



**Department  
of  
Public Works  
  
Infrastructure  
Services Division  
Facilities Development  
& Management Section**

**2<sup>ND</sup> & PLANKINTON PARKING STRUCTURE  
EAST ELEVATOR MODERNIZATION**

724 North 2<sup>nd</sup> Street  
Milwaukee, Wisconsin

March, 2013

Project Number RM5445149002  
Official Notice No. 65

CITY OF MILWAUKEE, WISCONSIN  
DEPARTMENT OF PUBLIC WORKS  
INFRASTRUCTURE SERVICES DIVISION  
FACILITIES DEVELOPMENT &  
MANAGEMENT SECTION

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PROJECT MANUAL  
GOVERNING THE  
2<sup>nd</sup> & PLANKINTON PARKING STRUCTURE  
EAST ELEVATOR MODERNIZATION  
724 NORTH 2<sup>ND</sup> STREET  
MILWAUKEE, WISCONSIN

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Project No. **RM5445149002**

March, 2013

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00030/1

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 66.0903 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: MARTIN MATSON,  
City Comptroller

CITY OF MILWAUKEE  
SPECIFIC OFFICIAL NOTICE NO. 65

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/65-2013>. 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 Wednesday, April 24<sup>th</sup>, 2013 at 10:30 A.M. for the **2<sup>nd</sup> and Plankinton Parking Structure East Elevator Modernization located at 724 North 2<sup>nd</sup> Street, 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: 200 Working Days.

(Disincentive) Liquidated Damages, per diem: \$150.00  
(Incentive) Early Completion Amount, per diem: \$150.00

The SBE requirement for this project is 25% of the contract base bid.

**(SBE: 25%)**

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

The apprenticeship requirements for this project are: **1**

**Elevator Mechanic**

The contractor shall specifically note the SBE, 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](http://mpw.milwaukee.gov/services/bids_home)

Pre-Bid Meeting: A Pre-Bid Meeting is scheduled for **Thursday, April 18, 2013 at 2pm**, 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.

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 October 26, 2012, 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.

ALTERNATE BIDS:

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

Alternate No. 1:

State the amount to be added to the Base Bid to provide two (2) additional years of warranty and service in addition to the two year warranty and service provided in 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 Additive 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.

00100/2

INCENTIVE:

An incentive will be available for completion of the project prior to the number of allotted working days.

The "Daily Incentive Amount" will be \$150 per working day.

DISINCENTIVE:

A disincentive will be incurred for failure to complete the project within after the number of allotted working days has expired.

The "Daily Disincentive Amount" will be \$150 per working day.

BASE BID EXCLUSIONS:

None

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.

SECTION 00700: GENERAL CONDITIONS1. 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

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 Facilities Development and Management Section, Room 602, Zeidler Municipal Building.

3. Definitions:

- A. Owner: City of Milwaukee.
- B. Facilities Manager: The Facilities Manager of the 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 transfer 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 Facilities Development and Management Section 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:

- International 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

00821/1

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: 01/10/2013  
Amended On: 02/18/2013

**DETERMINATION NUMBER:** 201300081

**EXPIRATION DATE:** Prime Contracts MUST Be Awarded or Negotiated On Or Before 12/31/2013. 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

<b>CLASSIFICATION:</b>	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: <a href="http://dwd.wisconsin.gov/er/prevailing_wage_rate/Dictionary/dictionary_main.htm">dwd.wisconsin.gov/er/prevailing_wage_rate/Dictionary/dictionary_main.htm</a> .
<b>OVERTIME:</b>	<p>Time and one-half must be paid for all hours worked:</p> <ul style="list-style-type: none"><li>- over 10 hours per day on prevailing wage projects</li><li>- over 40 hours per calendar week</li><li>- Saturday and Sunday</li><li>- 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;</li><li>- The day before if January 1, July 4 or December 25 falls on a Saturday;</li><li>- The day following if January 1, July 4 or December 25 falls on a Sunday.</li></ul> <p>Apply the time and one-half overtime calculation to whichever is higher between the Hourly Basic Rate listed on this project determination or the employee's regular hourly rate of pay. Add any applicable Premium or DOT Premium to the Hourly Basic Rate before calculating overtime.</p> <p>A DOT Premium (discussed below) may supersede this time and one-half requirement.</p>
<b>FUTURE INCREASE:</b>	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.
<b>PREMIUM PAY:</b>	If indicated for a specific trade or occupation, the full amount of such pay MUST be added to the "HOURLY BASIC RATE OF PAY" indicated for such trade or occupation, whenever such pay is applicable.
<b>DOT PREMIUM:</b>	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.
<b>APPRENTICES:</b>	Pay apprentices a percentage of the applicable journey person's hourly basic rate of pay and hourly fringe benefit contributions specified in this determination. Obtain the appropriate percentage from each apprentice's contract or indenture.
<b>SUBJOURNEY:</b>	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.

<b>BUILDING OR HEAVY CONSTRUCTION</b>
---------------------------------------

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.

<b>SKILLED TRADES</b>
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<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
101	Acoustic Ceiling Tile Installer Future Increase(s): Add \$.75/hr on 6/3/2013. Add \$1.25/hr on 6/2/2014.	32.93	19.81	52.74
102	Boilermaker	31.09	27.23	58.32
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): 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.	35.80	16.87	52.67
104	Cabinet Installer Future Increase(s): Add \$.75/hr on 6/3/2013. Add \$1.25/hr on 6/2/2014.	32.93	19.81	52.74
105	Carpenter Future Increase(s): Add \$.75/hr on 6/3/2013. Add \$1.25/hr on 6/2/2014. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.93	19.81	52.74
106	Carpet Layer or Soft Floor Coverer	33.43	19.21	52.64
107	Cement Finisher	32.57	17.03	49.60
108	Drywall Taper or Finisher	29.87	18.79	48.66
109	Electrician Future Increase(s): 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.	32.20	21.71	53.91
110	Elevator Constructor	41.71	23.88	65.59
111	Fence Erector	28.00	4.50	32.50
112	Fire Sprinkler Fitter	37.45	19.30	56.75

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
113	Glazier	34.19	18.25	52.44
114	Heat or Frost Insulator	33.93	23.26	57.19
115	Insulator (Batt or Blown)	27.47	19.16	46.63
116	Ironworker	31.31	21.99	53.30
117	Lather	33.43	19.31	52.74
118	Line Constructor (Electrical)	37.05	16.94	53.99
119	Marble Finisher	20.00	0.00	20.00
120	Marble Mason	35.58	16.37	51.95
121	Metal Building Erector	18.50	3.20	21.70
122	Millwright	28.28	24.19	52.47
123	Overhead Door Installer	27.30	3.28	30.58
124	Painter	29.27	18.18	47.45
125	Pavement Marking Operator	30.00	0.00	30.00
126	Piledriver Future Increase(s): Add \$.75/hr on 6/3/2013. Premium Increase(s): Add \$.65/hr for Piledriver Loftsmen; Add \$.75/hr for Sheet Piling Loftsmen. 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.	29.06	25.46	54.52
127	Pipeline Fuser or Welder (Gas or Utility)	31.18	19.29	50.47
129	Plasterer	32.06	17.68	49.74
130	Plumber Future Increase(s): Add \$1.00/hr 6/1/2013; Add \$1.00/hr 6/1/2014.	36.47	19.47	55.94
132	Refrigeration Mechanic	37.76	19.99	57.75
133	Roofer or Waterproofer	29.40	15.55	44.95
134	Sheet Metal Worker Future Increase(s): Add \$1.41/hour 6/1/2013; Add \$1.56/hour 6/1/2014.	36.17	18.00	54.17
135	Steamfitter	37.76	19.99	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.	24.75	16.08	40.83

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
138	Temperature Control Installer	37.31	19.49	56.80
139	Terrazzo Finisher Future Increase(s): Add \$ .80 on 6/1/2013	26.57	16.50	43.07
140	Terrazzo Mechanic	29.51	17.63	47.14
141	Tile Finisher	22.27	6.52	28.79
142	Tile Setter	29.70	16.05	45.75
143	Tuckpointer, Caulker or Cleaner	34.35	11.13	45.48
144	Underwater Diver (Except on Great Lakes)	34.16	15.31	49.47
146	Well Driller or Pump Installer Future Increase(s): Add \$.20/hr on 06/01/2013.	25.32	15.45	40.77
147	Siding Installer	37.20	17.01	54.21
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	28.24	15.10	43.34
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	29.64	14.64	44.28
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.94	13.57	39.51
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	24.08	12.96	37.04
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	24.00	11.57	35.57

**TRUCK DRIVERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
201	Single Axle or Two Axle	33.32	17.60	50.92
203	Three or More Axle	18.00	9.50	27.50
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add \$0.75/hour 6/3/2013; Add \$1.00/hour 6/2/2014; Add \$1.50/hour 6/1/2015; Add \$1.60/hour 5/30/2016.	33.52	17.60	51.12
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	18.00	9.50	27.50

**LABORERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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	16.11	44.93
302	Asbestos Abatement Worker	18.00	0.00	18.00
303	Landscaper	11.00	3.97	14.97
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	19.69	16.03	35.72
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.24	15.03	32.27
314	Railroad Track Laborer	14.50	3.53	18.03
315	Final Construction Clean-Up Worker	28.82	15.61	44.43

**HEAVY EQUIPMENT OPERATORS  
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
501	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Milling Machine; Boring Machine (Directional, Horizontal or Vertical); Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Backhoe (Track Type) Having a Mfgr's Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Crane, Shovel, Dragline, Clamshells; Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Grader or Motor Patrol; Master Mechanic; Mechanic or Welder; Robotic Tool Carrier (With or Without Attachments); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Tractor (Scraper, Dozer, Pusher, Loader); Trencher (Wheel Type or Chain Type Having Over 8 Inch Bucket). Future Increase(s): Add \$0.75/hour 6/3/2013; Add \$1.00/hour 6/2/2014; Add \$1.50/hour 6/1/2015; Add \$1.60/hour 5/30/2016.	33.82	17.60	51.42

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>				
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
		<b>\$</b>	<b>\$</b>	<b>\$</b>
502	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Environmental Burner; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Jeep Digger; Screed (Milling Machine); Skid Rig; Straddle Carrier or Travel Lift; Stump Chipper; Trencher (Wheel Type or Chain Type Having 8 Inch Bucket & Under). Future Increase(s): Add \$0.75/hour 6/3/2013; Add \$1.00/hour 6/2/2014; Add \$1.50/hour 6/1/2015; Add \$1.60/hour 5/30/2016.	33.52	17.60	51.12
503	Air Compressor (&/or 400 CFM or Over); Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Greaser; High Pressure Utility Locating Machine (Daylighting Machine); Mulcher; Oiler; Post Hole Digger or Driver; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add \$0.75/hour 6/3/2013; Add \$1.00/hour 6/2/2014; Add \$1.50/hour 6/1/2015; Add \$1.60/hour 5/30/2016.	33.52	17.60	51.12
504	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	37.45	19.45	56.90
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. Future Increase(s): Add \$2.19/hr on 01/01/2013; Add \$2.00/hr on 01/01/2014. Premium Increase(s): Add \$.50/hr for Friction Crane, Lattice Boom or Crane Certification (CCO).	38.80	20.17	58.97
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. Future Increase(s): Add \$2.08/hr on 01/01/2013; Add \$2.00/hr on 01/01/2014.	34.50	20.04	54.54
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. Future Increase(s): Add \$1.88/hr on 01/01/2013; Add \$2.00/hr on 01/01/2014.	28.70	19.86	48.56

