any opening to its original condition after the apparatus has been brought into the building.

3.6 EQUIPMENT AND PANEL ACCESSIBILITY

A. Install all raceways, conduit, accessories, etc. to permit access to equipment and panels for maintenance and service.

B. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties.

C. Where access is required in drywall or plaster walls or ceilings, furnish the access doors to the General Contractor.

3.7 COORDINATION

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.

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

D. Coordinate with Division 15400 for any required Factory Start-Up and Training that may be required by those Divisions.

3.8 IDENTIFICATION

A. Refer to individual specification sections for specific identification requirements.

B. Provide the appropriate identification as indicated in this section for all new and existing to be reused, remodeled or modified equipment, conduit, panels, disconnects, ceiling tiles, access panels, etc.

C. Where mixed voltages are used in one building (e.g. 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction box, equipment, etc., on each system must be labeled for voltage in addition to the other requirements listed herein.

D. Switchboards, Panelboards, Substations, Transformers, etc.:

1. Provide the respective board with an identification plate mounted at the top of the main disconnect section. This nameplate shall include all of the following:
2. Board designation as shown on the plans.
3. Board voltage.
4. Number of phases.
5. Current rating.
6. AIC rating.
7. All overcurrent devices in the respective board shall be identified with engraved plastic nameplates as to the load served. Nameplate shall be located adjacent to the device. Load served shall be the next equipment downstream (panelboard, transformer, transfer switch, etc.). Where the load served is a motor the HVAC motor designation or other description (ex. elevator #1) shall be used in lieu of the motor number on the electrical drawings. Spare devices shall be identified as such.

E. All branch circuit and power panels must be identified with the same symbol used in circuit directory in main distribution center.

F. Switchboards, panelboards, motor starters, disconnect switches, timeclocks, contactors, wire ways, fire alarm panels and transformers: 0.25 inch high lettering to identify equipment designation: and 0.125 inch high lettering to identify voltage rating and source.

G. See schedules on drawings for appropriate labeling of equipment and associated controls, starters, etc.

H. Clean and degrease surfaces to receive nameplates.

I. Install nameplates parallel to equipment lines.

J. Provide nameplate for each panelboard, contactor, time switch, starter, transformer, fire alarm panel or disconnect switch.

K. Locate on inside cover of panels in locations accessible to students.

L. Label each feeder at all accessible locations.

M. Label each end of empty conduit runs to indicate the use of the conduit and the location of opposite end. Use room numbers that are permanently assigned.

N. Provide nameplates of minimum letter height as listed.

O. Junction boxes: shall be labeled with ½ inch high and identify system source and load served.

P. Junction boxes for electrical communications, signal and control systems: Identify system source and equipment serviced,

3.9 DISPOSAL AND CLEANING EQUIPMENT, MATERIALS AND SITE

A. Refer to Division 0 and Division 1 (Bidding Requirements, General Requirements and General Conditions).

B. Install temporary covers, caps, etc. over equipment, panelboards, devices, etc. to minimize dust contamination during construction.

C. The Contractor shall tour demolition areas with the Construction Project Inspector to determine the status of all equipment to be removed during demolition. All equipment that is to be salvaged for reuse by the MPS shall be removed by the Contractor and transported to Construction Project Inspector designated storage area on the site. MPS shall be responsible for removal of salvaged equipment from the storage area.

D. The Contractor shall at all times keep the premises free from accumulations of waste material, rubbish, debris, etc. caused by his operations. The Contractor shall remove all dirt, rubbish or debris resulting from his Work, from time to time as the building operations progress and as often as may be directed by the Construction Project Inspector. On the failure, retardation, or refusal of the Contractor to remove said rubbish, dirt and debris promptly, or if majority of the final cleaning up consists of rubbish from several or all Contractors, the Construction Project Inspector shall cause same to be removed and the prorated cost thereof shall be charged against the several Contractors responsible and retained out of the contract price. At the completion of the Project, the Contractor shall remove all tools, equipment, and surplus materials and leave the Project "broom clean" or its equivalent.

E. General Cleaning: Contractor shall remove his rubbish and debris from site promptly upon its accumulation and when requested by the Construction Project Inspector. **Do not use MPS disposal containers**.

F. Final Cleaning: At final completion of Work and immediately prior to final inspection, Contractor shall remove all tools, debris, equipment, protection, unused materials, and shall remove from Work and equipment provided under the Contract Agreement all foreign matter, spots and soils, so as to put all such Work and equipment, including finishes, in a complete and finished condition to the satisfaction of the Construction Project Inspector.

G. Verify if obsolete ballasts and transformer equipment to be removed contains PCB's. If PCB's exist in ballasts or equipment, remove ballasts and equipment and turn over to MPS for proper disposal.

H. Lamps are to be disposed of in accordance with EPA and DNR requirements.

3.10 COMMISSIONING, TESTS AND ACCEPTANCE

A. See individual specifications sections for specific testing and acceptance.

B. The operation of the equipment and electrical systems does not constitute an acceptance of the work by the Construction Project Inspector. The final acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

C. Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction. He shall demonstrate that all work is complete and in perfect operating condition, with race way and conduit system properly grounded, all wiring free from grounds, shorts, and that the entire installation is free from any physical defects.

D. In the presence of the Construction Project Inspector, the Contractor shall demonstrate the proper operation of all miscellaneous systems.

E. Perform other test as specifically directed in other sections of the specification for specific equipment.

F. The Contractor performing the solar work shall be on the Focus on Energy full service installers list within one month of the actual installation.

G. The Focus on Energy rebate will be completed and submitted by this Contractor. This Contractor is also required to provide a breakdown of cost for the labor and material of the PV System. Assist Owner with the Focus on Energy Notice of Installation (NOI) paperwork.

This Contractor shall inspect, test and repair or replace any defective part or component of the systems and equipment installed or affected by the performed work.

END OF SECTION

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SECTION 16111

RACEWAY, CONDUIT AND FITTINGS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, extend, remove or remodel all required conduit, raceways and associated fittings, accessories, etc. of type, quality, sizes, lengths, etc. for power and communications systems as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Reference Standards
3. Quality Assurance
4. Submittals
5. Design Criteria
6. Delivery, Storage, And Handling
7. Galvanized Rigid And Intermediate Metal
8. Flexible Electrical Metallic Tubing
9. Liquidtight Flexible
10. Conduit Body Fittings
11. Conduit And Raceways
12. Fittings
13. Procedures And Practices
14. Restrictions
15. Commissioning

1.2 RELATED WORK

A. Section 16010 - General Electrical Requirements

B. Section 16113 - Openings, Sleeves and Fire Stopping

C. Section 16120 - Wires, Cables, and Connectors

D. Section 16130 - Electrical Boxes

E. Section 16170 - Grounding and Bonding

F. Section 16190 - Hangers, Support Systems and Anchors

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), NECA - Standard of Installation.

C. For HDPE Pipe and Fittings: ASTM Standards: F-2160, D-3485, D-2447, D-3350, UL 651 B and NEMA TC7

1.4 QUALITY ASSURANCE

A. All installed materials, devices, equipment, etc. must meet the requirements of the referenced standards.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Contractor shall submit schedule indicating conduit and fitting types to be used for this project with manufacturer's data sheets.

1.6 DESIGN CRITERIA

A. All conduit, raceway and associated fittings and accessories shall be provided and installed in accordance with referenced standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 - General Electrical Requirements.

B. Cover raceways, conduits and fittings to prevent rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect conduit and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place.

PART 2 PRODUCTS

2.1 GALVANIZED RIGID STEEL CONDUIT

A. Conduit

1. Manufactured lengths, full weight, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.
2. Minimum conduit size shall be ½ inch.

B. Fittings

1. Galvanized or Cadmium Plated Steel
2. Threaded
3. Liquid tight
4. Insulated bushing, with double locknut

2.2 ELECTRICAL METALLIC TUBING (EMT)

A. Conduit

1. Standard lengths and size.
2. Minimum conduit size shall be ½ inch.

B. Fittings:

1. Galvanized or Cadmium Plated Steel
2. Threaded
3. Insulated throat
4. Gland compression type
5. Rain and concrete tight
6. Set screw type steel fittings are permissible only in completely inaccessible locations (example; inside a wall) or for conduits sizes ≥ 2”, when installed ≥ 10’ -0” A.F.F.
7. All fittings shall be water-tight located in Boiler Rooms and Pool equipment rooms.

2.3 FLEXIBLE

A. Conduit

1. Galvanized flexible steel.
2. Standard conduit sizes.
3. Minimum size ½" with the exception that 3/8" diameter may be used in lengths not to exceed 6 foot, to serve individual lighting fixtures installed in a suspended accessible ceiling system.

B. Fittings

1. Galvanized or Cadmium Plated Steel
2. Threaded
3. Grounding type
4. Insulated throat
5. Externally Secured

2.4 LIQUIDTIGHT FLEXIBLE

A. Conduit

1. Galvanized flexible steel with an outer liquidtight, nonmetallic sunlight resistant jacket
2. Standard conduit sizes
3. Minimum size ½"

B. Fittings

1. Galvanized or Cadmium Plated Steel
2. Threaded
3. Grounding type
4. Insulated throat
5. Liquid tight
6. Externally Secured

2.5 EXPANSION AND DEFLECTION FITTINGS

B. Expansion Fitting: Crouse-Hinds Type XJ or equal with bonding jumpers and clamps.

C. Expansion/deflection fittings: Copper bonding jumper, Crouse-Hinds Type XD or equal with tinned copper flexible braid grounding straps.

2.6 CONDUIT BODY FITTINGS

C. Galvanized or Cadmium Plated Steel

D. Threaded hubs

E. Removable cover, with gasket

F. Corrosion-resistant screws

G. All long conduit bodies (LB) shall be mogul style

PART 3 - EXECUTION

3.1 CONDUIT AND RACEWAYS

A. Install raceways, conduit and tubing products in accordance with NEC and in accordance with recognized industry practices.

B. All conduits containing service entrance conductors shall be rigid metal conduits.

C. Interior conduits may be electrical metallic tubing (EMT) except as otherwise directed on the plans.

D. Do not use electrical metallic tubing (EMT) for exterior conduits.

E. The conduit installation shall be complete prior to installing conductors and cables.

F. Conduits installed under this project shall be continuous from outlet to outlet and from outlets to cabinets, junction, or pull boxes, and shall enter and be secured to boxes in such a manner that each system shall be electrically continuous from point of service to outlets.

G. Use flexible metal or liquidtight flexible conduit for **final** connections to junction boxes of equipment, panels and fixtures. Do not use flexible conduit for connecting conduits to each other or from box to box except at expansion joints or express written permission of MPS Representative.

H. Cut joints shall be square, reamed smooth, and drawn up tight.

I. Keep conduit plugged, clean, and dry during construction.

J. Install a #12 pull wire in empty conduits.

K. Cap spare conduits.

L. Provide conduit system separate from normal building wiring for each of the following:

1. Photovoltaic system

3.2 FITTINGS

A. Install electrical fittings in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that fittings serve intended purposes.

B. Rigidly secure connectors at cabinets and boxes with galvanized lock nut and bushing.

C. Seal conduits at both ends that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.

D. Install conduit expansion fittings complete with bonding jumper in following locations:

1. Conduit runs which cross a structural expansion joint.
2. Conduit runs where movement perpendicular to axis of conduit may be encountered.

E. Locate conduit bodies so as to assure accessibility of electrical wiring.

3.3 PROCEDURES AND PRACTICES

A. Unless indicated on drawings all conduit routing must be approved by MPS prior to installation.

B. Where conduits must cross or follow the same path as water, steam or other fluid piping, run electrical conduits above such piping wherever possible.

C. Make final connections to rotating or vibrating machinery with a length of liquid tight flexible conduit in moisture latent areas or flexible metal conduit in dry areas.

D. Where exposed raceways and electrical devices are required in existing construction, exposed "wiremold" raceway, fittings and boxes can be used provided that the installation meets the following:

1. Raceways shall be routed horizontally along the corner surfaces formed by walls and ceilings, directly above edges of bases at the floor, along the tops of window mullions and door frames.
2. Raceways shall be routed vertically along corners formed by adjacent walls and along the edges of door frames.
3. Surface raceways shall not be routed down or across open wall surfaces except in portions of runs not exceeding 12" in length.
4. Surface raceways shall be painted to match wall finishes on which the raceways are routed. Ivory colored “V” series raceways need not be painted. If wood backing is required, it shall be painted to match surrounding surfaces. If raceways are installed prior to painting, raceways will then be painted as part of the painting contract.
5. Fittings and boxes used with surface metal raceways shall be specifically designed and approved for use with such raceways. Generally all fittings and boxes shall be as manufactured by Wiremold for use with Wiremold surface raceway.

E. Except where specifically noted on the plans or in these specifications, all new feeder conduits shall not be run exposed in finished spaces.

F. All exposed conduits in finished spaces, especially classrooms, shall be tight to building surfaces as much as possible, and shall be rigidly supported so as not to form "grab bars" for the students and shall conform to the requirements of Paragraph 3.3.C, items 1 thru 4.