**HEAVY EQUIPMENT OPERATORS  
EXCLUDING SITE PREPARATION, UTILITY, PAVING LANDSCAPING WORK**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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
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 & Gantry (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

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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).	37.47	19.10	56.57
512	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Grout Pump; Hoist (Tugger, Automatic); Industrial Locomotives; Jeep Digger; Lift Slab Machine; Mulcher; Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames. Future Increase(s): Add \$0.75/hour 6/3/2013; Add \$1.00/hour 6/2/2014; Add \$1.50/hour 6/1/2015; Add \$1.60/hour 5/30/2016.	33.82	17.60	51.42
513	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Boatmen (NOT Performing Work on the Great Lakes); Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Elevator; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Forklift; Generator (&/or 150 KW or Over); Greaser; Heaters (Mechanical); Loading Machine (Conveyor); Oiler; Post Hole Digger or Driver; Prestress Machine; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Robotic Tool Carrier (With or Without Attachments); Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack.	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	20.59	55.48
515	Gas or Utility Pipeline, Except Sewer & Water (Secondary Equipment). Future Increase(s): Add \$1.60/hr on 06/01/2013; Add \$1.60/hr on 06/01/2014; Add \$1.65/hr on 06/01/2015	32.26	17.95	50.21
516	Fiber Optic Cable Equipment	20.00	7.88	27.88

<b>SEWER, WATER OR TUNNEL CONSTRUCTION</b>
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Includes those projects that primarily involve public sewer or water distribution, transmission or collection systems and related tunnel work (excluding buildings).

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**SKILLED TRADES**

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<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		
		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
		<b>\$</b>	<b>\$</b>	<b>\$</b>
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): 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.	35.80	16.87	52.67
105	Carpenter Future Increase(s): Add \$.75/hr on 6/3/2013. Add \$1.25/hr on 6/2/2014. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.93	19.81	52.74
107	Cement Finisher	30.68	16.75	47.43
109	Electrician Future Increase(s): 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.	32.20	21.71	53.91
111	Fence Erector	28.00	4.50	32.50
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	37.05	16.94	53.99
125	Pavement Marking Operator	28.10	15.00	43.10
126	Piledriver	29.56	24.96	54.52
130	Plumber	36.97	17.66	54.63
135	Steamfitter	38.26	19.49	57.75
137	Teledata Technician or Installer	24.65	15.67	40.32
143	Tuckpointer, Caulker or Cleaner	34.35	11.13	45.48
144	Underwater Diver (Except on Great Lakes)	37.45	19.45	56.90
146	Well Driller or Pump Installer	21.00	2.23	23.23

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	28.24	15.10	43.34
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	29.64	14.64	44.28
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.94	13.57	39.51
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	24.08	12.96	37.04
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.75	11.90	33.65

**TRUCK DRIVERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
201	Single Axle or Two Axle	25.87	13.00	38.87
203	Three or More Axle	18.00	0.00	18.00
204	Articulated, Euclid, Dumptor, Off Road Material Hauler	31.89	17.98	49.87
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	17.00	0.00	17.00

**LABORERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
301	General Laborer 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.	28.95	16.11	45.06
303	Landscaper	26.92	12.51	39.43
304	Flagperson or Traffic Control Person	23.55	13.45	37.00
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.24	15.03	32.27
314	Railroad Track Laborer	14.50	3.53	18.03

**HEAVY EQUIPMENT OPERATORS  
SEWER, WATER OR TUNNEL WORK**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
521	<p>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 &amp;/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.</p> <p>Future Increase(s): Add \$1/hr on 6/2/2013.</p> <p>Premium Increase(s): Add \$.50/hr for &gt;200 Ton / Add \$1/hr at 300 Ton / Add \$1.50 at 400 Ton / Add \$2/hr at 500 Ton &amp; Over.</p>	35.12	18.46	53.58
522	<p>Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. &amp; 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 &amp; Distributor; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &amp;/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. &amp; Under; Dredge (NOT Performing Work on the Great Lakes); Milling Machine; Skid Rig; Telehandler; Traveling Crane (Bridge Type).</p> <p>Premium Increase(s): Add \$.25/hr for operating tower crane.</p>	35.36	19.15	54.51
523	<p>Air Track, Rotary or Percussion Drilling Machine &amp;/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 &amp; Under), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb &amp; 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).</p> <p>Premium Increase(s): Add \$.25/hr for operating tower crane.</p>	34.41	19.15	53.56

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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.	31.89	18.11	50.00
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. Premium Increase(s): Add \$.25/hr for operating tower crane.	31.96	19.15	51.11
526	Boiler (Temporary Heat); Forklift; Greaser; Oiler.	30.44	19.10	49.54
527	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	37.45	19.45	56.90
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.	37.45	19.45	56.90
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.	27.75	19.15	46.90
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.	27.75	19.15	46.90

<b>AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION</b>
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**Includes all airport projects (excluding buildings) and all projects awarded by the Wisconsin Department of Transportation (excluding buildings).**

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**SKILLED TRADES**

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<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
103	Bricklayer, Blocklayer or Stonemason	35.58	19.20	54.78
105	Carpenter Future Increase(s): Add \$.75/hr on 6/3/2013. Add \$1.25/hr on 6/2/2014. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.93	19.81	52.74
107	Cement Finisher Future Increase(s): Add \$1.87 on 6/1/13; Add \$1.87 on 6/1/14; Add \$1.87 on 6/1/15; Add \$1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	30.69	17.53	48.22
109	Electrician	31.54	21.14	52.68
111	Fence Erector	28.00	4.50	32.50
116	Ironworker	31.31	21.99	53.30
118	Line Constructor (Electrical)	31.29	15.34	46.63
124	Painter	29.22	16.69	45.91
125	Pavement Marking Operator	29.22	16.69	45.91
126	Piledriver	29.56	23.86	53.42
133	Rofer or Waterproofofer	29.40	15.05	44.45
137	Teledata Technician or Installer	24.65	15.67	40.32
143	Tuckpointer, Caulker or Cleaner	34.35	11.13	45.48
144	Underwater Diver (Except on Great Lakes)	37.45	19.45	56.90
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	29.64	17.06	46.70

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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.	30.60	14.64	45.24
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.94	13.57	39.51
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	24.08	12.96	37.04
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.75	11.90	33.65

**TRUCK DRIVERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
201	Single Axle or Two Axle	33.22	18.90	52.12
203	Three or More Axle Future Increase(s): 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.	23.31	17.13	40.44
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	27.77	19.90	47.67
205	Pavement Marking Vehicle	23.84	14.90	38.74
206	Shadow or Pilot Vehicle	33.22	18.90	52.12
207	Truck Mechanic	22.50	16.19	38.69

**LABORERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
301	General Laborer Future Increase(s): 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).	25.39	18.40	43.79
302	Asbestos Abatement Worker	18.00	0.00	18.00
303	Landscaper Future Increase(s): Add \$1.70/hr on 6/1/13; Add \$1.60/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	25.39	18.40	43.79
304	Flagperson or Traffic Control Person Future Increase(s): 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.	21.88	18.40	40.28

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.24	15.03	32.27
314	Railroad Track Laborer	14.50	3.53	18.03

**HEAVY EQUIPMENT OPERATORS  
AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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 6/1/13; 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	35.22	19.90	55.12
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 6/1/13; 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	34.72	19.90	54.62

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
533	<p>Air Track, Rotary or Percussion Drilling Machine &amp;/or Hammers, Blaster; Asphalt Heater, Planer &amp; 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. &amp; Under); Bituminous (Asphalt) Plant &amp; 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 &amp; Gutter Machine; Concrete Spreader &amp; 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 &amp; A-Frames.</p> <p>Future Increase(s): Add \$2/hr on 6/1/13; Add \$1.75/hr on 6/1/14.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day &amp; Christmas Day. 2) Add \$1.25/hr night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtml">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtml</a>.</p>	34.22	19.90	54.12
534	<p>Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed &amp; Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver &amp; Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine.</p> <p>Future Increase(s): Add \$2/hr on 6/1/13; Add \$1.75/hr on 6/1/14.</p> <p>Premium Increase(s):</p>	33.96	19.90	53.86

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b><u>TOTAL</u></b>
<b><u>CODE</u></b>	<b><u>TRADE OR OCCUPATION</u></b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
	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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .			
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 6/1/13; 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	33.67	19.90	53.57
536	Fiber Optic Cable Equipment.	20.00	7.88	27.88
537	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	37.45	19.45	56.90
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.	37.45	19.45	56.90
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.	27.75	19.15	46.90
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.	27.75	19.15	46.90

<b>LOCAL STREET OR MISCELLANEOUS PAVING CONSTRUCTION</b>
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Includes roads, streets, alleys, trails, bridges, paths, racetracks, parking lots and driveways (except residential or agricultural), public sidewalks or other similar projects (excluding projects awarded by the Wisconsin Department of Transportation).

<b>SKILLED TRADES</b>
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<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
		\$	\$	\$
103	Bricklayer, Blocklayer or Stonemason	33.00	15.00	48.00
105	Carpenter	30.16	15.31	45.47
107	Cement Finisher	28.73	17.03	45.76
109	Electrician Future Increase(s): 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.	32.20	21.71	53.91
111	Fence Erector	28.00	4.50	32.50
116	Ironworker	31.31	21.99	53.30
118	Line Constructor (Electrical)	37.05	16.94	53.99
124	Painter	29.27	18.18	47.45
125	Pavement Marking Operator	28.10	15.00	43.10
126	Piledriver	29.56	24.96	54.52
133	Rofer or Waterproofer	29.40	15.05	44.45
137	Teledata Technician or Installer	24.65	15.67	40.32
143	Tuckpointer, Caulker or Cleaner	34.35	11.13	45.48
144	Underwater Diver (Except on Great Lakes)	37.45	19.45	56.90
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	29.64	14.55	44.19
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.	30.60	14.64	45.24
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.94	13.57	39.51
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	24.08	12.96	37.04
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.75	11.90	33.65

**TRUCK DRIVERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
201	Single Axle or Two Axle	25.87	13.00	38.87
203	Three or More Axle	17.00	0.00	17.00
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add \$1/hr on 6/2/2013.	32.39	18.46	50.85
205	Pavement Marking Vehicle	20.85	11.02	31.87
206	Shadow or Pilot Vehicle	25.87	13.00	38.87
207	Truck Mechanic	17.00	0.00	17.00

**LABORERS**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
301	General Laborer	22.31	18.64	40.95
303	Landscaper Future Increase(s): Add \$1.70/hr on 6/1/13; Add \$1.60/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	28.07	13.90	41.97
304	Flagperson or Traffic Control Person Future Increase(s): 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.	24.70	13.90	38.60
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.24	15.03	32.27
314	Railroad Track Laborer	14.50	3.53	18.03

**HEAVY EQUIPMENT OPERATORS  
CONCRETE PAVEMENT OR BRIDGE WORK**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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 6/1/13; 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	35.22	19.90	55.12
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 6/1/13; 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 night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a> .	34.72	19.90	54.62

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
543	<p>Air Track, Rotary or Percussion Drilling Machine &amp;/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. &amp; 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 &amp; Gutter Machine; Concrete Spreader &amp; 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 &amp; A-Frames.</p> <p>Future Increase(s): Add \$2/hr on 6/1/13; Add \$1.75/hr on 6/1/14.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day &amp; Christmas Day. 2) Add \$1.25/hr night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a>.</p>	34.22	19.90	54.12
544	<p>Backfiller; Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed &amp; Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Pile Driver &amp; Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine.</p> <p>Future Increase(s): Add \$2/hr on 6/1/13; Add \$1.75/hr on 6/1/14.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day &amp; Christmas Day. 2) Add \$1.25/hr night work premium. See DOT's website for details about the applicability of this night work premium at: <a href="http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm">http://roadwaystandards.dot.wi.gov/hcci/labor-wages-eeo/index.shtm</a>.</p>	33.96	19.90	53.86

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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.	33.02	17.60	50.62
546	Fiber Optic Cable Equipment.	20.00	7.88	27.88
547	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	37.45	19.45	56.90
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.	37.45	19.45	56.90
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.	27.75	19.15	46.90
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.	27.75	19.15	46.90

**HEAVY EQUIPMENT OPERATORS  
ASPHALT PAVEMENT OR OTHER WORK**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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.	39.16	19.10	58.26
552	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver. Future Increase(s): Add \$1/hr on 6/2/2013.	32.92	18.46	51.38

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
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.	32.67	18.44	51.11
554	Backfiller; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self-Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler. Future Increase(s): Add \$2/hr on 6/1/13; Add \$1.75/hr on 6/1/14.	33.67	19.55	53.22
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 6/1/13; Add \$1.75/hr on 6/1/14.	33.67	19.55	53.22
556	Fiber Optic Cable Equipment.	20.00	7.88	27.88

<b>RESIDENTIAL OR AGRICULTURAL CONSTRUCTION</b>
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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.

<b>SKILLED TRADES</b>
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<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u>	<u>HOURLY FRINGE BENEFITS</u>	<u>TOTAL</u>
		\$	\$	\$
101	Acoustic Ceiling Tile Installer	19.50	10.98	30.48
102	Boilermaker	31.09	27.23	58.32
103	Bricklayer, Blocklayer or Stonemason	25.00	12.36	37.36
104	Cabinet Installer	26.00	2.61	28.61
105	Carpenter	33.43	7.16	40.59
106	Carpet Layer or Soft Floor Coverer	32.93	21.85	54.78
107	Cement Finisher	23.32	6.27	29.59
108	Drywall Taper or Finisher	29.87	18.79	48.66
109	Electrician	24.50	8.96	33.46
110	Elevator Constructor	41.71	23.88	65.59
111	Fence Erector	13.00	1.07	14.07
112	Fire Sprinkler Fitter	37.45	19.30	56.75
113	Glazier	22.00	2.09	24.09
114	Heat or Frost Insulator	35.00	0.00	35.00
115	Insulator (Batt or Blown)	12.82	0.00	12.82
116	Ironworker	30.90	19.11	50.01
117	Lather	33.43	7.16	40.59
119	Marble Finisher	16.50	2.38	18.88
120	Marble Mason	25.00	12.36	37.36
121	Metal Building Erector	17.00	2.62	19.62
123	Overhead Door Installer	25.00	19.00	44.00
124	Painter	23.50	3.73	27.23
125	Pavement Marking Operator	28.10	15.00	43.10

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
129	Plasterer	20.00	0.00	20.00
130	Plumber	36.97	18.42	55.39
132	Refrigeration Mechanic	24.75	10.42	35.17
133	Roofer or Waterproofer	29.40	15.55	44.95
134	Sheet Metal Worker	28.15	15.14	43.29
135	Steamfitter	38.26	19.49	57.75
137	Teledata Technician or Installer	18.85	5.00	23.85
138	Temperature Control Installer	22.00	1.10	23.10
139	Terrazzo Finisher	26.57	16.00	42.57
140	Terrazzo Mechanic	30.01	17.13	47.14
141	Tile Finisher	20.60	3.53	24.13
142	Tile Setter	20.43	8.03	28.46
143	Tuckpointer, Caulker or Cleaner	32.50	2.84	35.34
146	Well Driller or Pump Installer	27.60	0.00	27.60
147	Siding Installer	16.00	0.62	16.62

#### TRUCK DRIVERS

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
201	Single Axle or Two Axle	16.25	4.60	20.85
203	Three or More Axle	17.10	1.78	18.88
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	19.00	1.85	20.85

#### LABORERS

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
301	General Laborer	18.00	6.16	24.16
302	Asbestos Abatement Worker	18.00	0.00	18.00
303	Landscaper	11.00	0.00	11.00

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.24	15.03	32.27
315	Final Construction Clean-Up Worker	15.00	0.00	15.00

**HEAVY EQUIPMENT OPERATORS  
RESIDENTIAL OR AGRICULTURAL CONSTRUCTION**

<b>Fringe Benefits Must Be Paid On <u>All</u> Hours Worked</b>		<b>HOURLY BASIC RATE OF PAY</b>	<b>HOURLY FRINGE BENEFITS</b>	<b>TOTAL</b>
<b>CODE</b>	<b>TRADE OR OCCUPATION</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
557	Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Backhoe (Track Type); Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boring Machine (Directional, Horizontal or Vertical); Bulldozer or Endloader; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Crane, Shovel, Dragline, Clamshells; Forestry Equipment, Timberco, Tree Shear, Tub Grinder, Processor; Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type); Winches & A-Frames.	23.35	5.58	28.93
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.	21.10	0.87	21.97

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

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.

<u>Sheet No.</u>	<u>Title</u>
T-1	Title Sheet
AS-1	Partial Plan - Architectural New Work
AS-2	Architectural Details
M-1	Partial Plan – Mechanical New Work
E-1	Partial Plan - Electrical Demolition
E-2	Partial Plan - Electrical New Work

SECTION 01010: SUMMARY OF WORK:1. SCOPE:A. Index:

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

2. PROJECT DESCRIPTION:

- A. In general, the project includes all site and building work (unless otherwise noted) necessary for modernization of one electric traction elevator, including; controller, drive mechanism, door systems, wiring, lighting, etc. to constitute a complete installation as specified for the East Elevator at the 2<sup>nd</sup> & Plankinton Ave Public Parking Structure, as described in the plans and as specified herein.
- B. The City will occupy Site and existing public parking structure during entire period of construction for conduct of operations. Cooperate with the City during project construction operation to minimize conflicts and facilitate City's normal operations. Contractor shall, at all times, conduct operation to ensure least inconvenience to City, other contractors, general public, and operation of the 2<sup>nd</sup> & Plankinton Ave. Public Parking Structure operation.
- C. The contractor must coordinate all work with the City, 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. Scope of work includes but is not limited to the following:

1. Furnish and install new VVVF control panel.
2. Minimally recondition car interior as specified. Provide new energy efficient lighting as specified
3. Furnish and install all new penthouse, hoistway, and car wiring. Provide new duct and conduits. Start-up and test the systems for proper operation. Clean up area and dispose of rubbish.
4. Remove old buttons, operating panels, and replace with new faceplates at the proper height.
5. Furnish and install vandal resistant car control stations, Braille plates, corridor call stations, etc., as specified.
6. Furnish "as-built" drawings and wiring diagrams.
7. Remove all old material, unused and abandoned conduit, and wiring.
8. All work shall be performed in accordance with the latest edition (as of the date bids are taken) of the American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks (ANSI A17.1), ANSI A117.1, Barrier Free Code as pertaining to Passenger Elevators, The National Electric Code, and/or such State and Local codes as applicable.
9. Furnish and install a new store-front style window glazed enclosure at the 7<sup>th</sup> floor East Elevator vestibule, as shown on Plans and Specifications Division 8.
10. Install air conditioning system as specified to serve the elevator machine room.
11. Provide warranty, start-up service, O & M Manuals, record as-built drawings and all other specified documentation.
12. All required approvals and necessary permits and fees shall be obtained for this project.
13. Attend regularly scheduled construction meeting until project completion.
14. 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.
15. Contractors shall maintain any special security procedures that are in place at the site.
16. Furnish and install new window and storefront Prefin framings at existing window opening in the elevator penthouse where shown on Plans and Specification Division 5.
17. Furnish and install a new wall mounted mini-split air conditioning unit with outdoor roof mounted Air-Cooled Condenser Unit for elevator penthouse equipment cooling as shown on Plans and Specification Division 15.
18. Furnish and install a new electric space heating system for elevator pit as shown on Plans and Specification Division 16.
19. Provide all equipment, materials and labor necessary to upgrade the existing electrical power systems for the passenger elevator modernization, including; elevator power and lighting systems as shown on Plans and Specification Division 26.
20. Provide all equipment, materials, and labor necessary to modify the existing plant telephone system to service the passenger elevator modernization upgrades as shown on Plans and Specification Division 26.
21. Provide all equipment, materials and labor necessary to furnish and install a new fire alarm system for Phase I and II Emergency control and alarm requirements for the freight elevator modernization upgrades as shown on Plans and Specification Division 28.

WORK BY OTHERS:

None.

4. SCHEDULING OF WORK:

- A. Within ten (10) business days after Notice to Proceed is issued, the contractor shall submit a construction schedule for approval. The schedule shall be made in sufficient detail to indicate dates of each significant operation. The schedule shall be such that the entire job will be completed within the specified completion time. Contractor shall submit the schedule in hard copy and electronic format using Microsoft Project or Primavera P6.
- B. All work shall be done after 6:00 AM and before 3:30 PM on weekdays as the building will remain in operation and be occupied during construction.
- C. Contractor shall notify DPW, ISD - Facilities Development and Management Section 48 hours in advance of commencement of any work on this project.
- D. Site work is not to proceed without authorization from the owner or its engineer/consultant or before a Pre-Construction Meeting.