G. Conduits may be routed exposed in mechanical equipment rooms and utility rooms.

H. Route all conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members except conduit runs routed concealed in poured-in-place concrete floor slabs may be run in a direct line from source to load.

I. Make bends and offsets without kinking or destroying smooth bore of conduit.

J. Negotiate beams and changes in ceiling heights with long body conduit fittings on outside corners and ells on inside corners. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.

K. Horizontal conduit runs in finished areas with lay-in or otherwise accessible ceilings shall be concealed. Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal.

L. See Section 16190 - Hangers, Support Systems and Anchors

1. Support shall be independent of the installation of other trades.
2. Do not hang conduits from ceiling tile grid or tie wires.

M. The Contractor shall be responsible for necessary chases in masonry walls, required to assure conduit will be concealed beneath finished surfaces.

N. Conduit runs that extend through areas of different temperature or atmospheric conditions or that are partly indoors and partly outdoors shall be sealed, drained, and installed in a manner that will prevent drainage of condensed or entrapped moisture into cabinets, motors, or equipment enclosures.

O. Confine all conduit runs to insulated portions of building, unless otherwise shown.

P. Install conduit expansion fittings for conduits crossing expansion joints.

Q. Where a new switch or other devices is to be installed at the same location as an existing device that was removed as part of demolition, the contractor may reuse the existing back-box and conduit where practical and possible.

R. Provide sleeves and other raceways as required for low voltage wiring included in this project. Install blank cover plates, device hangers and adapters, grommets, bushings, chase nipples and the like to form a complete workmanlike installation.

S. Take special care with raceways intended for optical fiber cables.

T. All sleeves not terminating in a box must extend 2” on both sides of the wall/floor.

U. See Section 16113 for Openings, Sleeves and Firestopping.

V. Penetrations through all walls and floors should be securely strapped to the surface that they penetrate.

3.4 RESTRICTIONS

A. Split, crushed, or scarred conduit is not acceptable.

B. Welded conduit is not acceptable.

C. No conduits shall be installed in front or back of any gauge, shut-off valve, piping specialty, etc., as to obstruct removal, inspection or repair.

D. Conduits routed parallel to steam lines, hot water pipes, flues, high temperature piping or ducts shall be routed at least 12" from such and shall be a minimum 12" clear when crossing same.

E. Do not install conduit in concrete slabs or roofs unless indicated on drawings or with written permission of the Construction Project Inspector.

F. Do not route conduit over or under boilers, gas-fired or other high temperature equipment.

G. No PVC conduit may be used anywhere in the interior of the building, except for Greenhouses, Pool Equipment Rooms or in specific locations with written permission from Construction Project Inspector.

3.5 COMMISSIONING

A. Tighten any loose conduit and fittings.

B. Verify hangers, support systems and anchors are adequate for cable or conductor pulling.

C. Pull cleaning plug through conduits to clear of dirt, oil, and moisture prior to cable or conductor pulling.

END OF SECTION

SECTION 16113

OPENINGS, SLEEVES AND FIRE STOPPING

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install or repair all required openings, sleeves and fire stopping of building surfaces for all conduit, communication cables, etc. as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Description
6. Submittals
7. Design Criteria
8. Mineral Wool Insulation
9. Fireproofing Insulation
10. Urethane Caulk
11. Communications Cable And Low Voltage Wiring Fire Stopping Assembly And Systems
12. Communications Cable And Low Voltage Wiring Carrier Conduit
13. Conduit Sleeves
14. Conduit Setting Grout
15. Conduit Link Seals
16. Conduit Penetrations Fire Stopping Assembly And Systems
17. Conduit Penetrations Through Roof
18. Escutcheons
19. Installation
20. Coordination
21. Conduit Penetrations Through Exterior Surfaces
22. Communications Cable And Low Voltage Wiring Penetrations Through Non-Rated Penetrations
23. Conduit Penetrations Through Interior Surfaces

24. Communications Cable And Low Voltage Wiring Penetrations Through Rated Penetrations

1.2 RELATED WORK

A. Section 07840 - Fire Stopping

B. Section 16010 - General Electrical Provisions

C. Section 16111 - Raceway, Conduit and Fittings

D. Section 16120 - Wires, Cables and Connectors

1.3 REFERENCE STANDARDS

A. ASTM E814 - Fire Tests of Through-Penetration Fire Stops

B. ASTM E119-73 – Fire and Hose Stream Test Requirements

C. UL 263 - Fire Test for Building Construction and Materials

D. NEC – National Electrical Code (Specifically Article 300-21)

1.4 QUALITY ASSURANCE

A. All fire stopping of conduit penetrations must be UL Listed.

B. All fire-stopping systems shall be provided by the same manufacturer.

1.5 DESCRIPTION

A. Provide all service, devices and materials as required for the any and all penetrations of building surfaces.

B. Sealing and fire-stopping of sleeves/openings between conduit, boxes, communications cable, etc. and the sleeves, in structural or partition openings, shall be the responsibility of this Contractor.

C. This Contractor responsible shall hire and pay for individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and firestopping occupation.

1.6 SUBMITTALS

A. Refer to Division 1, Submittals.

B. Refer to requirements of Section 16010, Submittals.

C. Submittals are required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

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

1.7 DESIGN CRITERIA

A. Division 16000 Contractor shall provide all openings, sleeves and patching required to permit installation of piping or any other part of the work under this section.

B. All required patching of floors, walls and ceiling including concrete floors shall be provided by this Section, unless otherwise noted.

PART 2 PRODUCTS

2.1 MINERAL WOOL INSULATION

A. Mineral wool insulation shall be rigid preformed mineral fiber, minimum nominal density of 8 LBS/FT^3, thermal conductivity of not more than 0.29 at 200°F minimum compressive strength of 3 PSI, maximum wicking of 1%, maximum water adsorption of 1% by volume, rated for service of -120°F to 1200°F.

2.2 FIREPROOFING INSULATION

A. Fire proofing insulation shall be mineral fiber with nominal density of 8 LBS/FT^3, flame spread index of 25, fuel contribution index of 0, and smoke developed index of 0.0, thermal conductivity of not more than 0.23 at 75°F, rated for service of -120°F to 1200°F. Use rigid insulation straight surfaces or semi-rigid board for round surfaces.

B. Equal to U.S. Gypsum Thermafiber insulation.

C. Foil-scrim-polyethylene vapor barrier jacket, factory applied to insulation, maximum permeance of 0.02 perms.

2.3 URETHANE CAULK

A. Equal to that as manufactured by 3M with color to match associated wall color.

2.4 COMMUNICATIONS CABLE AND LOW VOLTAGE WIRING FIRE STOPPING ASSEMBLY AND SYSTEMS

A. Fire Stopping shall be equal to 3M Fire Barrier Moldable Putty+ #MP Stix.

B. Use a product that has a rating not less than the rating of the wall or floor being penetrated.

C. Provide mineral wool backing where specified in manufacturer's application detail.

D. When damming materials are to be left in place after the seal is complete, and then all such materials shall be non-flammable.

E. When sealant is injected into a penetration, the caulk shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The caulk shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the caulk to block the conduits.

F. All communication conduits and sleeves, penetrating fire rated partitions shall be have fire stop material both inside and around the conduit. The sealant inside the conduit shall remain soft and pliable to allow for the removal and/or addition of cables without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of anything going through the penetration without the seal cracking or crumbling.

2.5 COMMUNICATIONS CABLE AND LOW VOLTAGE WIRING CARRIER CONDUIT

A. Electric metallic tubing (EMT) carrier conduit with fittings on both ends of conduit to provide a smooth non-abrasive cable pathway.

B. Conduit shall be a minimum of ¾" in size and as long as the wall is wide with room for fittings on both ends.

2.6 CONDUIT SLEEVES

A. **Above Ground and Below Ground Existing Masonry Construction:** ASTM A53, Type F, standard weight, Schedule 40, black steel conduit sized to accept carrier conduit and link-seal.

B. Above Ground Existing Non-Masonry Construction:

1. PVC plastic conduit, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent conduit and fittings sized for carrier conduit and insulation.
2. 20 Gauge ASTM A525 or ASTM A527 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90 sized for carrier conduit or insulated conduit.

C. Sleeves through floors shall be ¾" longer than the floor depth.

D. Sleeves through walls shall be of a length as necessary to fully span the wall width.

2.7 CONDUIT SETTING GROUT

A. Hydraulic setting, non-shrink grout shall be as that manufactured by Quickcrete or Rapidset.

2.8 CONDUIT LINK SEALS

A. Conduit link type seals shall be equal to that as manufactured by Thunderline.

B. Link seal shall be specifically designed for the service type and material of carrier conduit.

C. Link type seals shall be modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type sleeve.

2.9 CONDUIT PENETRATIONS FIRE STOPPING ASSEMBLY AND SYSTEMS

A. Use appropriate conduit sleeve.

B. Fire stopping shall be as manufactured by 3M, STI/SpecSeal, Tremco, Proset or Hilti.

C. Contractor shall be responsible for selecting the appropriate UL tested fire stop system for each application required on the project and must submit this to the Engineer for review.

D. Use a product that has a rating not less than the rating of the wall or floor being penetrated.

E. Contractor shall use fire-stop putty, caulk sealant, intumescent wrapstrips, intumescent fire-stop collars, fire-stop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

F. When conduit is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

2.10 CONDUIT PENETRATIONS THROUGH ROOF

A. Conduit penetrations through roof shall be made with piping portals and shall be as manufactured by Custom Curb, Curbs Plus, Roof Products and Systems, Pate, ThyCurb or Vent Products. Pitch Pockets will not be allowed.

B. Curb assembly shall be constructed of 18 gauge (minimum) galvanized steel reinforced so it is structurally capable of supporting the intended load, inside and outside corner sections that are mitered and continuously welded.

C. Curb shall be filled with 3 pound density insulation and complete with integral deck mounting flange, nominal 2” wood nailer, laminated acrylic clad thermoplastic cover with graduated step boots to accommodate various size conduits, fastening screws for cover, and stainless steel clamps for securing boots around the conduit.

D. Do not use built-in metal base flashings or cants.

E. Height of curb to a minimum of 12” above finished roof

2.11 ESCUTCHEONS

A. Escutcheons plates shall be as manufactured by Grinnell or equal and shall be constructed of steel with chromium plate finish.

B. Size escutcheons plates to accommodate insulation, where applicable.

C. Floor escutcheons plates shall be steel with concealed hinge and held in place by spring action.

D. Ceiling escutcheons plates shall be steel with concealed hinge and held in place by spring action and set screw.

PART 3 EXECUTION

3.1 INSTALLATION

A. Penetrations through structural support members such as load bearing walls, beams, planks, etc. are not allowed without written consent of the Engineer.

B. All round openings and holes that are cut through existing reinforced concrete shall be carefully cored so as to avoid spawling and unnecessary damage or weakening of any structural member; chopping or breaking out shall not be permitted.

C. All non round openings that are through existing reinforced concrete shall be carefully cored at the corners so as to avoid over cutting and unnecessary damage or weakening of any structural member; chopping or breaking out shall not be permitted.

3.2 COORDINATION

A. Coordinate the location of all building surface penetrations with the appropriate Contractors.

B. All openings in construction unless the openings are detailed on the Architectural or Structural drawings shall be by this Section, unless specifically noted otherwise.

C. Make all arrangements with other Contractors for any special framing, spacing or chases.

D. All the penetrations in the structure made required by Division 15400 and provided by the General Contractor shall be in locations as directed by this Section.

3.3 COMMUNICATIONS CABLE AND LOW VOLTAGE WIRING PENETRATIONS THROUGH RATED PENETRATIONS

A. Core drill opening as required for fire rated system or where possible turnover carrier conduit to General Contractor of installation in new construction.

B. Assembly carrier conduit with fittings on both ends of conduit to provide a smooth non-abrasive cable pathway.

C. Install approved products in accordance with the manufacturer's instructions.

D. Where fire-stop mortar is used to in-fill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Fire-stop mortar alone is not adequate to support any substantial weight.

E. Assembly carrier conduit with fittings on both ends of conduit to provide a smooth non-abrasive cable pathway.

F. When sealant is injected into a penetration, the caulk shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The caulk shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the caulk to block the conduits.

G. All communication conduits and sleeves, penetrating fire rated partitions shall be have fire stop material both inside and around the conduit. The sealant inside the conduit shall remain soft and pliable to allow for the removal and/or addition of cables without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of anything going through the penetration without the seal cracking or crumbling.

H. Install escutcheons plates around conduits where conduits are exposed or where indicated.

3.4 COMMUNICATIONS CABLE AND LOW VOLTAGE WIRING PENETRATIONS THROUGH NON-RATED PENETRATIONS

A. Core drill opening as required for carrier conduit and assemble carrier conduit with fittings on both ends of conduit to provide a smooth non-abrasive cable pathway.

B. Pack any annular spaces between conduit and partition opening with mineral wool and seal penetration with urethane caulk.

C. Install escutcheons plates around conduits where conduits are exposed or where indicated.

3.5 CONDUIT PENETRATIONS THROUGH INTERIOR SURFACES

A. **Rated conduit penetrations:** Core drill opening through wall or floor. Install appropriate sleeve. Install and appropriate fire-stopping assembly. Seal penetration in accordance with fire-stopping manufacturer's recommendations.

B. **Floor conduit penetrations:** See rate conduit penetrations above. Top of sleeve shall extend ¾" above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert sleeve and grout area around sleeve with grout. If the conduit penetrating the sleeve is supported by a conduit clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

C. **Non-rated conduit penetrations:** Core drill opening through partition. Install the appropriate conduit sleeve. Pack mineral wool in annular space between sleeve and conduit and/or insulated conduit and sleeve and wall penetration. Seal wall penetration with urethane caulk.

D. Where conduit penetration is exposed, cut sleeve flush with wall. In masonry construction grout area around sleeve to provide a smooth clean finish.

E. Install escutcheons plates around conduits where conduits are exposed or where indicated.

3.6 CONDUIT PENETRATIONS THROUGH EXTERIOR SURFACES

A. Roof penetrations:

1. Drill or saw cut penetration one size larger than the carrier conduit. Fill annual space between conduit and penetration with mineral wool insulation. Where penetration is exposed, install an escutcheon plate and fasten plate to roof construction.
2. Install at piping portal where conduits penetrate roof. Install as shown on the drawings, as detailed and according to the manufacturer's installation instructions.
3. Coordinate with Division 15400 if conduits serve equipment of this division so a single piping portal with multiple openings is used for piping, control conduit wiring and power conduit wiring.
4. Flashing and counterflashing by the General Contractor unless otherwise noted on drawings.

B. Above grade penetrations in masonry construction:

1. Conduits < 1½" in size: Carefully core drill penetration in existing construction one size larger than anticipated conduit. Directly set conduit in hydraulic setting grout. Seal both ends and annual space with hydraulic setting, non-shrink grout to provide a watertight assembly.

2. Conduit sizes ≥ 2" in size: Carefully core drill penetration in existing construction one size larger than anticipated. Set appropriate conduit sleeve in hydraulic grout and assemble and seal with link type seal to provide a watertight assembly in accordance with manufacturer's instructions.

C. **Above grade penetrations in non-masonry construction:** Core drill opening one conduit size larger than conduit. Mount appropriate conduit sleeve in existing construction. Fill annual spaces between sleeve and wall with closed cell waterproof insulation and caulk water tight. Install piping flanges on both sides of the sleeve and fasten flanges to wall. Seal around flanges to caulk to provide a watertight seal.

END OF SECTION

SECTION 16120

WIRES, CABLES AND CONNECTORS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, extend, remodel or remove all required wires conductors, cables and connectors of types, lengths, sizes, colors, etc. as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Delivery, Storage and Handling
8. Wire Conductors
9. Joints, Tapes and Splices
10. Installation
11. Identification
12. Wire Colors

1.2 RELATED WORK

A. Section 16010 - General Electrical Requirements

B. Section 16111 - Raceway, Conduits and Fittings

C. Section 16122 - Branch Circuits

D. Section 16170 - Grounding and Bonding

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), NECA - Standard of Installation.

C. Insulated Cable Engineers Association (ICEA)

D. Electrical Testing Laboratory (ETL)

1.4 QUALITY ASSURANCE

A. All installed materials, devices, equipment, etc. must meet the requirements of the referenced standards.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Contractor shall submit manufacturer's data sheets indicating wiring, cables and connectors to be used for this project.

1.6 DESIGN CRITERIA

A. Use only new material, free of defects, corrosion and scale, and meeting the latest revision of NEC, NECA and ICEA requirements and as listed in this specification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 - General Electrical Requirements.

B. Store wire conducts, cables and connectors to prevent rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

C. All wires shall be delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

PART 2 PRODUCTS

2.1 WIRE CONDUCTORS

A. All conductors shall be copper and have an insulation rating of 600 volts.

B. In mechanical rooms, light fixtures and other high temperature applications, the insulation shall be rated 90°C or greater. Others areas shall use insulation rated min. 75°C unless stated otherwise in other parts of these specifications and drawings.

C. Conductors installed in wet locations and areas with high humidity shall be type THW, THHN or THWN.

D. All conductors must be suitable for the application intended. Conductors #10 and larger must be stranded. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:

1. All conductors terminated with crimp type devices must be stranded.
2. Stranded conductors may only be terminated with UL or ETL listed type termination or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device if a terminal screw is used or must be terminated in an approved back wired method.

2.2 JOINTS, TAPS AND SPLICES

A. Conductors No. 10 AWG and Smaller: "Ideal" spring type solderless wire-connectors (or equal) with plastic cover. **IDC (Insulation Displacement Connector) type connectors are not an approved equal.**

B. Joints, Taps, and Splices for Conductors No. 6 AWG and larger shall be made utilizing one of the following methods:

1. Solderless compression type connectors, tool and die applied, of a type that will not loosen under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.
2. Each tap, joint, or splice shall be taped with two half-lap layers of varnished cambric tape plus two half-lap layers of Scotch 33 tape and where required by code, or specified herein a finish wrap of color coding tape.
3. "Multi-Cable Connector Blocks" Manufactured by NSI.

C. Split bolt connectors are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, extend, and remodel all required wire conductors, cables and connectors as indicated on the drawings.

B. Run wire and cable in conduit, unless otherwise indicated on drawings.

C. Provide separate conduit system for each of the following:

1. Photovoltaic system

D. Pull all conductors into a raceway at the same time. Use Listed "Wire Pulling Lubricant" for pulling 4 AWG and larger wires and for other conditions when necessary.

E. Cable splices No. 6 AWG and larger shall be made only in distribution and junction boxes.

3.2 IDENTIFICATION

A. See Section 16010 - General Electrical Requirements, “Identification”.

B. Branch Circuit Conductors:

1. Provide machine printed adhesive label tags.
2. Label tags shall identify the panelboard name and circuit number as installed.
3. Install label tags on wire(s) in all panels, and at each receptacle, device or point of utilization.
4. Install label identification within 1” of wire termination point.

3.3 WIRE COLOR

A. Colors:

1. Use “Phase A black” and “Phase B red” for single phase circuits at 120/240 volts, use “Phase A black”, “Phase B red” and “Phase C blue” for circuits at 120/208 volts single phase or three phase.
2. Use “Phase A brown”, “Phase B orange” and “Phase C yellow” for circuits at 277/480 volts single or three phase.
3. Note: This includes fixture whips except for Listed whips mounted by the fixtures manufacturer on the fixture and Listed as a System.

B. Branch Circuit Conductors:

1. Color coding of the conductor insulation shall be continuous for all wiring.
2. Each phase shall be uniquely color coded as described above.

C. Feeder Circuit Conductors: Each phase shall be uniquely color coded as described above.

D. Ground Conductors: Green or green with yellow stripes or bare.

END OF SECTION

SECTION 16122

BRANCH CIRCUITS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, extend and remodel all branch wiring circuits of sizes, lengths, etc. to serve all lighting, receptacles, motors, equipment, etc. as indicated on the drawings and as specified herein.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Design Criteria
8. Inspection
9. Installation
10. Identification

1.2 RELATED WORK

A. Section 16010 - General Electrical Requirements

B. Section 16111 - Raceway, Conduits and Fittings

C. Section 16120 - Wires, Cables and Connectors

D. Section 16170 - Grounding and Bonding

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), Standard of Installation.

1.4 QUALITY ASSURANCE

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of reference standards listed in this specification.

1.5 DESIGN CRITERIA

A. Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.

B. Size 120V branch circuits for length of run on following basis:

1. 0 to 100 ft run from panelboard to first outlet: No. 12 AWG minimum.
2. 101 to 150 ft run: increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.
3. 151 to 200 ft run: increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.
4. 201 and above: wiring to be sized for 3% maximum voltage drop.

C. Provide an equipment grounding conductor within each conduit serving receptacles and/or special purpose outlets as indicated on the drawings and as specified herein.

D. Voltage drop for branch circuits shall not exceed requirements of NEC Article 215.

E. Neutral conductor for all 120/208 volt, single or multi-wire circuits, for computer or lighting circuits shall be #10 AWG minimum. All wire sizes indicated shall be adjusted accordingly for length of run.

F. Size conduit, outlet boxes, and other raceway system components in accordance with NEC requirements as minimum.

G. Circuit numbers as shown on drawings are for Contractor to plan his wiring and for estimating purposes and are not necessarily the exact circuit numbers to be used in that panel for that particular load. Exact circuit numbers for each load are to be selected by the Contractor at his option. Balanced load on panelboard bus is to be determining factor in arrangement of circuits. Panelboards average load shall not differ from phase to phase by ± 7½%. Record drawings, panelboard branch circuit directories and wire identification shall be revised to correspond to the actual branch breaker number in the panelboard.

PART 2 PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which branch circuits are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install, extend, remodel branch circuits and switch legs as dictated by construction, in accordance with manufacturer's written instructions and recognized industry practices.

B. Verify routing with MPS prior to installation.

C. Trapped runs without facilities for continuous drainage are not acceptable.

3.3 IDENTIFICATION

A. Provide conductor identification as per section 16010.

END OF SECTION

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SECTION 16130

ELECTRICAL BOXES

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or remodel electrical boxes and accessories of type, quality, sizes, finishes, etc. as indicated on the drawings and as specified herein.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Delivery, Storage and Handling
8. General
9. Outlet Boxes - Surface Mounted
10. Interior Outlet Box Accessories
11. Installation
12. General Purpose Junction And Pull Boxes
13. Outlet Box Locations

1.2 RELATED WORK

A. Section 16010 - General Electrical Requirements

B. Section 16111 - Raceway Conduit and Fittings

C. Section 16122 - Branch Circuits

D. Section 16170 - Grounding and Bonding

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), NECA - Standard of Installation.

1.4 QUALITY ASSURANCE

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of reference standards listed in this specification.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Contractor shall submit manufacturer's data sheets indicating box type, size, etc. to be used for this project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 - General Electrical Requirements.

B. Store boxes to prevent rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

C. Protect boxes so they are not damaged or contaminated.

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers of electrical boxes shall be Appleton, Steel City, Rayco, Wiremold or Bell

B. Size boxes as required by code for number of conduits and conductors entering and leaving box.

C. Fabricate boxes of code required gauge galvanized steel and provide with covers held in place by corrosion resistant machine screws.

D. Minimum box size 4" square.

2.2 OUTLET BOXES - SURFACE MOUNTED

A. Provide outlet boxes as required to accommodate the device indicated by symbol on the drawings.

B. Multi-gang galvanized boxes shall be provided for all devices indicated adjacent to one another on the plans.

C. Wiremold style boxes shall be minimum size 4-5/8"x2-7/8"x1-3/8", such as V5747.

D. Wiremold style box without outlet can be minimum size 4-3/8"x2-7/8"x15/16", such as V5748S.

E. **Wet locations:** Single or multiple ganged moisture-proof cast aluminum boxes with threaded hubs.

2.3 INTERIOR OUTLET BOX ACCESSORIES

A. Provide outlet box accessories as required for each installation, such as mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.4 SPECIAL BOXES

A. Provide special boxes fabricated by the manufacturer for fixtures and other devices where standard boxes are not applicable.

B. Fabricate from gauge 16 gauge (min.) galvanized steel minimum complete with covers held in place by corrosion resistant machine screws.

C. Provide box with welded seams, where applicable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as indicated, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes serve the intended purposes.

B. Provide outlet boxes as required to accommodate the device indicated by symbol on the drawings.

C. Install knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes so as to assure accessibility of electrical wiring.

E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers, as required.

G. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

H. Do not burn conduit holes or use hole saws; use knock-out punches only.

I. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings, etc. within the box. Do not use box extensions to create additional volume to meet N.E.C. requirements for the number of conductors contained in a box.

3.2 GENERAL PURPOSE JUNCTION AND PULL BOXES

A. Pull boxes and junction boxes shall have a minimum of 24” clearance in front of the cover or as required by Code, whichever is greater.

3.3 OUTLET BOX LOCATIONS

A. Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified with MPS and shall be determined by:

1. Construction or code requirements.
2. Conflict with equipment of other trades.
3. Equipment manufacturer's drawings.

B. Where receptacles and communications outlets are indicated adjacent to each other on the drawings, the outlet boxes shall be physically adjacent to each other and not spaced according to stud spacing. The Contractor shall fabricate box supports to allow all outlet boxes to be mounted adjacent to each other within the same stud space.

C. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 ft, provided the change in location is requested prior to rough-in.

D. Mounting heights for devices and equipment to be measured from finished floor to center line of device unless indicated otherwise.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or extend all required grounding and bonding as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Crimped Connectors
8. Ground Clamps
9. Examination
10. General
11. Field Quality Control

1.2 RELATED WORK

A. Section 16010 - General Electrical Requirements

B. Section 16111 - Conduit and Fittings

C. Section 16120 - Wires, Cables and Connectors

D. Section 16122 - Branch Circuits

E. Section 16130 - Electrical Boxes

F. Section 16190 - Hangers, Support Systems and Anchors

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), NECA - Standard of Installation.