- E. Contractor shall schedule and execute construction activities in a manner which minimizes disruption of operations. As such, construction activities shall be carried out in a contiguous fashion.
- F. All work shall be completed within the time period designated in the contract documents.
- G. Contractor shall protect existing equipment, floors, and walls from all construction debris and damage.
- H. 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.

5. GENERAL SPECIFICATIONS:

- A. For purposes of this contract the following modifications have been made to the City of Milwaukee, Department of Public Works General Specifications.
  - 1. Delete in their entirety articles 2.4.10 and 2.4.11
  - 2. Article 2.4.13 shall be modified to read:

2.4.13.1 Inspection

All materials and each part or detail of the work shall be subject at all times to inspection by the Commissioner or the Commissioner's authorized representatives, and the Contractor shall be held strictly to the true intent of the specifications in regard to quality of materials, workmanship, and the diligent execution of the contract. Such inspection may include mill, plant, or shop inspection, and any material furnished under these specifications is subject to such inspection. The Commissioner or the Commissioner's representatives shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is determined by the Commissioner or the Commissioner's representative to make a complete and detailed inspection.

The Contractor shall, if the Commissioner requests, remove or uncover such portion of the finished work as the Commissioner may direct before the final acceptance. After the examination, the Contractor shall restore said portion of the work to the standard required by the specifications. If the work thus exposed and examined proves acceptable, the expense of uncovering or removing and replacing the parts removed shall be paid for as extra work but, if the work so exposed and examined is unacceptable, the expense of the uncovering or removing and replacing in accordance with the specifications shall be borne by the Contractor.

Failure or negligence on the part of the Commissioner or the Commissioner's representative to condemn or reject substandard or inferior work or materials shall not be construed to imply an acceptance of such work or materials, if it becomes evident at any time prior to the final acceptance of the work by the City. Neither shall it be construed as barring the City at any subsequent time from the recovery of damages or of such a sum of money as may be needed to rebuild and/or replace all portions of the substandard or inferior work or replacement of improper materials wherever found.

Any portion of the work or any material incorporated into the work, which may have become

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damaged by contractor or as a result of the control or lack of protection during the progress of the work, shall be removed and replaced at the expense of the Contractor prior to final inspection and acceptance of the work.

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

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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/PERMITS1. 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 Facilities Development and Management Section. 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.

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- 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.

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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. Water
9. Toilet Facilities
10. Parking
11. Barricades and Signage

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.

Outlying buildings are not generally open to the public. Contracted work in these buildings can take place at any time. It is essential that contractors and their City agents understand and abide by security policy.

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B. Scope:

At the beginning of any project, a copy of this policy and procedure statement will be added to the 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 Buildings and Fleet Services 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, DPW Facilities Dev. & Management. City shall be responsible to ensure the sheet and badges are transported to the appropriate location where the work is to be completed (City Hall Information Center for the Downtown Complex, for outlying buildings to the designated Facility Manager) 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.

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 the City (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.

E. Key or Key Card Access: Effective October 1, 2004 - The following policy has been established to maintain control of City Property and to ensure the physical protection of the City Hall Complex. signing out access cards and/or keys from the Information Center will be following the steps below.

- 1) 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.

- 2) Provide the Operator your driver's license as collateral for the return of City property.
- 3) Sign out the property in the sign out book as per current policy.
- 4) 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.
- 5) Sign out at the end of your workday on the sign out sheet.
- 6) 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.
- 7) In the event that keys or cards are not returned daily the contractor in question will have a deduct (security violation) **\$50.00** penalty for each occurrence.as per the contract. Individuals who loose or fail to return keys will be responsible for the cost of re-keying to the City.
- 8) Contractors shall not ask custodians or mechanics to unlock doors. In the rare case where access is not provided, the City Hall Operator may be contacted to assist in providing access. 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.

F. Dock Access: 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.

G. Outlying Building Access:

- 1) 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.
- 2) 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.
- 3) 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.

- 4) Use of City materials is strictly prohibited unless pre-arranged through the City employee contact.
- 5) 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 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:

- A. Contractor may use existing outlets for power. Contractor is to supply his own extension cords. All current used will be provided and paid by the City of Milwaukee.
- B. OSHA regulations require that employers use either ground fault circuit interrupters or an assured equipment grounding conductor problem in addition to any other regulations for equipment grounding conductors.

8. WATER:

Contractor may use existing hose bibs for water. Contractor is to supply his own hoses. Contractor's hoses shall be leak free and contractor is to regulate the flow to limit it to project related use. The cost of the water will be paid for by the City.

9. TOILET FACILITIES:

Contractor may use existing toilet facilities in the building but will then be responsible to ensure that the facility is kept in a sanitary condition.

10. PARKING:

Contractor is responsible for parking of vehicles. No parking areas will be provided by the City.

11. BARRICADES AND SIGNAGE:

Contractor is to provide barricades and signage as required by OSHA and City/State Codes for their work.

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
1. The purpose of the Construction Waste Management Plan is to identify construction waste reduction goals, identify targeted materials, and explain specific waste reduction actions to be taken, by whom, and when.
  2. 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. 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.
- C. 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 **75%** 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 lie 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. 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.
- 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 Section 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. The premises and the work shall be adequately protected from damage from the

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commencement of work to the date of final acceptance.

- B. All construction work and traffic shall remain within the construction area.
- C. All damage shall be corrected or repaired by the contractor or contractors causing same at his or their own expense.
- D. 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:

1. Scope
2. General
3. Safety Cleaning
4. Progress Cleaning
5. Disposal
6. Final Cleaning
7. Charges
8. Record Drawings
9. Owner's Manuals and Training
10. Guarantees
11. Maintenance
12. Emergency Callback Service

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.

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.
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. RECORD DRAWINGS:
- A. At the completion of work and prior to final payment, the mechanical and electrical contractors shall provide Facilities Development and Management Section with three (3) marked up sets of prints showing all changes or variations from contract drawings, and not specified on change order drawings theretofore issued. Contractors providing buried or concealed piping, conduit, or similar items shall locate such items by dimensions and elevations.
  - B. Other contractors shall provide one (1) marked up set of prints showing all changes or variations from contract drawings.
  - C. Drawings shall show complete layout of revised piping, equipment, etc., as actually installed.
9. OWNER'S MANUALS AND TRAINING:
- A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment at the time of the owner's training. In addition, provide owner's manuals in an electronic format. Final retention will be withheld until data is received by owner and reviewed by consultant. Include the following as minimums:

1. Straight-line wiring diagram of "as-installed" elevator circuits, with index of location and function of components. Provide one set reproducible master drawings. These diagrams are owner's property.
2. Lubricating instructions, including recommended grade of lubricants.
3. Parts catalogs for all replaceable parts including ordering forms and instructions.
4. Four sets of neatly tagged keys for all switches and control features.
5. Diagnostic equipment complete with access codes, adjusters, manuals, set-up manuals, etc., for adjustment, diagnosis, and troubleshooting of elevator system and performance of routine safety tests.

B. Non-Proprietary Equipment Design:

1. Provider shall submit the following information, within 30 days of final acceptance of the installation, for owner's file:
  - a. Wiring Diagrams: Three sets of "as installed" straight-line wiring diagrams showing the electrical connections of all equipment and all modifications to control circuits. One set of straight-line wiring diagrams shall be a reproducible original. A legend sheet shall be furnished with each set of drawings to provide the following information:
    - (1) Name and symbol of each relay, switch, or other apparatus.
    - (2) Location on drawings, drawing sheet number and area, and location of all contacts.
    - (3) Location of apparatus – whether on controller or on car.
    - (4) Lubricating instructions, including recommended grade of lubricants.
  - b. Parts Catalog: Three sets of complete parts catalogs listing all replaceable parts including manufacturer's identifying numbers and ordering instructions.
  - c. Printed Instructions: Three sets of neatly bound instructions explaining all operating features.
  - d. Complete software documentation for all installed equipment.
  - e. Diagnostic Test Equipment and Instructions: Provide all diagnostic test devices together with one set of all supporting information necessary for interpretation of test data and troubleshooting of system.
  - f. The elevator installation shall be a design that can be maintainable by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions, from the original equipment manufacturer.
    - (1) Provide on-site capability to diagnose faults to the level of individual circuit boards and individual discreet components for the solid state elevator controller.

- (2) If the equipment for fault diagnosis is not completely self-contained within the controllers but requires a separate, detachable device, that device shall be furnished to the owner as part of this installation. Such device shall be in possession of and become property of the owner.
  - (3) Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to the owner.
  - g. Equipment provider is responsible for upgrades and/or revisions of software during the progress of the work, warranty period, and the term of the ongoing maintenance agreement, between the owner and provider.
- C. Training: Provide owner training prior to placing the completed elevator into operation. Provide follow-up training to the owner's personnel eleven (11) months after the elevator is placed into operation.
- 1. The training shall include the following:
    - a. Emergency fire service operation.
    - b. Emergency power operation.
    - c. Demonstrate enunciator panel function.
    - d. Smoke detection reset operation.
    - e. Emergency lowering operation (manual lowering).
    - f. Emergency key release.
    - g. Security operation.
  - 2. The contractor shall provide O & M manuals and an outline of the training session prior to scheduling the training session.

10. GUARANTEES:

- A. Each contractor shall guarantee to replace or repair promptly at his own expense, as directed by the Commissioner of Public Works or his agent, all workmanship or materials in which defects may develop within two (2) year from the date of final acceptance of his work. This guarantee includes all damage done to the City due to faulty equipment, poor installation or poor construction.
- B. Guarantee periods other than the two year time period are indicated in specific specification sections.

11. MAINTENANCE:

- A. The contractor shall furnish maintenance on the equipment installed under this contract for a period of 24 months beginning on the date that the elevator car is turned over and accepted by the City. This maintenance is to include regular examinations, adjustments, and lubrication of all elevator equipment. The contractor to repair or replace electrical and mechanical parts of the elevator equipment whenever required. It is understood that the contractor's obligation for repairs or replacement parts under this maintenance provision

applies to the materials and equipment furnished and installed under this contract. Renewals or repairs necessitated by reason of negligence or misuse of the equipment or by reason of any other cause beyond the control of this contractor, except ordinary wear and tear, shall not be the responsibility of this contractor.

- B. The elevator contractor shall perform all maintenance on the elevator during this contract. This maintenance provision is to include regular examinations, adjustments, and lubrication of all elevator equipment. This contractor is to repair or replace electrical and mechanical parts of the elevator equipment whenever required.
- C. All work under this maintenance provision is to be performed by competent and trained elevator service personnel under the supervision and direct employment of this contractor. Emergency call back service shall be available at all times.