C. ANSI/NFPA 70 - National Electrical Code.

D. IEEE/ANSI 142-1991 - Recommended Practice for Grounding of Industrial and Commercial Power Systems (Green Book).

E. IEEE/ANSI 1100-1992 - Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (Emerald Book).

F. Underwriters Laboratories (UL)

1.4 QUALITY ASSURANCE

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of reference standards listed in this specification.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each grounding electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

E. Accurately record routing of ground conductors and actual locations of grounding electrodes, including driven ground rods on Record Drawings

1.6 DESIGN CRITERIA

A. Provide bonding to meet all Regulatory Requirements, including but not limited to, NEC, State and Local Codes.

B. Acceptable Grounding Electrode System Connections:

1. Building Structural Steel
2. Other available Electrodes

PART 2 - PRODUCTS

2.1 CRIMPED CONNECTORS

A. Acceptable manufacturers of crimped connectors shall be Burndy Co. - Hy-Ground Series or Thomas & Betts.

B. Crimped connectors shall be fabricated of bronze material and be compression type, designed to be applied with a compression tool. The crimping tool shall emboss an indicator of the die used to make the crimp

C. All compression lugs shall be bolted with cadmium plated, grade five hardened steel bolts, 1-1/2" x 5/16" diameter for 1/0 and smaller cable lugs, 1-1/2" x 1/2" diameter for larger than 1/0 cable lugs, using lock washer and flat washers as shown.

D. The grounding electrode conductors shall be fastened to the ground rods with a compression type ground rod tap connector such as Burndy No. YGHR29C34 or equal as manufactured by Thomas & Betts.

E. All grounding conductor connections shall be made with crimp two hole long barrel compression lugs or with approved molded exothermic weld process as indicated on the drawings. Compression lugs shall be:

Wire Size / Connector Type	Burndy	Thomas & Betts
#2 thru #6 C-Tap	YGHC2C2	54735
#2 Connector	YA2C-2N	54856
#6 Connector	YA6C-2N	54852
#1/0 Connector	YA25-2N	54860
#1/0 to #1/0 C-Tap	YGHC26C26	54755
#3/0 Connector	YA27-2N	54864
#3/0 to #3/0 C-Tap	YGHC29C29	54760
#4/0 Connector	YA28-2N	54866
#4/0 to #4/0 C-Tap	YGHC29C29	54760
#750 MCM Connector	YA39-2N	54880
#750 to #750 MCM C-Tap	YFR915	63170

2.2 GROUNDING ELECTRODE CONDUCTOR

A. Feeder and Branch Circuit and Equipment Ground conductors shall be in accordance with the following schedule:

Circuit Breaker Rating	Ground Wire Size
15 thru 20 ampere	#12
25 thru 60 ampere	#10
70 thru 100 ampere	#6
125 thru 200 ampere	#4
225 thru 400 ampere	#1
500 thru 600 ampere	(2) #1/0 in parallel
Over 600 ampere	As scheduled on the Main Service and Distribution diagram.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compacting has been completed before driving rod electrodes.

3.2 GENERAL

A. Install products in accordance with manufacturer's instructions.

B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

C. Grounding connections shall be made to clean, bare metal surfaces.

D. Copper wires shall be coated with an anti-oxidant compound before making crimped connections.

3.3 SYSTEM GROUNDING

A. Provide separate, insulated, equipment grounding conductor for the following:

1. Within each conduit containing branch circuit conductors serving **all** receptacles and/or special purpose outlets.
2. Identify at all access points.
3. Terminate each end on suitable lug, bus, or bushing.

B. Grounding conductor(s) shall be insulated to match temperature ratings of circuit conductors occupying the same raceway.

C. The color coding of this equipment grounding conductor shall be green.

1. Identification must be continuous green color coding which completely covers all exposed insulation at all access points.
2. Green color coding shall be accomplished with green insulation or green tape for conductors sizes #4 or larger. (Paint is not allowed).

D. The equipment grounding conductor shall be electrically bonded to the equipment enclosure at the source of power, to each metallic enclosure or box through which it passes and to the apparatus being served by the electrical supply. Provide per NEC Sections 250-148.

E. The solid neutral (white or gray) conductors shall not be used for equipment grounding.

F. Equipment grounding conductors shall be terminated at the panelboard equipment grounding bus (NOT to the solid neutral bus). All panelboards on this project shall be equipped with an equipment grounding bus bar that is separate from the solid neutral bar and is electrically bonded to the panel enclosure.

G. The neutral conductor or neutral bus bar shall not be used for equipment grounding.

H. A separate green grounding conductor must be installed in all flexible conduits, containing **"Line Voltage"** conductors, regardless of length or circuit ampacity.

I. A separate green grounding conductor must be installed in all flexible conduits, containing **"Low Voltage"** conductors, where the flexible conduit exceeds 6 foot in length, regardless of circuit ampacity.

J. Only one equipment grounding conductor per conduit is required. It shall be sized for largest overcurrent device of all conductors in a conduit.

3.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.

1. Grounding conductor terminations, splices and taps shall be made with crimp compression type devices only. Set screw type connections will not be allowed.
2. Use anti-oxidation compound on all terminations.
3. Wire nuts are acceptable for #10 AWG or smaller conductors for equipment ground splices in junction boxes.

C. Crimps of compression connections shall be made in conformance with the manufacturer's requirements pertaining to wire gauge, type of lug and the tool used. Compression connectors or cable sizes # 1/0 AWG and larger shall employ hex for circumferential type crimps and the crimp shall emboss an indicator of the die used to make the crimp.

D. Terminations of the ground conductors at the ground bars shall be made with two hole crimp type compression connectors only.

E. Taps shall be made with "C" type compression taps only.

F. See Section 2 of this specifications for acceptable two hole connectors and "C" type tap connectors.

END OF SECTION

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SECTION 16190

HANGERS, SUPPORT SYSTEMS AND ANCHORS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or remodel all required hangers, supports and anchors, etc. for all conduit, equipment and materials as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Delivery, Storage and Handling
8. Manufacturers
9. General
10. Acceptable Manufacturers
11. General
12. **S**upport Structures
13. Interior Conduit Supports
14. Junction Box Supports
15. Exterior Sidewall Conduit Supports
16. Roof Mounted Conduit Supports
17. Conduit Penetrations Through Roof
18. Steel Hanger Rods
19. Installation Of Anchors
20. Interior Support Of Conduits
21. Junction Box Supports
22. Exterior Sidewall Conduit Supports
23. Vertical Cable Support

1.2 RELATED WORK

A. Division 15400 - Plumbing

B. Division 15500 - HVAC

C. Section 16010 - General Electrical Requirements

D. Section 16111 - Conduit Systems and Fittings

E. Section 16170 - Grounding and Bonding

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA)

1.4 QUALITY ASSURANCE

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of reference standards listed in this specification.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Contractor shall submit manufacturer’s data sheets indicating boxes to be used for this project.

1.6 DESIGN CRITERIA

A. Use only new material, free of defects, corrosion and scale, and meeting the latest revision of NEC requirements and as listed in this specification.

B. Support system shall be adequate for weight of equipment and conduit, including wiring which they carry.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 - General Electrical Requirements.

B. Store all materials and devices to prevent rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers if support systems are Kindorf, Midland-Ross Corp., Elgen Co., Steel City, Midland-Ross Corp., Uni-strut, B-Line, And Caddy

2.2 GENERAL

A. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

2.3 SUPPORT STRUCTURES

A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.

2.4 INTERIOR CONDUIT SUPPORTS

A. One hole galvanized **heavy duty** steel straps.

B. Two hole galvanized **heavy duty** steel straps.

C. Continuous slot galvanized steel channel.

D. Continuous T-slot galvanized steel concrete insert channel.

E. Plastic conduit shall have 2-hole plastic conduit supports such as Carlon Snap-Straps.

2.5 JUNCTION BOX SUPPORTS

A. See Section 16130 for any such as mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.6 EXTERIOR SIDEWALL CONDUIT SUPPORTS

A. Use contractor-fabricated support consisting of 8” piece of painted “Uni-strut” channel fasted to building structure. Fasten conduit to channel with “Snap and Strut” plastic conduit clamps or “Uni-strut” clamps and fasteners.

B. Paint all steel components with two coats of gray rustproof paint.

2.7 ROOF MOUNTED CONDUIT SUPPORTS

A. Use 12” Long piece of conduit with built-in “Uni-Strut” channel equal to that as manufactured by “ERICO”. Fasten conduit to channel with “Snap and Strut” plastic conduit clamps or “Uni-strut” clamps and fasteners.

B. Provide a concrete pad for each support to protect the built-up roofs or a rubber traffic pad equal to that as manufactured by “SIPLAST” for membrane roofs to allow for expansion and contraction of roof and piping systems.

C. Paint all steel components with two coats of gray rustproof paint.

2.8 CONDUIT PENETRATIONS THROUGH ROOF

A. Conduit penetrations through roof shall be made with piping portals and shall be as manufactured by Custom Curb, Curbs Plus, Roof Products and Systems, Pate, ThyCurb or Vent Products. Pitch Pockets will not be allowed.

B. Curb assembly shall be constructed of 18 gauge (minimum) galvanized steel reinforced so it is structurally capable of supporting the intended load, inside and outside corner sections that are mitered and continuously welded

C. Curb shall be filled with 3 pound density insulation and complete with integral deck mounting flange, nominal 2” wood nailer, laminated acrylic clad thermoplastic cover with graduated step boots to accommodate various size conduits, fastening screws for cover, and stainless steel clamps for securing boots around the conduit.

D. Do not use built-in metal base flashings or cants.

E. Height of curb to a minimum of 12” above finished roof

2.9 SUPPORT CABLES AND ACCESSORIES

A. Support cables and accessories shall be equal to those as manufactured by Gripple.

B. Cables shall be galvanized high tensile steel cable of standard lengths from 5ft-30ft or cut to order sized for anticipated load with a safety factor of 5 and come complete with all fasteners, anchors, loops, toggles, end stops, hooks, eyelets, etc. as required for application

C. Cable fasteners shall have housing fabricated from Type ZA2 Zinc wedge Sintered steel hardened to min. 56 Rockwell C with Spring formed from Stainless Steel (Type 302) and End Cap with UV stabilized homopolymer polypropylene

2.10 STEEL HANGER RODS:

A. Threaded both ends, threaded one end, or continuous threaded, cadmium plated finish.

B. Size rods for individual hangers and trapeze support as indicated in the following schedule.

C. Provide rods complete with adjusting and lock nuts.

D. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (Inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

PART 3 - EXECUTION

3.1 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.

B. Installation methods shall be in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of any expansion anchor and an edge of exterior corner of concrete shall be not less than 4½ times the diameter of the hole in which it is installed.

C. Anchors shall be specifically identified as, **"approved for use"**, in the material in which they are installed. If there is any question as to the suitability, of a specific anchor, for use in the intended material; it shall be the "Contractors" responsibility to get written approval, from MPS, prior to the use of the anchor in question.

D. In general, use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction. See MPS for other applications.

E. Do not use powder-actuated anchors.

F. Do not use plastic anchors.

G. Do not drill structural steel members unless approved, in writing, by MPS.

3.2 INTERIOR SUPPORT OF CONDUITS

A. Fasten conduit to structural parts of building in a manner acceptable to Engineer. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or other conduits.

B. Do not use perforated strapping or tie wire as a hanging method. Do not hang conduits from ceiling tile grid or tie wires.

C. Do not use spring steel clips and clamps.

D. Support V700 surface raceway using V704 2-hole mounting straps.

E. Support Metallic Conduit As Follows:

1. **Single Conduit Runs:** Galvanized, heavy duty, 2-hole steel pipe straps every 8'-0" for all conduits. 1-hole straps can be used for conduits size 1" and less if installed 10'-0" AFF or more.

2. Multiple Conduit Runs

a) Vertical Surfaces: Continuous slot galvanized steel channel with conduit straps as required.
b) Horizontal Surfaces: Single or double continuous slot galvanized steel channel, complete with conduit straps as required; support with 3/8" minimum threaded hanger rods.
c) Provide supports every 8'-0" for all conduits.
d) Use 2-hole straps with spring-nuts for all straps installed below 8'-0".

3.3 JUNCTION BOX SUPPORTS

A. Mount brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations as recommended by manufacturer and as required for the installation arrangement.

B. In addition to the ceiling grid support system, any boxes installed in non-plaster ceilings shall be supported by an independent threaded rod with matching nut in box, fastened securely to the floor above with a threaded anchor.

3.4 EXTERIOR SIDEWALL CONDUIT SUPPORTS

A. Conduits serving Div. 15400 equipment should be routed with Div. piping where possible. Coordinate with Div. 15400 Contractor.

B. Use for mounting piping on sidewalls of buildings as indicated on drawings. Paint assembly to match wall. Paint with two coats of rustproof paint.

C. Space conduit supports as indicated in this Section.

3.5 ROOF MOUNTED CONDUIT SUPPORTS

A. Conduits serving Div. 15400 equipment should be routed with Div. piping where possible. Coordinate with Div. 15400 Contractor.

B. Use for mounting conduit on roofs as indicated on drawings.

C. Paint all exposed metal parts with (2) coats of rustproof gray paint.

D. Mount support assembly on concrete pad or rubber pad as required for roof type.

E. Space conduit supports as indicated in this Section.

3.6 CONDUIT PENETRATIONS THROUGH ROOF

A. Conduit serving Div. 15400 equipment should be routed with Div. piping where possible. Coordinate with Div. 15400 Contractor.

B. Install at points where conduits penetrate roof. Install as shown on the drawings, as detailed and according to the manufacturer's installation instructions.

C. Flashing and counter flashing by the General Contractor unless otherwise noted on drawings.

3.7 VERTICAL CABLE SUPPORT

A. Conductors in vertical raceways shall be supported using suitable cable supports. Locate support every 25’-0” maximum and additionally as required by NEC Table 300-19 (A).

END OF SECTION

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SECTION 16440

MOTOR AND CIRCUIT DISCONNECTS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or replace motor and circuit disconnects and accessories, enclosures, etc. as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Delivery, Storage, and Handling
8. 1Ø Disconnects
9. Inspection
10. Installation
11. Commissioning

1.2 RELATED WORK

A. Division 15400 - Plumbing

B. Section 16010 - General Electrical Requirements

C. Section 16170 - Grounding and Bonding

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC), Including State of Wisconsin and local supplements.

B. National Electrical Contractors Association (NECA), NECA - Standard of Installation.

1.4 QUALITY ASSURANCE

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of reference standards listed in this specification.

1.5 SUBMITTALS

A. Refer to Section 16010 - General Electrical Requirements

B. Enclosure dimensions, nameplate nomenclature, electrical ratings, and fuse and breaker type listing.

C. Field quality control test results.

1.6 DESIGN CRITERIA

A. Disconnects shall be UL listed short circuit rating shall be 200,000 RMS amps with Class R fuses.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 16010 - General Electrical Requirements

B. Do not store equipment so it is exposed to weather

C. Physically protect against damage from work of other Trades

PART 2 - PRODUCTS

2.1 1Ø (SINGLE PHASE) DISCONNECTS (IF NOT PROVIDED IN DIVISION 15400)

A. Integral Disconnects in Equipment with Motors less than ½ HP shall be manufacturer's standard UL rated disconnect switch.

B. All non-integral disconnects serving equipment with motors less than ½ HP shall be heavy duty Square D.

C. Enclosures

1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
2. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive disconnect to assure adequate clearance for installation.

B. Start work only after unsatisfactory conditions are corrected.

3.2 COORDINATION

A. Coordinate with Division 15400 for plumbing equipment disconnect requirements and locations.

B. Do not install multiple disconnects in series unless required by code or specially identified on drawings.

3.3 INSTALLATION

A. Install all disconnect switches whether furnished under this contract or not.

B. Provide disconnect switches for loads as required by code.

C. It is the Electrical Contractor's responsibility to determine the need for a disconnect switch requirements for each specific load. The contractors shall include in their bid all disconnect switches required whether indicated on the drawings or not.

D. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

E. Locate disconnect switches as shown on drawings or as required by NEC.

F. Install on equipment support where feasible, or anchor firmly to wall or structural surface.

G. Provide control circuit interlock as required by NEC.

H. Label all disconnects according to equipment they serve. See Section 16010.

3.4 COMMISSIONING

A. Adjust covers and operating mechanism for free mechanical movement.

B. Verify overcurrent protection to provide proper operation and compliance with NEC.

C. Tighten wire and cable connections.

D. Clean interior of enclosure.

E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

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SECTION 16800

PHOTOVOLTAIC POWER GENERATION SYSTEM

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or replace all photovoltaic power generation system complete with collectors and associated mounting frame system, wiring, fasteners, etc. as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Quality Assurance
5. Submittals
6. Design Criteria
7. Warranty
8. Collector Manufacturers
9. Collector Electrical Specifications
10. Collector Assembly And Frame
11. Collector Physical Specifications
12. Collector Thermal Parameters
13. Collector Wiring
14. Collector Mounting Frame System
15. General
16. Module Wiring
17. Grounding
18. Mounting Frame System
19. Commissioning

1.2 RELATED WORK

A. Section 16010 - General Electrical Provisions

B. Section 16810 - Photovoltaic Power Generation System Inverters

1.3 REFERENCE STANDARDS

A. National Electrical Code (NEC)

B. State of Wisconsin and local supplements to NEC

C. National Electrical Contractors Association (NECA) - Standard of Installation.

D. National Electrical Code Article 690-7(a)

1.4 DESCRIPTION

A. This section covers photovoltaic collection systems also known as solar collectors or modules and their respective support systems.

1.5 QUALITY ASSURANCE

A. Refer to Division 1 and General Conditions for equals and substitutions.

B. Provide factory tested equipment.

C. Factory where collectors are manufactured shall be ISO14001 certified.

D. Provide equipment and components with UL label. Specifically UL 1703

1.6 SUBMITTALS

A. Refer to requirements of Sections 01300 and 16010, Submittals.

B. Detailed specification sheet with specific collector(s) identified.

C. Installation instructions, wiring diagrams with all required field connection clearly indicated.

D. IV Curve charts.

1.7 DESIGN CRITERIA

A. Sizes, capacities, quantities, minimum acceptable efficiency ratings shall be as follows:

B. Maximum output of collector array: **10,000 Watts or 10 KW,**

C. Maximum collector power output shall be the following:

1. (40) at 285 Watts

D. Tolerance: +10%/-5%

E. Conversion efficiency: >16%

1.8 WARRANTY

A. In addition to the one year standard labor and parts warranty, provide a non-prorated, labor and parts extended warranty for the following:

1. 25 year on power output. Not more than 10% reduction within 12 years and 20% in 25 years.

PART 2 PRODUCTS

2.1 COLLECTOR MANUFACTURERS

A. Collectors shall be manufactured by Helios Solar works.

B. In a multiple collector array, all collectors shall be of the same manufacturer and where possible of the same size and power output.

2.2 COLLECTOR ELECTRICAL SPECIFICATIONS

A. Provided by Vendor for specific collector submitted:

1. Maximum power voltage: 33.31
2. Maximum power current: 6.43
3. Open circuit voltage: 40.97
4. Short-circuit: 6.88

2.3 COLLECTOR ASSEMBLY AND FRAME

A. Collectors shall be constructed of multiple polycrystalline silicon photovoltaic cells, high transmission, tempered glass front surface, polyvinyl fluoride (PVF) back sheet. Entire assembly shall be housed in an anodized aluminum frame with holes and/or brackets for mounting to an adjustable rail system.

B. Collectors shall possess a Class C fire rating.

2.4 COLLECTOR PHYSICAL SPECIFICATIONS:

A. 7T2285 Collector

1. Length: 78.11 inches
2. Width: 38.74 inches
3. Depth: 1:58 inches
4. Weight: 57.2 pounds

2.5 COLLECTOR THERMAL PARAMETERS:

A. Operating collector temperature: -40 to 90^{o}C (-40 to 120^{o}F)

B. I_{sc} Current temperature coefficient: (3.18x10^{-3}) A/^{o}C

C. V_{oc} Voltage temperature coefficient: ()-1.23x10^{-1}) V/^{o}C

2.6 COLLECTOR WIRING

A. Modules shall come pre-wired and terminated ready for free standing or direct building installations. Each module shall have (2)#10 AWG type USE-2/RHH/RHW-2 stranded sunlight resistant output cables each terminated with Multi-Contact connectors. The positive (+) terminal shall have the female connector while the negative (-) terminal shall have the male connector.

2.7 COLLECTOR MOUNTING FRAME SYSTEM:

A. Mounting frame system shall be manufactured by UniRac SolarMount or MPS approved equal.

B. All components, including but not limited to; frames, rails, legs, clamps, clips, feet, fasteners, etc. shall be from the same manufacturer and be completely compatible to the photovoltaic collectors.

C. All components shall be constructed of heavy duty anodized aluminum.

D. All fasteners shall be manufactured from 18-8 stainless steel.

E. Provide all required components as required for a complete mounting assembly.

PART 3 EXECUTION

3.1 GENERAL

A. Install and wire all collectors in accordance with manufacturer's written instructions.

B. Install all collectors on solar mounting rails and support assemblies designed specifically for the awarded collector manufacturer.

C. Coordinate with Construction Project Inspector and MPS Roof Shop for roof top installations.

D. For optimal performance in all applications, maintain the required clearance between the module frame and the mounting surface as required to allow cooler ambient air to circulate around the back of the module.

3.2 MODULE WIRING

A. The module shall be wired for series connections only, i.e. female (+) to male (-) interconnections. Series and parallel connections shall be made by use of two #10 AWG type XLP sunlight resistant output cables with male and female Multi-Contact connectors.

B. When making connections with Multi-Contact connectors, make sure the array is disabled. DO NOT MAKE CONNECTIONS WHILE UNDER LOAD. Module output connections are marked "Do not disconnect under load".

C. Do not exceed the maximum system voltage rating of the collector system recommended by the collector manufacturer.

D. Refer to the National Electrical Code Article 690-7(a) for determining the maximum number of series modules that can be placed in series. Temperature coefficients, specific to the module of use, can be used to provide the most accurate prediction of module voltage under temperature extremes.

3.3 GROUNDING

A. Before installing your solar system, contact local authorities to determine the necessary grounding.

B. Attach all module frames to an earth ground in accordance with the National Electrical Code (NEC).

C. Proper grounding shall be achieved by connecting the module frame(s) and structural members contiguously one to another using a suitable "grounding conductor". The grounding conductor shall be a material acceptable for use as an electrical conductor per NEC. The grounding conductor must then make a connection to earth using a suitable earth ground electrode. Ensure positive electrical contact through the anodizing on the module's frame by utilizing the method as recommended by collector manufacturer.

3.4 MOUNTING FRAME SYSTEM

A. Install, assemble and erect mounting frames, rails, legs, clamps, clips, feet, fasteners, in accordance with manufacturer’s written instructions and as detailed on drawings.

B. Assemble mounting frame system to provide a code compliant grounding system.

3.5 COMMISSIONING

A. Adjust collectors and support rail assembly to the correct azimuth as indicated on drawings.

B. Demonstrate that all components are functioning properly. Replace all defective parts.

END OF SECTION

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SECTION 16810

PHOTOVOLTAIC POWER GENERATION SYSTEM INVERTERS

PART 1 GENERAL

1.1 SCOPE

A. Drawings and general provisions of Contract, including Bidding Requirements, General Requirements and General Conditions apply to this section.

B. Provide, install, remove or replace all photovoltaic power generation system inverters with accessories to connect photovoltaic collection system to the utility power grid as indicated on drawings and specified herein for this project.

C. Included are the following topics:

1. Scope
2. Related Work
3. Reference Standards
4. Description
5. Quality Assurance
6. Submittals
7. Warranty
8. Acceptable Inverters
9. Requirements
10. Installation

1.2 RELATED WORK

A. Section 16010 - General Electrical Provisions

B. Section 16800 - Photovoltaic Power Generation Systems

1.3 REFERENCE STANDARDS

A. National Electrical Code (NFPA 70)

B. Including State of Wisconsin and local supplements

C. National Electrical Contractors Association (NECA)

D. NECA – Standard of Installation

E. National Electrical Manufacturers Association (NEMA)

F. Institute of Electrical and Electronic Engineers (IEEE)

G. ASME

H. WE Energies

I. Local Codes having jurisdiction

1.4 DESCRIPTION

A. This section covers photovoltaic collection systems also known as solar collectors or modules and their respective support systems.

1.5 QUALITY ASSURANCE

A. Refer to Division 1 and General Conditions for equals and substitutions.

B. Inverter and installation shall conform to all standards, codes, organizations, etc. in the Referenced Standards of the Section.

C. Provide factory tested equipment.

D. Must be certified under UL 1741 by a nationally recognized testing laboratory.

E. Must have a CEC efficiency of 94% when operating at maximum connected load.

F. Inverter must be new. It shall not have been previously installed at any other location or used for any other applications. Rebuilt, refurbished or relocated inverters shall not be used.