12. EMERGENCY CALLBACK SERVICE:

Where emergency call back service is required, the successful bidder shall certify that they maintain adequate staff to respond to any call for this service within two hours after receipt of call with a service technician on site. In an instance of entrapment of personnel, the contractor must arrive within 30 minutes of receiving the call. There shall be a \$100.00 per hour deduct from the contract should the contractor fail to arrive onsite within the require time (2 hours emergency maintenance; 30 minute personnel entrapment). Contractor shall provide a telephone number that is monitored 24 hours a day, 7 days a week as the emergency contact. Additionally, the contractor shall program the elevator emergency phone to dial this number and the City Hall operator. The contractor will be held responsible for responding to the call.

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**SECTION 04200  
UNIT MASONRY**

**PART 1 - GENERAL**

1.1 SCOPE

- A. The work under this section includes all labor, supervision, material, equipment and related services necessary to furnish and install:

1. Concrete masonry units.
2. Concrete building brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Grouting.
10. Grouted concrete curb.

1.2 RELATED WORK

- A. Applicable provisions of Division 1 shall govern all work under this Section. The Contractor shall consult these provisions in detail prior to proceeding with work.

1. Division 08 "Hollow Metal Frames" for hollow metal frames to be anchored to masonry walls.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- D. Preinstallation Conference: Conduct conference at Project site to review schedule, means and methods.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.7 PROJECT CONDITIONS

- A. Provide enclosure to confine dust, dirt and debris to work area.
- B. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections and existing surfaces from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Protect parking deck membrane from damage. This contractor shall repair parking deck membrane where damaged by masonry work.
- E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

- F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- G. Protect deck surface at work area with plywood protection board. At completion of work, remove protection board.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow 10% percent of units to contain chips, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for ends of wall, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners unless otherwise indicated.

- B. CMUs: ASTM C 90.

1. Density Classification: Normal weight.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

- C. Concrete Building Brick: ASTM C 55.

1. Density Classification: Normal weight.

### 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color to match existing mortar color.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

- D. Masonry Cement: ASTM C 91.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Capital Materials Corporation; Flamingo Color Masonry Cement.
- b. Cemex S.A.B. de C.V
- c. Essroc, Italcementi Group
- d. Holcim (US) Inc.

- e. Lafarge North America Inc.
- f. Lehigh Cement Company
- g. National Cement Company, Inc.; Coosa Masonry Cement.

E. Aggregate for Mortar: ASTM C 144.

- 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

## 2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M. Electrically welded and galvanized side and cross rod truss type.. Conform with IBC 2009 Section 2103.13. Galvanizing shall conform to ASTM A 116, class 1 (min. 4 oz. per square foot).

- 1. Single Wythe Walls: Truss type with deformed No. 9 gage side wires and plain cross rods. Provide specially fabricated units for all corners and all wall intersections.

a. Products:

- 1) Wire Bond Truss 2 Wire System Series 300.
- 2) Hohman & Barnard, Inc Truss Mesh No. 120.

## 2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

- 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
- 2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
- 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

B. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from steel sheet, galvanized after fabrication not less 0.043 inch thick.

## 2.6 MASONRY CLEANERS

A. Proprietary Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

## 2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type S.
  - 2. For reinforced masonry, use Type S.
  - 3. For mortar parge coats, use Type S or Type N.
  - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
  - 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
  - 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Provide grouted concrete curb at knee wall to creates a level masonry bearing to match adjacent masonry coursing.

### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
  - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
  - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
  - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
  - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
  - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.

7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout where indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- 3.6 MASONRY JOINT REINFORCEMENT
- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
  2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls, knee walls and parapet walls.
  3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings or edge of infill and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
- 3.7 CONTROL AND EXPANSION JOINTS
- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Rake out mortar joints for sealant bead and backer rod installation.
- 3.8 REINFORCED UNIT MASONRY INSTALLATION
- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
  - C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
    1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
    2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).
- 3.9 REPAIRING, POINTING, AND CLEANING
- A. Where new work occurs, remove and/or replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that prevent proper installation of adjacent materials. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
  - B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
  - C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
  - D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
    1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
    2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
    3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
    4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
    5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
    6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
- 3.10 MASONRY WASTE DISPOSAL
- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove these and all waste materials from Project site.

END OF SECTION

Masonry  
04200-10  
February 11, 2013

2<sup>nd</sup> & Plankinton Parking Structure East  
Elevator Modernization  
COM #RM5445149002

**SECTION 07180  
TRAFFIC COATINGS**

**PART 1 - GENERAL**

1.1 SCOPE

A. Section includes:

1. Providing traffic coating membrane base on new walls.
2. Repair and/or re-coating of existing traffic coating and wall base where damaged by construction.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Specification Sections, apply to this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including installation instructions.

- B. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

- C. Samples for Initial Selection:

1. For each type of exposed finish and aggregate.
2. Manufacturer's full range of available colors.
3. Aggregate samples applied to minimum 12" x 12" rigid backing.

- D. Samples for Verification: For each type of exposed finish, prepared on minimum 18" x 18" rigid backing.

1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.
2. For each type of exposed finish and aggregate in selected color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Certificates: For each type of traffic coating.

- C. Field quality control report.

- D. Sample Warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Product Data: For all materials used under this section.

B. Maintenance Data: For traffic coatings to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be qualified for the project of this scope and be an authorized representative who is trained and approved by manufacturer. Being sold materials for the project does not constitute a Contractor as a qualified installer.

#### 1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to contaminated, damp or wet substrates; when air temperatures are below 50 deg F and falling; when relative humidity exceeds 85 percent; when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

D. Schedule: Submit in writing a description of the work activities, schedule of work and needed facility closures to the Facilities Development and Management Construction Representative. Obtain Facilities Development and Management Construction Representative approval of the schedule in writing prior to proceeding with work.

#### 1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

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

- a. Adhesive or cohesive failures.
- b. Abrasion or tearing failures.
- c. Surface crazing or spalling.
- d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:

1. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
2. Obtain pavement-marking paint from single source from single manufacturer.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for vehicular traffic according to ASTM C 957.

1. Traffic coating system shall be suitable for heavy vehicular traffic including vehicle turning lanes, entrances and exits. System includes but is not limited to surface preparation and re-coating over the existing traffic membrane. System will also require vertical application at walls.
2. Basis-of-Design Product: Subject to compliance with requirements, provide products by one of the following manufacturers:
  - a. Tremco Incorporated; an RPM company.(Basis of Design)
  - b. Advanced Polymer Technology Corporation.
  - c. BASF Construction Chemicals, LLC - Building Systems.
  - d. Neogard; Division of Jones-Blair.

B. Primer:

1. Liquid primer recommended for substrate and conditions by traffic-coating manufacturer.
2. Basis of Design: Vulkem Primer 191. Low VOC one-part interlaminar primer.

C. Base Coat:

1. Polyurethane of minimum film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.
2. Basis of Design: Vulkem 350NF roller grade two-part, slightly thixotropic, polyurethane coating used as the elastomeric waterproofing base coat.

D. Intermediate Coat

1. Two-part aromatic low odor/no VOC, 99% solids polyurethane of minimum film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.
2. Basis of Design: Vulkem 950NF Coating. Two-part aromatic low odor/no VOC, 99% solids polyurethane providing a chemical resistant, weatherproof surface.

E. Top Coat:

1. Two-part low odor/no VOC aliphatic polyurethane of minimum film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.

2. Basis of Design: Vulkem 951NF. Two-part low odor/no VOC aliphatic 99% solid polyurethane. Chemical and UV resistant, color stable, weatherproof wearing surface.

F. Aggregate:

1. Match existing aggregate.

2.3 ACCESSORY MATERIALS

A. Joint Sealants:

1. ASTM C 920 and as recommended in writing by traffic coating manufacturer.
2. Basis of Design: Dymeric 240C Sealant. Two part chemically cured, gun grade polyurethane deck joint sealant for use in sealing cracks, expansion joints and for use in forming cants.

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

**PART 3 - EXECUTION**

3.1 GENERAL

A. Install traffic coating per manufacturer's written recommendations.

B. The intent is for new coating to match existing coating in color and texture.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer and Manufacturer's representative present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly clean, dry and free of moisture and contaminants that could affect the traffic coating performance.

C. Proceed with installation only after adjacent construction work has been completed and unsatisfactory conditions have been corrected.

1. Begin coating application only after substrates are clean and dry and suitable for the application of the traffic coating as recommended in writing by the traffic coating manufacturer.

2. Application of coating indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

- B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.
- C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.
- D. Substrates:
  - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete and existing traffic coatings. Refer to SYSTEM 1 and SYSTEM 2.
  - 2. Remove fins, ridges, and other projections.
  - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
  - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.
  - 5. Re-Coating Areas - Remove incompatible materials and loose existing traffic coating that might affect the new traffic coating adhesion and performance.

#### 3.4 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.
- B. Provide sealant cants at penetrations and at reinforced and non-reinforced, deck-to-wall butt joints and deck to curb joints per manufacturer's written instructions.
- C. Terminate edges of deck-to-deck expansion joints and joints between new and existing coatings with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

#### 3.5 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.
- B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

#### 3.6 TRAFFIC-COATING APPLICATION

- A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

- B. Apply number of coats of specified compositions for each type of traffic coating recommendations at locations as indicated:
    - 1. After substrate preparation, apply primer over existing traffic coating and areas of exposed concrete to be patched.
    - 2. Apply base coat within the area to be patched. Level of base coat to be less than the level of the surface of the adjacent existing traffic coating to allow the intermediate coating to be applied to the same level as the adjacent existing traffic coating. Minimum application shall be at a rate of 64 sq.ft./gal. and a minimum of 25 mil wet film thickness.
    - 3. Apply intermediate coating to the same level as the adjacent existing traffic coating. Apply intermediate coat at a rate of 125 sq.ft./gal. and a minimum of 12 mil wet film thickness.
    - 4. Apply top coat at a rate of 125 sq.ft./gal. and a minimum of 12 mil wet film thickness over the existing traffic coating and the area being patched. Broadcast Aggregate 'A' over the entire area while topcoat is wet and backroll into the coating to provide a continuous encapsulated look with a standard slip resistance.
  - C. Start traffic-coating application in presence of manufacturer's technical representative.
  - D. Verify that wet film thickness per manufacturer's written guidelines.
  - E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, remove excess aggregate.
  - F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height of existing wall terminations.
  - G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.
- 3.7 FIELD QUALITY CONTROL
- A. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.
- 3.8 PROTECTING AND CLEANING
- A. Until the areas with applied traffic coating and pavement markings are cured or dried and released to the Facilities Development and Management Construction Representative for use, provide:
    - 1. Traffic barricades and protect traffic coatings from damage and wear during remainder of construction and curing period. Inform Facilities Development and Management Construction Representative in writing of when traffic coatings will be available to receive vehicular and pedestrian traffic.
    - 2. Protection from direct and wind driven precipitation and also direct and wind driven debris. Protect traffic coating from liquid runoff within the parking structure.
  - B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07180

**SECTION 07920  
JOINT SEALANTS**

**PART 1 – GENERAL**

1.1 SCOPE

- A. The work under this section includes all labor, material, equipment and related services necessary to install joint sealants and associated components. Joint sealants for applications indicated in the Joint Sealant Schedule at the end of Part 3.

1.2 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this Section. The Contractor shall consult these provisions in detail prior to proceeding with work.
  - 1. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
  - 2. Division 08 Section "Hollow Metal Doors and Frames".

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 SUSTAINABILITY

- A. All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site shall comply with the requirements of the following reference standards –
  - 1. Adhesives, Sealants and Sealant Primers: Limit VOC's per South Coast Air Quality Management District (SCAQMD) Rule #1168.

1.7 PROJECT CONDITIONS

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

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40°F (5°C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### **2.2 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  1. Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.

### **2.3 ELASTOMERIC JOINT SEALANTS**

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Multi-component Nonsag Urethane Sealant:
  1. Products:
    - a. Pecora Corporation; Dynatrol II.
    - b. Tremco; THC 900/901
  2. Type and Grade: M (multicomponent) and NS (nonsag).
  3. Class: 50.
  4. Uses Related to Exposure: NT (nontraffic) and T (traffic).
  5. Uses Related to Joint Substrates: M, G, A, and as applicable to joint substrates indicated, O.
  6. Use O Joint Substrates: Color aluminum, galvanized steel, brick and concrete.
- D. Single-component Nonsag Urethane Sealant:
  1. Products:
    - a. Pecora Corporation; Dynatrol I-XL.
    - b. Tremco; Dymonic FC

2. Type and Grade: S (singlecomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and as applicable to joint substrates indicated, O.
6. Use O Joint Substrates: Color aluminum, galvanized steel, brick and concrete.

#### 2.4 LATEX JOINT SEALANTS

- A. Acrylic latex or siliconized acrylic latex sealant. Comply with ASTM C 834, Type OP, Grade NF.
- B. Products:
  1. Pecora Corporation; AC-20+.
  2. Sonneborn, Division of ChemRex Inc.; Sonolac.
  3. Tremco; Tremflex 834.

#### 2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to  $-26^{\circ}\text{F}$  ( $-32^{\circ}\text{C}$ ). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

#### 2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### **PART 3 – EXECUTION**

#### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Stone and precast.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
  5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- 3.4 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.5 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
- B. Notify City Project Representative in writing with locations of newly applied joint sealants. Coordinate and provide barriers as necessary to protect applied sealant from personnel contact. Maintain barriers until sealant is cured.
- 3.6 JOINT-SEALANT SCHEDULE
- A. Joint-Sealant Application: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
1. Joint Sealant: Multicomponent nonsag urethane sealant.
  2. Joint-Sealant Color: As selected by Owner from manufacturer's full range.

- B. Joint-Sealant Application: Exterior perimeter joints between masonry, stone, concrete, frames of doors, windows, flashing and louvers. Vestibule at Level 7 is considered an exterior space.
  - 1. Joint Sealant: Multicomponent nonsag urethane sealant.
  - 2. Joint-Sealant Color: As selected by Owner from manufacturer's full range.
  
- C. Joint-Sealant Application: Other exterior joints in vertical and horizontal nontraffic surfaces. Vestibule at Level 7 is considered an exterior space.
  - 1. Joint Sealant: Multicomponent nonsag urethane sealant.
  - 2. Joint-Sealant Color: As selected by Owner from manufacturer's full range.
  
- D. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
  - 1. Joint Sealant: Multicomponent nonsag urethane sealant.
  - 2. Joint-Sealant Color: As selected by Owner from manufacturer's full range.
  
- E. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frame of elevator penthouse window.
  - 1. Joint Sealant: Multicomponent nonsag urethane sealant.
  - 2. Joint-Sealant Color: As selected by Owner from manufacturer's full range.

END OF SECTION

**SECTION 08113  
HOLLOW METAL FRAMES**

**PART 1 - GENERAL**

1.1 SCOPE

- A. The work under this section includes all labor, supervision, material, equipment and related services necessary to furnish and install custom hollow metal frames and metal louver glazed into hollow metal frame.

1.2 RELATED WORK

- A. Applicable provisions of Division 1 shall govern all work under this Section. The Contractor shall consult these provisions in detail prior to proceeding with work.
  - 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
  - 2. Division 09 Section "Painting" for field painting factory-primed doors and frames.

1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Shop Drawings: Show the following:
  - 1. Elevations of each hollow metal frame installation.
  - 2. Frame details for each frame type including dimensioned profiles.
  - 3. Details and locations of reinforcement and preparations for hardware.
  - 4. Details of each different wall opening condition.
  - 5. Details of anchorages, accessories, joints, and connections.
- C. Operating and Maintenance Manual Data: Submit data on all products for inclusion in O&M Manual per General Requirements.

## 1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using un-vented plastic or canvas shelters that could create a humidity chamber. If frame packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked frames to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS) or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with minimum G60 (Z180) or A60(ZF180).
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.
- E. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
- F. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- G. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

- H. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- I. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- J. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.2 CUSTOM HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as full profile welded.
  - 3. Sheet Material Thickness: 0.067-inch (1.7 mm) thick steel sheet.

## 2.3 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Post-Installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8 inch diameter bolts with expansion inserts or shields. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Head and Sill Anchors: Same as jamb anchors.

## 2.4 STOPS AND MOLDINGS

- A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 3/4 inch high. Verify in field. The intent is to match the existing frames and stops.

## 2.5 FABRICATION

- A. The intent is for the new hollow metal frame profile to match the existing hollow metal frame profile.
- B. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- C. Tolerances: Fabricate standard hollow metal work to tolerances indicated in SDI 117 and custom hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.

- D. Hollow Metal Frames:
1. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  2. Frames shall be welded frames. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. All joints shall be continuously filled, dress, sealed and made smooth, flush, and invisible and weathertight..
  3. Provide countersunk, flat- head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Post-Installed Expansion Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  3. Provide loose stops and moldings on inside of hollow metal work.
  4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.6 FINISHES

- A. Hollow Metal Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

## 2.7 PREFINISHED METAL LOUVER

- A. Prefinished heavy duty aluminum grille. Mandrel tube construction of heavy gauge aluminum. Powder coat finish with color selected by Owner from all available manufacturer's standard colors.
1. Price Industries; Model ATGH; Border style BF: Finish to be aluminum powder coat B15

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Field verify openings for frame configuration and sizes.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Remove welded-in shipping spreaders and spacers installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
- C. Squareness: Plus or minus 1/16 inch, measured at glazing rabbet on a line 90 degrees from jamb perpendicular to frame head.
- D. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
- E. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
- F. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

### **3.3 INSTALLATION**

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 for standard frames and HMMA 840 for custom frames.
- C. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. Remove temporary braces after frames are permanently anchored, leaving surfaces smooth and undamaged.
- D. Installation Tolerances: Adjust hollow metal frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

- 4. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
  
  - L. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
    - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
  
  - B. Prefinished Metal Louver:
    - 1. Field verify fane opening and frame configuration.
    - 2. Install louver into hollow metal frame opening per manufacturer's written instructions and guidelines.
- 3.4 ADJUSTING AND CLEANING
- E. Remove grout and other bonding material from hollow metal work immediately after installation.
  
  - F. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
  
  - G. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

**SECTION 08413  
ALUMINUM-FRAMED STOREFRONT**

**PART 1 - GENERAL**

- 1.1 Scope
- A. The work under this section includes all labor, supervision, material, equipment and related services necessary to provide a weathertight installation:
1. Remove the existing window in the elevator penthouse.
  2. Prepare the window opening for the installation of the aluminum-framed storefront.
  3. Furnishing, glazing and installing aluminum-framed storefront.
  4. Sealing perimeter of storefront opening on interior and exterior.
- 1.2 Related Work
- A. Applicable provisions of Division 1 shall govern work under this Section. The Contractor shall consult these provisions in detail prior to proceeding with work.
1. Division 07 Section "Joint Sealants".
  2. Division 08 Section "Glazing".
- 1.3 Submittals
- A. Contractor shall submit all shop drawings to the architect for approval. Drawings shall show scale elevations and sections. Full size sections shall be shown only when needed for clarity. Drawings shall show construction of all parts of the work, including metal and glass thickness, methods of joining, details of all field connections and anchorage, fastening and sealing methods, metal finishes and all pertinent information. Relationship to other work should be clearly indicated. No work shall be fabricated until shop drawings for that work have been finally approved for fabrication.
- B. Samples for Finish Selection: Provide entire set of samples of manufacturer's standard finishes on metal to be provided, approximate size 3" x 4".
- 1.4 Warranties
- A. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total storefront installation. This includes the glass, glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water, and structural adequacy.
- B. Any deficiencies shall be corrected by the responsible contractor at his expense during the warranty period.
- 1.5 Project Conditions
- A. Field Measurements and Conditions: Verify actual locations and conditions of supports for aluminum-framed systems by field verification and measurement before fabrication and indicate measurements on Shop Drawings.

**PART 2 - PRODUCTS**

- 2.1 Storefront
- A. Prefinished aluminum thermally broke interior glazed storefront. Include all accessories, trims and anchors for as weathertight installation. Storefront type shall be installed and glazed from the interior.

1. Basis of Design: Traco 785 (thermally broken).
  2. Finish: Kynar finish selected by Owner from manufacturer's standard finishes.
- 2.2 Dissimilar Metals: All dissimilar metals must be properly insulated to prevent galvanic action.
- 2.3 Fasteners: All fasteners shall be stainless steel and tamper-proof.
- 2.4 Glazing: As specified in Section 08000 "Glazing".
- 2.5 Sealant: As specified in Section 07920 "Joint Sealant".

### PART 3 - EXECUTION

- 3.1 Examination
- A. Examine areas and conditions for compliance and other conditions affecting performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected
- 3.2 Installation
- A. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.
  - B. Comply with manufacturer's written instructions.
  - C. Do not install damaged components.
  - D. Seal all joints weathertight. Seal interior and exterior joints around entire perimeter.
  - E. Provide refinished metal flashing and trim to provide a:
    1. Complete installation.
    2. Weathertight installation.
    3. Drain water to the exterior of the building.
- 3.3 Protection and Cleaning
- A. The contractor shall protect the windows surfaces and finish against damage from construction activities and harmful substances. The contractor shall remove any protective coatings and shall clean the windows glass and aluminum surfaces.