1.6 SUBMITTALS

A. Refer to requirements of Sections 01300 and 16010, Submittals.

1.7 SUBMITTALS

A. Provide original manufacture’s product data sheets that include the following:

1. Manufacture, part number, device dimensions, nameplate nomenclature, electrical ratings both inputs and outputs.
2. Installation instructions.
3. Interrupting Rating
4. KW Rating
5. Alarms and Warnings

1.8 WARRANTY

A. The inverter must have a minimum five year warranty to protect the purchaser against system or component breakdown. The warranty must cover and provide no-cost repair or replacement of the system or components including any associated labor for a minimum of five years. The warranty must cover the inverter against breakdown or degradation in electrical output of more than 10 percent deviation from their originally rated electrical output during the period. The manufacturer’s warranty may be provided in combination with installer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE INVERTERS

A. Ingeteam # IS SMART 5 UT.

2.2 REQUIREMENTS

A. Inverter shall be equipped with the following protection functions, and ratings:

1. Integrated load break rated AC and CD disconnect switch.
2. Integrated fused series string combiner.
3. Sealed electronics enclosure
4. Synchronism Check.
5. Under Voltage: must be adjustable and have time delay to override system transients and clearing of external faults. The pickup setting shall be 90% of nominal voltage and have a time delay of 1.0 seconds.
6. Over-voltage: must be adjustable. The pickup setting shall be 110% of nominal voltage and have a time delay of 0.1 seconds.
7. Under-frequency: must have a single set point at 59.5 Hz and have a time delay of 0.5 seconds.
8. Over-frequency: must have a single set point at 60.5 Hz and be instantaneous.
9. Automatically disconnect in utility has loss of power.
10. Automatically synchronize with utility distribution system.
11. Must comply with the latest version of IEEE 519 “Recommended Practices and Requirements of Harmonic Control in Electric Power Systems.”
12. Power factor must be maintained between .9 leading and .9 lagging.
13. Shall not cause flicker in excess of 2%.
14. Maximum input DC Voltage 600Volts with a range of Peak Power Tracking 250-480volts, and DC ripple voltage of <5%.
15. DC Input adjustable PV start voltage.
16. DC Input, minimum of 4 fused inputs.
17. AC Output, the inverter must be a single phase device rated to operate on two phases of a 3 phase system. The inverter output shall monitor and match school electrical system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install inverters in accordance with manufacturer's written instructions, installation drawing, and applicable requirements of NEC and in accordance with recognized industry practices.

B. Equipment shall not be installed such that it voids any warranties or listings on it or any other equipment it is installed with. Any discrepancies shall be brought to the engineers and manufacturers attention prior to continuing with the work.

END OF SECTION

ATTACHMENT A

ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANT PROGRAM

SUBRECIPIENT OR SUBCONTRACTOR FLOWDOWN REQUIREMENTS

Subawardees who receive federal funds under an assistance agreement shall comply with the flow down requirements for subawardees specified in the "Special Provisions Relating to Work Funded under American Recovery and Reinvestment Act of 2009" which apply to this award. Additionally, as required by 10 CFR 600.2(b), 10 CFR 600.236, and 10 CFR 600.237, any new, continuation, or renewal award and any subsequent subaward shall comply with any applicable Federal statute, Federal rule, Office of Management and Budget (OMB) Circular and Government-wide guidance in effect as of the date of such award. These requirements include, but are not limited to the following:

a. DOE Assistance Regulations, 10 CFR Part 600 at http://ecfr.gpoaccess.gov.
b. In addition to 10 CFR 600, Appendix A, Generally Applicable Requirements, the National Policy Assurances to Be Incorporated as Award Terms in effect on date of award at http://management.energy.gov/business_doe/1374.htm apply.
c. 2 CFR 215, "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations (OMB Circular A-110)."
d. OMB Circular A-102, "Grants and Cooperative Agreements with State and Local Governments" Common Rules.
e. OMB Circular A-21, "Cost Principles for Educational Institutions," OMB Circular A-87, "Cost Principles for State , Local, and Indian Tribal Governments," OMB Circular A-122, "Cost Principles for Non-Profit Organizations," or FAR at 48 CFR Part 31, "Contract Cost Principles and Procedures," for Profit Organizations, as applicable.
f. OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
g. Subawardee Application/proposal as approved by DOE.

The following pages set forth subgrant flowdown provisions suggested for use in issuing subawards.

Recipients are also advised that all contracts must include the provisions in 10 CFR 600.236, "Procurement", Section (i) "Contract Provisions", numbers 1-13.

Please be reminded that recipients are responsible for ensuring no more than 10% of the entire award allocation is expended on administrative costs, per EISA sec. 545(b)(3)(A). Subrecipients (vendors, subgrantees, and subcontractors) are not subject to a 10% limitation on administrative costs for their individual awards, but all administrative costs expended on the prime EECBG award, including the administrative costs incurred by subrecipients, count towards the 10% limitation. The recipient should be mindful of the limitation on administrative costs when drafting contracts and subawards to ensure that the 10% limitation is not exceeded.

SUBGRANT FLOWDOWN PROVISIONS FOR EECBG FINANCIAL ASSISTANCE AWARDS

SPECIAL TERMS AND CONDITIONS

Table of Contents

1. RESOLUTION OF CONFLICTING CONDITIONS

Any apparent inconsistency between Federal statutes and regulations and the terms and conditions contained in this award must be referred to the DOE Award Administrator for guidance.

2. LIMITATIONS ON USE OF FUNDS

a. By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, for gambling establishments, aquariums, zoos, golf courses or swimming pools.

b. Recipients may not use more than 50 percent of the amounts provided for the establishment of a loan loss reserve.

c. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or $250,000, whichever is greater (EISA Sec 545 (b)(3)(B)), for the establishment of revolving loan funds.

d. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or $250,000, whichever is greater (EISA Sec 545 (b)(3)(C)), for subgrants to nongovernmental organizations for the purpose of assisting in the implementation of the energy efficiency and conservation strategy of the eligible unit of local government or Indian tribe.

3. REIMBURSABLE INDIRECT COSTS AND FRINGE BENEFIT COSTS

a. The Recipient is expected to manage their final negotiated project budgets, including their indirect costs and fringe benefit costs. DOE will not amend an award solely to provide additional funds for changes in the indirect and/or fringe benefit costs or for changes in rates used for calculating these costs. DOE recognizes that the inability to obtain full reimbursement for indirect or fringe benefit costs means the Recipient must absorb the underrecovery. Such underrecovery may be allocated as part of the Recipient's cost share**.**

b. If actual allowable [indirect and/or fringe benefit] costs are less than those budgeted and funded under the award, the Recipient may use the difference to pay additional allowable direct costs during the project period. If at the completion of the award the Government's share of total allowable costs (i.e., direct and indirect), is less than the total costs reimbursed, the Recipient must refund the difference.

4. INDIRECT COSTS AND FRINGE BENEFITS ARE NOT REIMBURSABLE

[Use when indirect charges and/or fringe benefits are not reimbursable]

The budget for this award does not include [indirect costs or fringe benefits]. Therefore, these expenses shall not be charged to nor reimbursement requested for this project nor shall the indirect and fringe benefit costs from this project be allocated to any other federally sponsored project. In addition, indirect costs or fringe benefits shall not be counted as cost share unless approved by the Contracting Officer. This restriction does not apply to subawardees' indirect or fringe benefit costs.

5. USE OF PROGRAM INCOME

If you earn program income during the project period as a result of this award, you may add the program income to the funds committed to the award and used to further eligible project objectives.

6. STATEMENT OF FEDERAL STEWARDSHIP

DOE will exercise normal Federal stewardship in overseeing the project activities performed under this award. Stewardship activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing technical assistance and/or temporary intervention in unusual circumstances to correct deficiencies which develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the award objectives have been accomplished.

7. SITE VISITS

DOE's authorized representatives have the right to make site visits at reasonable times to review project accomplishments and management control systems and to provide technical assistance, if required. You must provide, and must require your subawardees to provide, reasonable access to facilities, office space, resources, and assistance for the safety and convenience of the government representatives in the performance of their duties. All site visits and evaluations must be performed in a manner that does not unduly interfere with or delay the work.

8. REPORTING REQUIREMENTS

a. Requirements. The reporting requirements for this award are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to this award. Failure to comply with these reporting requirements is considered a material noncompliance with the terms of the award. Noncompliance may result in withholding of future payments, suspension or termination of the current award, and withholding of future awards. A willful failure to perform, a history of failure to perform, or unsatisfactory performance of this and/or other financial assistance awards, may also result in a debarment action to preclude future awards by Federal agencies.

b. Additional Recovery Act Reporting Requirements are found in the Provision below labeled: "REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT."

9. PUBLICATIONS

a. You are encouraged to publish or otherwise make publicly available the results of the work conducted under the award.

b. An acknowledgment of DOE support and a disclaimer must appear in the publication of any material, whether copyrighted or not, based on or developed under this project, as follows:

> *Acknowledgment*: "This material is based upon work supported by the Department of Energy [National Nuclear Security Administration] [add name(s) of other agencies, if applicable] under Award Number(s) [enter the award number(s)]."
>
> *Disclaimer*: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

10. FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS

You must obtain any required permits, ensure the safety and structural integrity of any repair, replacement, construction and/or alteration, and comply with applicable federal, state, and municipal laws, codes, and regulations for work performed under this award.

11. LOBBYING RESTRICTIONS

By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

12. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REQUIREMENTS

You are restricted from taking any action using Federal funds, which would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to DOE providing either a NEPA clearance or a final NEPA decision regarding this project.

If you move forward with activities that are not authorized for Federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share.

If this award includes construction activities, you must submit an environmental evaluation report/evaluation notification form addressing NEPA issues prior to DOE initiating the NEPA process.

13. HISTORIC PRESERVATION

Prior to the expenditure of Project funds to alter any historic structure or site, the Recipient or subrecipient shall ensure that it is compliant with Section 106 of the National Historic Preservation Act (NHPA), consistent with DOE's 2009 letter of delegation of authority regarding the NHPA. Section 106 applies to historic properties that are listed in or eligible for listing in the National Register of Historic Places. If applicable, the Recipient or subrecipient must contact the State Historic Preservation Officer (SHPO), and the Tribal Historic Preservation Officer (THPO) to coordinate the Section 106 review outlined in 36 CFR Part 800. In the event that a State, State SHPO and DOE enter into a Programmatic Agreement, the terms of that Programmatic Agreement shall apply to all recipient and subrecipient activities within that State. SHPO contact information is available at the following link: http://www.ncshpo.org/find/index.htm. THPO contact information is available at the following link: http://www.nathpo.org/map.html. Section 110(k) of the NHPA applies to DOE funded activities.

The Recipient or subrecipient certifies that it will retain sufficient documentation to demonstrate that the Recipient or subrecipient has received required approval(s) from the SHPO or THPO for the Project. Recipients or subrecipients shall avoid taking any action that results in an adverse effect to historic properties pending compliance with Section 106. The Recipient or subrecipient shall deem compliance with Section 106 of the NHPA complete only after it has received this documentation. The Recipient or subrecipient shall make this documentation available to DOE on DOE's request (for example, during a post-award audit). Recipient will be required to report annually on September 1 the disposition of all historic preservation consultations by category.

14. WASTE STREAM

The Recipient assures that it will create or obtain a waste management plan addressing waste generated by a proposed Project prior to the Project generating waste. This waste management plan will describe the Recipient's or subrecipient's plan to dispose of any sanitary or hazardous waste (e.g., construction and demolition debris, old light bulbs, lead ballasts, piping, roofing material, discarded equipment, debris, and asbestos) generated as a result of the proposed Project. The Recipient shall ensure that the Project is in compliance

with all Federal, state and local regulations for waste disposal. The Recipient shall make the waste management plan and related documentation available to DOE on DOE's request (for example, during a post-award audit).

15. DECONTAMINATION AND/OR DECOMMISSIONING (D&D) COSTS

Notwithstanding any other provisions of this Agreement, the Government shall not be responsible for or have any obligation to the Recipient for (i) Decontamination and/or Decommissioning (D&D) of any of the Recipient's facilities, or (ii) any costs which may be incurred by the Recipient in connection with the D&D of any of its facilities due to the performance of the work under this Agreement, whether said work was performed prior to or subsequent to the effective date of the Agreement.

16. SUBGRANTS AND LOANS

a. The Recipient hereby warrants that it will ensure that all activities by sub-grantee(s) and loan recipients to accomplish the approved Project Description or Statement of Project Objectives are eligible activities under 42 U.S.C. 171534(1)-(13). State recipients hereby warrant that they will ensure that all activities by sub-grantee(s) and loan recipients pursuant to 42 U.S.C. 17155(c)(1)(A) to accomplish the approved Project Description or Statement of Project objects are eligible activities under 42 U.S.C. 171534(3)-(13).

b. Upon the Recipient's selection of the sub-grantee(s) and loan recipients, the Recipient shall notify (i.e. approval not required) the DOE Contracting Officer with the following information for each, regardless of dollar amount:
   - Name of Sub-Grantee
   - DUNS Number
   - Award Amount
   - Statement of work including applicable activities

   State recipients shall notify the DOE Contracting Officer with the above information within 180 days of the award date in Block 27 of the Assistance Agreement Cover Page.

c. In addition to the information in paragraph b. above, for each sub-grant and loan that has an estimated cost greater than $10,000,000, the recipient must submit for approval by the Contracting Officer, a SF424A Budget Information – Nonconstruction Programs, and PMC 123.1 Cost Reasonableness Determination for Financial Assistance (available at http://www.eere-pmc.energy.gov/forms.aspx).