END OF SECTION

**SECTION 08800  
GLAZING**

**PART 1 - GENERAL**

1.1 SCOPE

- A. Section includes glass/glazing for the following products and applications, including those specified in other Sections where glass/glazing requirements are specified by reference to this Section:
  - 1. Hollow Metal Transoms/Borrowed Lites.
  - 2. Penthouse Storefront.

1.2 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this Section. The Contractor shall consult these provisions in detail prior to proceeding with work.
  - 1. Related Sections:
    - a. Division 08 Section "Hollow Metal Frames" for elements to be glazed.
    - b. Division 08 Section "Aluminum-Frame Storefront" for elements to be glazed.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass/glazing breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
- C. Design Wind Pressures: As indicated on Structural Drawings.
  - 1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
  - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
  - 4. Provide heat strengthened glass as necessary.

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
- E. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass/Glazing Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Product Certificates: For glass and glazing products, from manufacturer.
- E. Warranties: Sample of warranties.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
- D. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- B. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

- A. Manufacturer's Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination material-ly obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Warranty on Plastic Glazing: Manufacturer's standard form in which plastic glazing manufacturer agrees to replace plastic glazing units that deteriorate within specified warranty period. Deterioration of plastic glazing is defined as defects developed from normal use that are not attributed to breakage or to maintaining and cleaning plastic glazing contrary to manufacturer's written instructions. Defects include breakage, yellowing and hazing.
  - 1. Warranty Period: 7 years from date of Substantial Completion.

**PART 2 – PRODUCTS**

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
  - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
- C. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated. The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003" in the center of a lite and shall not exceed 0.008" within 10.5" of the leading or trailing edge.
- D. Fully tempered (FT) glass shall be heat soak tested to eliminate the potential of spontaneous breakage due to nickel-sulfite inclusions.
  - 1. For uncoated glass, comply with requirements for Condition A.
  - 2. For coated vision glass, comply with requirements for Condition C (other coated glass).

## 2.3 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
- B. Construction: Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
  - 1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  - 2. Interlayer Color: Clear unless otherwise indicated.
  - 3. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article and "Insulating Laminated-Glass Types" Article.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
- B. Sealing System: Dual seal, with manufacturer's standard primary and secondary, light grey in color matching exposed sealants.
  - 1. Spacer: Warm edge type spacer fabricated of stainless steel, light grey in color matching exposed sealants.
  - 2. Desiccant: Molecular sieve or silica gel, or blend of both.
- C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and "Insulating-Laminated-Glass Types" Article.

## 2.5 INSULATING LAMINATED GLASS

- A. Heat Treated Glass: ASTM C1048, with surface stress of 5,000 (+/-) 1500 psi.
- B. Interior Lite: Laminated heat strengthened safety glass with frit applied to the inside face. Two interior lites interleaved with polyvinyl butyral (PVB). Units must

meet criteria of ANSI Z97.1- 1984 and CPSC 16 CFR 1201 for safety glazing. Provide 0.060-in. PVB layer.

- C. Insulating Glass: CBA rated by the Insulating Glass Certification Council (IGCC) when tested in accordance with ASTM E773 and ASTM E774. Dual edge seals with the secondary seal being silicone. Exterior lite of heat strengthened glass and interior lites of heat strengthened laminated glass.
- D. All glass layers minimum ¼ inch thick.
- E. Exterior Lite: Heat strengthened safety glass.
- F. Glass: Comply with applicable requirements in "Glass Products" Article, "Laminated Glass" Article and "Insulating Glass" Article as indicated by designations in "Insulating-Laminated-Glass Types" Article.

## 2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
- B. Neoprene complying with ASTM C 864.
  - 1. EPDM complying with ASTM C 864.
  - 2. Silicone complying with ASTM C 1115.
  - 3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

## 2.7 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
  - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class and use as recommended by manufacturer for intended application and use.

## 2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; light grey in color matching exposed sealants; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; light grey in color matching exposed sealants and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- 2.9 MISCELLANEOUS GLAZING MATERIALS
- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- 2.10 FABRICATION OF GLAZING UNITS
- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.
- 2.11 TYPES OF GLASS AND GLAZING
- A. PLASTIC GLAZING (FOR VESTIBULE LEVEL 7 HOLLOW METAL FRAMING)
1. Plastic Glazing: Clear UV, chemical and abrasion resistant polycarbonate. UV, chemical and abrasion resistant coating to be applied to both sides of plastic glazing.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Basis of Design: Bayer Makrolon AR-V

a) Thickness: 6.0 mm.

B. INSULATING GLASS (FOR ELEVATOR PENTHOUSE STOREFRONT)

1. Glass Type: Clear, insulating heat strengthened, interior lite laminated and exterior lite tempered.
  - a. Overall Unit Thickness: 1 inch (26 mm).
  - b. Outdoor Lite: Fully tempered float glass.
  - c. Interspace Content: ½ inch air space.
  - d. Indoor Lite: Laminated heat strengthened. Two interior lites interleaved with polyvinyl butyral (PVB). Units must meet criteria of ANSI Z97.1- 1984 and CPSC 16 CFR 1201 for safety glazing.

**PART 3 – EXECUTION**

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass/plastic edges from damage during handling and installation. Remove damaged glass/plastic from Project site and legally dispose of off Project site. Damaged glass/plastic is glass/plastic with edge damage or other imperfections that, when installed, could weaken glass/plastic and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass/plastic manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass/plastic manufacturers for installing glass/plastic lites.
- G. Provide spacers for glass/plastic lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass/plastic and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass/plastic lites from moving sideways in glazing channel, as recommended in writing by glass/plastic manufacturer and according to requirements in referenced glazing publications.
- I. Set glass/plastic lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass/plastic lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.

- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

### 3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

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**SECTION 09900  
PAINTING AND COATINGS (PROFESSIONAL LINE PRODUCTS)**

**PART 1 – GENERAL**

1.1 SCOPE

- A. The work under this section includes all labor, supervision, material, equipment and related services necessary to provide surface preparation and field painting of exposed exterior and interior items and surfaces where indicated.

1.2 SUMMARY

- A. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of new and existing hollow metal doors and frames; new and existing wall and ceiling/deck surfaces where designated to be painted; covered pipes and ducts, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish and are mounted on surfaces designated to be painted.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Finished mechanical and electrical equipment.
    - b. Light fixtures.
    - c. Elevator
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Furred areas.
    - b. Ceiling plenums.
    - c. Utility tunnels.
    - d. Pipe spaces.
    - e. Duct shafts.
  - 3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper and copper alloys.
    - e. Bronze and brass.
  - 4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.

- b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

### 1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 1. Division 04 Section "Masonry" for concrete block to be painted.
  - 2. Division 08 Section "Hollow Metal Frames" for factory priming steel frames.

### 1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.
- B. The objective of this painting specification is to produce a uniform coating which will remain sound and free from visible defects for a period of not less than 10 years, and which can be renewed by application of additional coats without extensive or costly surface preparation.
- C. Sheen/gloss level definitions meeting Architects aesthetic expectations following ASTM D523 procedures:
  - 1. Flat 0 - 10 units at 85 degree geometry
  - 2. Eggshell (satin) 11 - 25 units at 85 degree geometry
  - 3. Low Sheen semi-gloss 26 - 42 units at 85 degree geometry
  - 4. High Sheen semi-gloss 43 - 59 units at 85 degree geometry
  - 5. Gloss 60 - 79 units at 85 degree geometry
  - 6. High Gloss 80 - 95 units at 85 degree geometry

### 1.5 SUBMITTALS

- A. Product Data: For each paint system indicated.
  - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
  - 3. Submit three draw down samples, 8 x 10 inches in size for each color selected.

### 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F (7°C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

#### 1.8 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90°F (10 and 32°C).

- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95°F (7 and 35°C).

- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5°F (3°C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

#### 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Quantity equal to 1% (Min. 1 full gallon of each color) of quantity installed.

### **PART 2 – PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

## 2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: As selected by Owner.

## 2.3 EXTERIOR CONCRETE MASONRY UNIT/CONCRETE PRIMER

- A. Exterior concrete masonry unit/concrete primer: Acrylic binding primer. Product is limited to the following:
  - 1. Glidden Professional; Hydrosealer Primer Sealer 6001-XXXX Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 2.5 to 3.0 mils.

## 2.4 EXTERIOR CONCRETE MASONRY UNIT/CONCRETE FINISH COAT

- A. Exterior concrete masonry unit/concrete finish coat: Waterborne acrylic gloss enamel. Product is limited to the following:
  - 1. Devco High Performance; Devflex 4208QD Interior/Exterior waterborne acrylic gloss enamel. Applied at a dry film thickness of not less than 2.5 to 3.0 mils.

## 2.5 METAL SURFACE

- A. Interior and Exterior Hollow Metal Doors and Frames: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application. Field verify sheen of existing paint on site.
  - 1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M28: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm) per coat.
  - 2. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
  - 3. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  - 4. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils (0.061 mm) per coating.

- 2.6 COLOR
- A. Colors and sheen as selected by Owner. The intent is to match the existing colors and sheen of the surfaces being repainted.

### **PART 3 – EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
  - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

#### **3.2 PREPARATION**

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, existing exterior plaster soffits, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Remove all loose paint from existing surfaces to be painted.

- b. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - c. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
  - 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  - 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
  - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Shop Primed 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.
- F. Existing Surfaces: Preparation of existing surfaces to receive painting and/or wallcoverings shall be Contractor's responsibility. Remove and replace attachments to existing surfaces that require finishing if said attachments are not to be painted with wall. Wash existing surfaces. Remove all loose, blistered, or otherwise defective paint. Sand surfaces smooth where chipped surfaces occur. Prepare specific surfaces as indicated above.
- G. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to

match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  2. Provide finish coats that are compatible with primers used.
  3. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
  5. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  9. Sand lightly between each succeeding enamel coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in occupied spaces unless specifically noted on drawings or room finish schedules.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
  2. Uninsulated plastic piping.
  3. Pipe hangers and supports.
  4. Tanks that do not have factory-applied final finishes.
  5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
  6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
  7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
  2. Panelboards.
  3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
  - 1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
  - 2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

### 3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.7 PAINT SCHEDULE

- A. CONFIRM SHEEN AND COLOR WITH OWNER ON SITE.
- B. Hollow Metal Doors And Frames: Provide the following finish systems over the interior and exterior surfaces of the hollow metal doors and frames:
  - 1. Factory-formulated full-gloss waterborne acrylic-latex enamel: Two finish coats over a factory applied primer.

- a. Primer: Factory applied rust resistant primer on new frames. Prime abrasions that are to metal on existing frames with rust resistant primer.
  - b. Finish Coats: Factory-formulated full-gloss waterborne acrylic-latex enamel.
  
- C. Exterior Concrete Masonry Unit/Concrete (Previously not painted): Provide the following finish systems over exterior concrete masonry units and concrete that were previously not painted:
  - 1. Acrylic Gloss Enamel Finish: Primer and two finish coats.
    - a. Primer: Concrete masonry unit/concrete primer.
    - b. Finish Coats: Exterior concrete masonry unit/concrete finish coat.
  