17. JUSTIFICATION OF BUDGET COSTS

This provision will be used if all costs were not released to the recipient through this award action.

a. In the original application, the recipient did not provide sufficient information to justify the approval or release of funds for the proposed activity/activities. In order to receive

reimbursement for the costs associated with the activity/activities listed in the approved Statement of Project Objectives (SOPO), a justification for all proposed costs must be submitted to the DOE Contracting Officer.

b. The Recipient must provide justification for the following costs:

Delete any cost categories that do not apply

Personnel Costs:

Personnel Costs:
The Recipient must submit cost justification for the following personnel costs for Activity/Activities [#___]: [list all personnel costs that require submission of additional cost detail] for approval by the Contracting Officer.

Fringe Benefit Costs:
The Recipient must submit a fringe benefit rate proposal/agreement for Activity/Activities [#___] for approval by the Contracting Officer.

Travel Costs:
The Recipient must submit cost justification for the following travel costs for Activity/Activities [#___]: [list all travel costs that require submission of additional cost detail] for approval by the Contracting Officer.

Equipment Costs:
The Recipient must submit vendor quotes for equipment with an individual item cost of $50,000 or more, for Activity/Activities [#___] for approval by the Contracting Officer.

Supplies Costs:
The Recipient must submit cost justification for the following supplies costs for Activity/Activities [#___]: [list all supplies costs that require submission of additional cost detail] for approval by the Contracting Officer.

Contractual Costs:
1. The recipient shall provide the following information for each individual or company that will receive EECBG funding, regardless of dollar amount:
- Name
- DUNS Number
- Award Amount
- Statement of work including applicable activities
- NEPA documentation, as applicable

2. In addition to the information in paragraph 1. above, for each individual or company that has an estimated cost greater than $10,000,000, the Recipient must submit a separate SF424A Budget Information – Nonconstruction Programs, and

Budget Justification. The DOE Contracting Officer may require additional information concerning these individuals or companies prior to providing written approval.

Other Direct Costs:
The Recipient must submit cost justification for the following other direct costs for Activity/Activities [#___]: [list all other direct costs that require submission of additional cost detail] for approval by the Contracting Officer.

Indirect Costs:
The Recipient must submit an indirect rate proposal/agreement for Activity/Activities [#___] for approval by the Contracting Officer.

c. Upon written notification and/or approval by the Contracting Officer, the Recipient may then receive payment for the activities listed in the approved SOPO for allowable costs incurred in accordance with the payment provisions contained in the Special Terms and Conditions of this agreement. These written notifications and/or approvals will be incorporated into the award by formal modification at a future date.

18. ADVANCE UNDERSTANDING CONCERNING PUBLICLY FINANCED ENERGY IMPROVEMENT PROGRAMS

The parties recognize that the Recipient may use funds under this award for Property-Assessed Clean Energy (PACE) loans, Sustainable Energy Municipal Financing, Clean Energy Assessment Districts, Energy Loan Tax Assessment Programs (ELTAPS), or any other form or derivation of Special Taxing District whereby taxing entities collect payments through increased tax assessments for energy efficiency and renewable energy building improvements made by their constituents. The Department of Energy has published "Best Practices" (http://www1.eere.energy.gov/wip/pace.html) and other guidelines pertaining to the use of funds made available to the Recipient under this award pertaining to the programs identified herein. By accepting this award, the Recipient agrees to incorporate, to the maximum extent practicable, those Best Practices and other guidelines into any such program(s) within a reasonable time after award. The Recipient also agrees, by its acceptance of this award, to require its sub-recipients to incorporate to the maximum extent practicable the best practices and other guideline into any such program used by the sub-recipient.

19. SPECIAL PROVISIONS RELATING TO WORK FUNDED UNDER AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (May 2009)

Preamble

The American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act) was enacted to preserve and create jobs and promote economic recovery, assist those most impacted by the recession, provide investments needed to increase economic efficiency by spurring technological advances in science and health, invest in transportation, environmental

protection, and other infrastructure that will provide long-term economic benefits, stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive State and local tax increases. Recipients shall use grant funds in a manner that maximizes job creation and economic benefit.

The Recipient shall comply with all terms and conditions in the Recovery Act relating generally to governance, accountability, transparency, data collection and resources as specified in Act itself and as discussed below.

Recipients should begin planning activities for their first tier subrecipients, including obtaining a DUNS number (or updating the existing DUNS record), and registering with the Central Contractor Registration (CCR).

Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related guidance. For projects funded by sources other than the Recovery Act, Contractors must keep separate records for Recovery Act funds and to ensure those records comply with the requirements of the Act.

The Government has not fully developed the implementing instructions of the Recovery Act, particularly concerning specific procedural requirements for the new reporting requirements. The Recipient will be provided these details as they become available. The Recipient must comply with all requirements of the Act. If the recipient believes there is any inconsistency between ARRA requirements and current award terms and conditions, the issues will be referred to the Contracting Officer for reconciliation.

Definitions

For purposes of this clause, Covered Funds means funds expended or obligated from appropriations under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5. Covered Funds will have special accounting codes and will be identified as Recovery Act funds in the grant, cooperative agreement or TIA and/or modification using Recovery Act funds. Covered Funds must be reimbursed by September 30, 2015.

Non-Federal employer means any employer with respect to covered funds -- the contractor, subcontractor, grantee, or recipient, as the case may be, if the contractor, subcontractor, grantee, or recipient is an employer; and any professional membership organization, certification of other professional body, any agent or licensee of the Federal government, or any person acting directly or indirectly in the interest of an employer receiving covered funds; or with respect to covered funds received by a State or local government, the State or local government receiving the funds and any contractor or subcontractor receiving the funds and any contractor or subcontractor of the State or local government; and does not mean any department, agency, or other entity of the federal government.

Recipient means any entity that receives Recovery Act funds directly from the Federal government (including Recovery Act funds received through grant, loan, or contract) other than an individual and includes a State that receives Recovery Act Funds.

Special Provisions

A. Flow Down Requirement

Recipients must include these special terms and conditions in any subaward.

B. Segregation of Costs

Recipients must segregate the obligations and expenditures related to funding under the Recovery Act. Financial and accounting systems should be revised as necessary to segregate, track and maintain these funds apart and separate from other revenue streams. No part of the funds from the Recovery Act shall be commingled with any other funds or used for a purpose other than that of making payments for costs allowable for Recovery Act projects.

C. Prohibition on Use of Funds

None of the funds provided under this agreement derived from the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may be used by any State or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool.

D. Access to Records

With respect to each financial assistance agreement awarded utilizing at least some of the funds appropriated or otherwise made available by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, any representative of an appropriate inspector general appointed under section 3 or 8G of the Inspector General Act of 1988 (5 U.S.C. App.) or of the Comptroller General is authorized --

(1) to examine any records of the contractor or grantee, any of its subcontractors or subgrantees, or any State or local agency administering such contract that pertain to, and involve transactions that relate to, the subcontract, subcontract, grant, or subgrant; and

(2) to interview any officer or employee of the contractor, grantee, subgrantee, or agency regarding such transactions.

E. Publication

An application may contain technical data and other data, including trade secrets and/or privileged or confidential information, which the applicant does not want disclosed to the public or used by the Government for any purpose other than the application. To protect such data, the applicant should specifically identify each page including each line or paragraph thereof containing the data to be protected and mark the cover sheet of the application with the following Notice as well as referring to the Notice on each page to which the Notice applies:

Notice of Restriction on Disclosure and Use of Data
The data contained in pages ---- of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data here to the extent provided in the award. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the applicant.

Information about this agreement will be published on the Internet and linked to the website www.recovery.gov, maintained by the Accountability and Transparency Board. The Board may exclude posting contractual or other information on the website on a case-by-case basis when necessary to protect national security or to protect information that is not subject to disclosure under sections 552 and 552a of title 5, United States Code.

F. Protecting State and Local Government and Contractor Whistleblowers.

The requirements of Section 1553 of the Act are summarized below. They include, but are not limited to:

Prohibition on Reprisals: An employee of any non-Federal employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing, including a disclosure made in the ordinary course of an employee's duties, to the Accountability and Transparency Board, an inspector general, the Comptroller General, a member of Congress, a State or Federal regulatory or law enforcement agency, a person with supervisory authority over the employee (or other person working for the employer who has the authority to investigate, discover or terminate misconduct), a court or grant jury, the head of a Federal agency, or their representatives information that the employee believes is evidence of:

- gross management of an agency contract or grant relating to covered funds;
- a gross waste of covered funds;
- a substantial and specific danger to public health or safety related to the implementation or use of covered funds;
- an abuse of authority related to the implementation or use of covered funds; or
- as violation of law, rule, or regulation related to an agency contract (including the competition for or negotiation of a contract) or grant, awarded or issued relating to covered funds.

Agency Action: Not later than 30 days after receiving an inspector general report of an alleged reprisal, the head of the agency shall determine whether there is sufficient basis to conclude that the non-Federal employer has subjected the employee to a prohibited reprisal. The agency shall either issue an order denying relief in whole or in part or shall take one or more of the following actions:

- Order the employer to take affirmative action to abate the reprisal.
- Order the employer to reinstate the person to the position that the person held before the

reprisal, together with compensation including back pay, compensatory damages, employment benefits, and other terms and conditions of employment that would apply to the person in that position if the reprisal had not been taken.

- Order the employer to pay the employee an amount equal to the aggregate amount of all costs and expenses (including attorneys' fees and expert witnesses' fees) that were reasonably incurred by the employee for or in connection with, bringing the complaint regarding the reprisal, as determined by the head of a court of competent jurisdiction.

Nonenforceability of Certain Provisions Waiving Rights and remedies or Requiring Arbitration: Except as provided in a collective bargaining agreement, the rights and remedies provided to aggrieved employees by this section may not be waived by any agreement, policy, form, or condition of employment, including any predispute arbitration agreement. No predispute arbitration agreement shall be valid or enforceable if it requires arbitration of a dispute arising out of this section.

Requirement to Post Notice of Rights and Remedies: Any employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, shall post notice of the rights and remedies as required therein. (Refer to section 1553 of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, www.Recovery.gov, for specific requirements of this section and prescribed language for the notices.).

G. Reserved

H. False Claims Act

Recipient and sub-recipients shall promptly refer to the DOE or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity or similar misconduct involving those funds.

I. Information in Support of Recovery Act Reporting

Recipient may be required to submit backup documentation for expenditures of funds under the Recovery Act including such items as timecards and invoices. Recipient shall provide copies of backup documentation at the request of the Contracting Officer or designee.

J. Availability of Funds

Funds obligated to this award are available for reimbursement of costs until 36 months after the award date.

K. Additional Funding Distribution and Assurance of Appropriate Use of Funds

Certification by Governor – For funds provided to any State or agency thereof by the American Reinvestment and Recovery Act of 2009, Pub. L. 111-5, the Governor of the State shall certify that: 1) the state will request and use funds provided by the Act; and 2) the funds

will be used to create jobs and promote economic growth.

Acceptance by State Legislature -- If funds provided to any State in any division of the Act are not accepted for use by the Governor, then acceptance by the State legislature, by means of the adoption of a concurrent resolution, shall be sufficient to provide funding to such State.

Distribution -- After adoption of a State legislature's concurrent resolution, funding to the State will be for distribution to local governments, councils of government, public entities, and public-private entities within the State either by formula or at the State's discretion.

L. Certifications

With respect to funds made available to State or local governments for infrastructure investments under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, the Governor, mayor, or other chief executive, as appropriate, certified by acceptance of this award that the infrastructure investment has received the full review and vetting required by law and that the chief executive accepts responsibility that the infrastructure investment is an appropriate use of taxpayer dollars. Recipient shall provide an additional certification that includes a description of the investment, the estimated total cost, and the amount of covered funds to be used for posting on the Internet. A State or local agency may not receive infrastructure investment funding from funds made available by the Act unless this certification is made and posted.

20. REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT

(a) This award requires the recipient to complete projects or activities which are funded under the American Recovery and Reinvestment Act of 2009 (Recovery Act) and to report on use of Recovery Act funds provided through this award. Information from these reports will be made available to the public.

(b) The reports are due no later than ten calendar days after each calendar quarter in which the Recipient receives the assistance award funded in whole or in part by the Recovery Act.

(c) Recipients and their first-tier subrecipients must maintain current registrations in the Central Contractor Registration (*http://www.ccr.gov*) at all times during which they have active federal awards funded with Recovery Act funds. A Dun and Bradstreet Data Universal Numbering System (DUNS) Number (*http://www.dnb.com*) is one of the requirements for registration in the Central Contractor Registration.

(d) The recipient shall report the information described in section 1512(c) of the Recovery Act using the reporting instructions and data elements that will be provided online at *http://www.FederalReporting.gov* and ensure that any information that is pre-filled is corrected or updated as needed.

21. NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

*Special Note: Definitization of the Provisions entitled, "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009" and "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009" will be done upon definition and review of final activities.

22. REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

If the Recipient determines at any time that any construction, alteration, or repair activity on a public building or public works will be performed during the course of the project, the Recipient shall notify the Contracting Officer prior to commencing such work and the following provisions shall apply.

(a) *Definitions*. As used in this award term and condition--

(1) *Manufactured good* means a good brought to the construction site for incorporation into the building or work that has been--

(i) Processed into a specific form and shape; or

(ii) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

(2) *Public building and public work* means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

(3) *Steel* means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Domestic preference*.

(1) This award term and condition implements Section 1605 of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111--5), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States except as provided in paragraph (b)(3) of this section and condition.

(2) This requirement does not apply to the material listed by the Federal Government as follows: None.

(3) The award official may add other iron, steel, and/or manufactured goods to the list in paragraph (b)(2) of this section and condition if the Federal Government determines that-

(i) The cost of the domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the cost of the overall project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of Section 1605 of the Recovery Act*.

(1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(3) of this section shall include adequate information for Federal Government evaluation of the request, including--

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;
(B) Unit of measure;
(C) Quantity;
(D) Cost;
(E) Time of delivery or availability;
(F) Location of the project;
(G) Name and address of the proposed supplier; and
(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(3) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, and/or manufactured goods material shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods is noncompliant with section 1605 of the American Recovery and Reinvestment Act.

(d) *Data*. To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the Recipient shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	Unit of measure	Quantity	Cost (dollars)*
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
Item 2:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

[List name, address, telephone number, email address, and contact for suppliers surveyed.

Attach copy of response; if oral, attach summary.]

[Include other applicable supporting information.]

[*Include all delivery costs to the construction site.]

23. REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions*. As used in this award term and condition--

Designated country --

(1) A World Trade Organization Government Procurement Agreement country (Aruba, Austria, Belgium, Bulgaria, Canada, Chinese Taipei (Taiwan), Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom;

(2) A Free Trade Agreement (FTA) country (Australia, Bahrain, Canada, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Mexico, Morocco, Nicaragua, Oman, Peru, or Singapore);

(3) A United States-European Communities Exchange of Letters (May 15, 1995) country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom; or

(4) An Agreement between Canada and the United States of America on Government Procurement country (Canada).

Designated country iron, steel, and/or manufactured goods –

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a manufactured good that consist in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different manufactured good distinct from the materials from which it was transformed.

Domestic iron, steel, and/or manufactured good –

(1) Is wholly the growth, product, or manufacture of the United States; or

(2) In the case of a manufactured good that consists in whole or in part of materials from another country, has been substantially transformed in the United States into a new and different manufactured good distinct from the materials from which it was transformed. There is no requirement with regard to the origin of components or subcomponents in manufactured goods or products, as long as the manufacture of the goods occurs in the United States.

Foreign iron, steel, and/or manufactured good means iron, steel and/or manufactured good that is not domestic or designated country iron, steel, and/or manufactured good.

Manufactured good means a good brought to the construction site for incorporation into the building or work that has been

(1) Processed into a specific form and shape; or

(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

Public building and public work means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Iron, steel, and manufactured goods*.

(1) The award term and condition described in this section implements-

(i) Section 1605(a) of the American Recovery and Reinvestment Act of 2009 (Pub. L. 111-5) (Recovery Act), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States; and

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated

country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. As of January 1, 2010, this obligation shall only apply to projects with an estimated value of $7,804,000 or more.

(2) The recipient shall use only domestic or designated country iron, steel, and manufactured goods in performing the work funded in whole or part with this award, except as provided in paragraphs (b)(3) and (b)(4) of this section.

(3) The requirement in paragraph (b)(2) of this section does not apply to the iron, steel, and manufactured goods listed by the Federal Government as follows: None.

(4) The award official may add other iron, steel, and manufactured goods to the list in paragraph (b)(3) of this section if the Federal Government determines that--

(i) The cost of domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, and/or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the overall cost of the project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act*.

(1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(4) of this section shall include adequate information for Federal Government evaluation of the request, including--

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;
(B) Unit of measure;
(C) Quantity;
(D) Cost;
(E) Time of delivery or availability;
(F) Location of the project;
(G) Name and address of the proposed supplier; and
(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(4) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, or manufactured goods shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other appropriate actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds, as appropriate, by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods other than designated country iron, steel, and/or manufactured goods is noncompliant with the applicable Act.

(d) *Data*. To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the applicant shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	**Unit of measure**	**Quantity**	**Cost (dollars)***
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
Item 2:			

Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

[List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.]

[Include other applicable supporting information.]

[*Include all delivery costs to the construction site.]

24. WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT

(a) Section 1606 of the Recovery Act requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Pursuant to Reorganization Plan No. 14 and the Copeland Act, 40 U.S.C. 3145, the Department of Labor has issued regulations at 29 CFR parts 1, 3, and 5 to implement the Davis-Bacon and related Acts. Regulations in 29 CFR 5.5 instruct agencies concerning application of the standard Davis-Bacon contract clauses set forth in that section. Federal agencies providing grants, cooperative agreements, and loans under the Recovery Act shall ensure that the standard Davis-Bacon contract clauses found in 29 CFR 5.5(a) are incorporated in any resultant covered contracts that are in excess of $2,000 for construction, alteration or repair (including painting and decorating).

(b) For additional guidance on the wage rate requirements of section 1606, contact your awarding agency. Recipients of grants, cooperative agreements and loans should direct their initial inquiries concerning the application of Davis-Bacon requirements to a particular federally assisted project to the Federal agency funding the project. The Secretary of Labor retains final coverage authority under Reorganization Plan Number 14.

25. RECOVERY ACT TRANSACTIONS LISTED IN SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS AND RECIPIENT RESPONSIBILITIES FOR INFORMING SUBRECIPIENTS

(a) To maximize the transparency and accountability of funds authorized under the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act) as required by Congress and in accordance with 2 CFR 215.21 “Uniform Administrative Requirements for Grants and Agreements” and OMB Circular A–102 Common Rules provisions, recipients agree to maintain records that identify adequately the source and application of Recovery Act

funds. OMB Circular A–102 is available at *http://www.whitehouse.gov/omb/circulars/a102/a102.html.*

(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A–133, "Audits of States, Local Governments, and Non-Profit Organizations," recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF–SAC) required by OMB Circular A–133. OMB Circular A–133 is available at *http://www.whitehouse.gov/omb/circulars/a133/a133.html.* This shall be accomplished by identifying expenditures for Federal awards made under the Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF–SAC by CFDA number, and inclusion of the prefix "ARRA-" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF–SAC.

(c) Recipients agree to separately identify to each subrecipient, and document at the time of subaward and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of Recovery Act funds. When a recipient awards Recovery Act funds for an existing program, the information furnished to subrecipients shall distinguish the subawards of incremental Recovery Act funds from regular subawards under the existing program.

(d) Recipients agree to require their subrecipients to include on their SEFA information to specifically identify Recovery Act funding similar to the requirements for the recipient SEFA described above. This information is needed to allow the recipient to properly monitor subrecipient expenditure of ARRA funds as well as oversight by the Federal awarding agencies, Offices of Inspector General and the Government Accountability Office.

26. DAVIS-BACON ACT AND CONTRACT WORKHOURS AND SAFETY STANDARD ACT

Definitions: For purposes of this provision, "Davis Bacon Act and Contract Work Hours and Safety Standards Act," the following definitions are applicable:

(1) "Award" means any grant, cooperative agreement or technology investment agreement made with Recovery Act funds by the Department of Energy (DOE) to a Recipient. Such Award must require compliance with the labor standards clauses and wage rate requirements of the Davis-Bacon Act (DBA) for work performed by all laborers and mechanics employed by Recipients (other than a unit of State or local government whose own employees perform the construction) Subrecipients, Contractors, and subcontractors.

(2) "Contractor" means an entity that enters into a Contract. For purposes of these clauses, Contractor shall include (as applicable) prime contractors, Recipients, Subrecipients, and Recipients' or Subrecipients' contractors, subcontractors, and lower-tier subcontractors. "Contractor" does not mean a unit of State or local government where construction is performed by its own employees."

(3) “Contract” means a contract executed by a Recipient, Subrecipient, prime contractor, or any tier subcontractor for construction, alteration, or repair. It may also mean (as applicable) (i) financial assistance instruments such as grants, cooperative agreements, technology investment agreements, and loans; and, (ii) Sub awards, contracts and subcontracts issued under financial assistance agreements. “Contract” does not mean a financial assistance instrument with a unit of State or local government where construction is performed by its own employees.

(4) “Contracting Officer” means the DOE official authorized to execute an Award on behalf of DOE and who is responsible for the business management and non-program aspects of the financial assistance process.

(5) “Recipient” means any entity other than an individual that receives an Award of Federal funds in the form of a grant, cooperative agreement, or technology investment agreement directly from the Federal Government and is financially accountable for the use of any DOE funds or property, and is legally responsible for carrying out the terms and conditions of the program and Award.

(6) “Subaward” means an award of financial assistance in the form of money, or property in lieu of money, made under an award by a Recipient to an eligible Subrecipient or by a Subrecipient to a lower-tier subrecipient. The term includes financial assistance when provided by any legal agreement, even if the agreement is called a contract, but does not include the Recipient’s procurement of goods and services to carry out the program nor does it include any form of assistance which is excluded from the definition of “Award” above.

(7) “Subrecipient” means a non-Federal entity that expends Federal funds received from a Recipient to carry out a Federal program, but does not include an individual that is a beneficiary of such a program.

(a) Davis Bacon Act

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and, without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, *provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The Contracting Officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the

Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the

Department of Energy, Recipient, or Subrecipient, may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full

social security number and current address of each covered worker, and shall provide them upon request to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 3729 of title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Department of Energy or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees—

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the

event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

(6) Contracts and Subcontracts. The Recipient, Subrecipient, the Recipient’s, and Subrecipient’s contractors and subcontractor shall insert in any Contracts the clauses contained herein in(a)(1) through (10) and such other clauses as the Department of Energy may by appropriate instructions require, and also a clause requiring the

subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of the paragraphs in this clause.

(7) Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Recipient, Subrecipient, the Contractor (or any of its subcontractors), and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No Contractor or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section, the Contractor and any

subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
(4) Contracts and Subcontracts. The Recipient, Subrecipient, and Recipient's and Subrecipient's contractor or subcontractor shall insert in any Contracts, the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(5) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the Contract for all laborers and mechanics, including guards and watchmen, working on the Contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Energy and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

(c) Recipient Responsibilities for Davis Bacon Act

(1) On behalf of the Department of Energy (DOE), Recipient shall perform the following functions:

(i) Obtain, maintain, and monitor all Davis Bacon Act (DBA) certified payroll records submitted by the Subrecipients and Contractors at any tier under this Award;

(ii) Review all DBA certified payroll records for compliance with DBA requirements, including applicable DOL wage determinations;

(iii) Notify DOE of any non-compliance with DBA requirements by Subrecipients or Contractors at any tier, including any non-compliances identified as the result of reviews performed pursuant to paragraph (ii) above;

(iv) Address any Subrecipient and any Contractor DBA non-compliance issues; if DBA non-compliance issues cannot be resolved in a timely manner, forward complaints, summary of investigations and all relevant information to DOE;

(v) Provide DOE with detailed information regarding the resolution of any DBA non-compliance issues;

(vi) Perform services in support of DOE investigations of complaints filed regarding noncompliance by Subrecipients and Contractors with DBA requirements;

(vii) Perform audit services as necessary to ensure compliance by Subrecipients and Contractors with DBA requirements and as requested by the Contracting Officer; and

(viii) Provide copies of all records upon request by DOE or DOL in a timely manner.

(d) Rates of Wages

The prevailing wage rates determined by the Secretary of Labor can be found at http://www.wdol.gov/.

Recipients/Subcontractors shall comply with all of the provisions of 10 CFR 600.236(i)(1)-(13), as applicable, including:

1. For all construction contracts in excess of $10,000, subrecipient/subcontractor must comply with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60).

2. Subrecipient/subcontractor must comply with 10 CFR 600.234 and 600.325, and the provisions referenced therein, and any and all other DOE requirements pertaining to patents, data, and copyrights.

3. For all contracts, subcontracts, and subgrants in excess of $100,000, subrecipient/subcontractor must comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15).

4. Subrecipients/subcontractors must comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163, 89 Stat. 871).

The contractor certifies that throughout the term of this Agreement, neither the Contractor nor any of its principals are, or will be, debarred, suspended, or proposed for debarment for federal financial assistance (e.g., General Service Administration' List of Parties Excluded from Federal Procurement and Non-Procurement Programs) and that the contractor will not enter into any transactions with any sub-recipients, contractors, or any of their principals who are debarred, suspended or proposed for debarment. The contractor further certifies that it will verify that no suspended or debarred entities are under contract or participating in activities under this agreement by reviewing the federal General Services Administration's Excluded Parties List System (EPLS) at http://epls.arnet.gov.