- D. Exterior Concrete Unit Masonry/Concrete (Previously painted): Provide the following finish systems over exterior concrete masonry and concrete that were previously painted:
  - 1. Acrylic Gloss Enamel Finish: Two finish coats.
    - a. Finish Coats: Exterior concrete masonry unit/concrete finish coat.

END OF SECTION

SECTION 14220

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SECTION 14220

ELECTRIC TRACTION ELEVATOR MODERNIZATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. 1 traction elevator(s) as follows:
  - 1. Geared Passenger Elevator(s) Car(s) East
- B. Re-key fire service on West car to match FEOK1.
- C. All engineering, equipment, labor, and permits required to satisfactorily complete elevator modernization required by Contract Documents.
- D. Applicable conditions of General, Special, and Supplemental Conditions, Division 1, and all sections listed in Contract Documents "Table of Contents."
- E. Preventive maintenance as described in Section 1.09, herein.
- F. Additional equipment or finishes furnished under other sections, installed under this section:
  - 1. None
- G. Cartage and Hoisting: All required staging, hoisting, and movement to, on, and from the site including new equipment, reused equipment, or dismantling and removal of existing equipment.
- H. Unless specifically identified as "Reuse," "Retain," or "Refurbish," provide new equipment.
- I. Protective barrier(s) between car(s) in normal operation and adjacent car(s) in the modernization process. Full depth and height of hoistway.
- J. Hoistway, pit, and machine room barricades as required.

1.02 RELATED WORK PROVIDED UNDER OTHER SPECIFICATION SECTIONS

- A. Hoistway and Pit:
  - 1. Vestibule construction as shown on drawings
  - 2. Remove existing cab flooring and provide new. Coordinate thickness of flooring with Elevator Contractor.
- B. Machine Room and Machinery Spaces:
  - 1. Self-closing and locking access door.
  - 2. Ventilation and heating. Maintain minimum temperature of 55° F, maximum 90° F. Maintain maximum 80% relative humidity, non-condensing.
  - 3. Review condition of machine room windows for weather resistance and efficiency.
- C. Electrical Service, Conductors, and Devices:
  - 1. Investigate conduit running through hoistway and exiting at the second floor.
  - 2. Make all machine room outlets GFCI type.
  - 3. Provide GFCI outlet in pit.
  - 4. Provide guarded weather resistant pit lighting to 10 footcandle level.

5. Provide weather resistant heater in pit as shown on electrical drawings.
6. Three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with protected lockable "open" disconnecting means.
7. Single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with individual protected lockable "open" disconnecting means located in machine room.
8. Power for machine room HVAC.
9. Fire alarm initiating devices in each elevator lobby and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation. Provide 3 relay activation modules within 3 feet of elevator controller location designated by elevator contractor.
10. Connection from machine room to CCTV system if required by the owner.

#### 1.03 DEFINITIONS

- A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.
- B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
- C. Provisions of this specification are applicable to all elevators unless identified otherwise.

#### 1.04 QUALITY ASSURANCE

- A. Approved Contractors: Alternate Contractors must receive approval of Owner and Consultant at least 14 calendar days prior to bid date.
  1. Geared Elevator(s): KONE, Otis, Schindler, ThyssenKrupp.
- B. Approved Suppliers:
  1. Elevator Controllers: Motion Control Engineering and GAL
- C. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following Codes, laws, and/or Authorities, including revisions and changes in effect:
  1. Safety Code for Elevators and Escalators, ASME A17.1
  2. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
  3. Elevator and Escalator Electrical Equipment, ASME A17.5
  4. National Electrical Code, NFPA 70
  5. Americans with Disabilities Act, ADA
  6. Local Fire Authority
  7. Requirements of most stringent provision of local applicable building code.
  8. Life Safety Code, NFPA 101
- D. Warranty:
  1. Material and workmanship of installation shall comply in every respect with Contract Documents. Correct defective material or workmanship which develops within **two years** from date of final acceptance of all work to satisfaction of Architect, Purchaser and Consultant at no additional cost, unless due to ordinary wear and tear or improper use or care by Purchaser. Perform maintenance in accordance with terms and conditions indicated in Section 1.09 herein.
  2. Defective is defined to include, but not be limited to: Operation or control system failures, car performance below required minimum, excessive wear, unusual

deterioration, or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise, or vibration, and similar unsatisfactory conditions.

3. Retained Equipment: All retained components, parts, and materials shall be cleaned, checked, modified, repaired, or replaced so each component and its parts are in like new operating condition. Retained equipment must be compatible for integration with new systems. All retained equipment shall be covered under the warranty provisions, of Article 1.04, D., 1. & 2. above. No prorations of equipment or parts shall be allowed on preventive maintenance contract, between the Contractor and Purchaser.
4. Make modifications, requirements, adjustments, and improvements to meet performance requirements of Section 14220.

#### 1.05 DOCUMENT AND SITE VERIFICATION

- A. In order to discover and resolve conflicts or lack of definition which might create problems, Contractor must review Contract Documents and site conditions for compatibility with its product prior to submittal of quotation. Review existing structural, electrical, and mechanical provisions for compatibility with Contractor's products. Purchaser will not pay for change to structural, mechanical, electrical, or other systems required to accommodate Contractor's equipment.

#### 1.06 SUBMITTALS

- A. Within 30 calendar days after award of contract and before beginning equipment fabrication submit shop drawings, and required material samples for review. Allow 15 days for response to initial submittal.
  1. Power Confirmation Information: Design for existing conditions. Provide power report.
  2. Fixtures: Cuts and detailed shop drawings.
  3. Design Information: Provide calculations verifying the following:
    - a. Adequacy of existing electrical provisions.
    - b. Adequacy of retained equipment relative to code requirements if car weight increased by more than 5%.
    - c. Machine room heat emissions in B.T.U.
    - d. Adequacy of existing retained elevator machine beams.
    - e. Adequacy of existing car platform structure for intended loading.
  4. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
- B. Submittal review shall not be construed as an indication that submittal is correct or suitable or that the work represented by submittal complies with the Contract Documents. Compliance with Contract Documents, Code requirements, dimensions, fit, and interface with other work is Contractor's responsibility.
- C. Acknowledge and/or respond to review comments within 14 calendar days of return. Promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Identify and cloud drawing revisions including Contractor elective revisions on each re-submittal. Contractor's revision response time is not justification for equipment delivery or installation delay.

## 1.07 FINAL CONTRACT DOCUMENTS

- A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
1. Straight-line wiring diagrams of “as-installed” elevator circuits with index of location and function of components. Provide one PDF master on USB flash drive. Mount one laminated set of wiring diagrams, in elevator machine room. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser’s property.
  2. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
  3. Provide any necessary interface cards required for equipment maintenance, code mandated testing, and troubleshooting.
  4. Lubrication instructions including recommended grade of lubricants.
  5. Parts catalogs for all replaceable parts including ordering forms and instructions.
  6. Four sets of keys for all switches and control features properly tagged and marked.
  7. Neatly bound instructions explaining all operating features including all apparatus in the car and lobby control panels.
  8. Neatly bound maintenance and adjustment instructions explaining areas to be addressed, methods and procedures to be used, and specified tolerances to be maintained for all equipment.
  9. Diagnostic equipment complete with access codes, adjusters’ manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system, and performance of routine safety tests.
- B. Non-Proprietary Equipment Design: Provide three sets of neatly bound written information necessary for proper maintenance and adjustment for equipment of within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
1. Straight-line wiring diagrams of “as-installed” elevator circuits, with index of location and function of components. Provide one set reproducible master. Mount one set wiring diagrams on panels, racked, or similarly protected, in elevator machine room. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser’s property. A legend sheet shall be furnished with each set of drawings to provide the following information:
    - a. Name and symbol of each relay, switch, or other apparatus.
    - b. Location on drawings, drawing sheet number and area, and location of all contacts.
    - c. Location of apparatus, whether on controller or on car.
  2. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
  3. Printed instructions explaining all operating features.
  4. Complete software documentation for all installed equipment.
  5. Lubrication instructions, including recommended grade of lubricants.
  6. Parts catalogs listing all replaceable parts including Contractor’s identifying numbers and ordering instructions.

7. Four sets of keys for all switches and control features properly tagged and marked.
  8. Diagnostic test devices together with all supporting information necessary for interpretation of test data and troubleshooting of elevator system, and performance of routine safety tests.
  9. The elevator installation shall be a design which can be maintained by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment Manufacturer.
    - a. Provide onsite capability to diagnose faults to the level of individual circuit boards and individual discreet components for the solid state elevator controller.
    - b. Provide a separate, detachable device, as required to the Purchaser as part of this installation if the equipment for fault diagnosis is not completely self-contained within the controller. Such device shall be in possession of and become property of the Purchaser.
    - c. Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to the Purchaser.
  10. Provide upgrades and/or revisions of software during the progress of the work, warranty period and the term of the ongoing maintenance agreement between the Purchaser and Contractor.
- C. Preventive Maintenance Contract: Contractors standard full maintenance agreement including unlimited overtime callback service and minimum monthly visits, shall be utilized during the warranty period.
- D. Acceptance of such records by Purchaser/Consultant shall not be a waiver of any Contractor deviation from Contract Documents or shop drawings or in any way relieve Contractor from his responsibility to perform work in accordance with Contract Documents.

#### 1.08 PERMIT, TEST AND INSPECTION

- A. Obtain and pay for permit, license, and inspection fee necessary to complete installation.
- B. Perform test required by Governing Authority in accordance with procedure described in ASME A17.2 Guide for Inspection of Elevators, Escalators, and Moving Walks in the presence of Authorized Representative.
- C. Supply personnel and equipment for test and final review by Consultant as required.
- D. Review procedure shall apply for individual elevators, portions of groups of elevators and completed groups of elevators accepted on an interim basis, or elevators and groups of elevators completed, accepted, and placed in operation.
- E. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when all Contractors' tests are complete and all elements of work or a designated portion thereof are in place and elevator or group of elevators are deemed ready for service as intended.
- F. Furnish labor, materials, and equipment necessary for Consultant's review. Notify Consultant five (5) working days in advance when ready for final review of elevator or group of elevators.

- G. Consultant's written list of observed deficiencies of materials, equipment and operating systems will be submitted to Contractor for corrective action. Consultant's review shall include as a minimum:
1. Workmanship and equipment compliance with Contract Documents.
  2. Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
  3. Performance of following is satisfactory:
    - a. Starting, accelerating, running
    - b. Decelerating, stopping accuracy
    - c. Door operation and closing force
    - d. Equipment noise levels
    - e. Signal fixture utility
    - f. Overall ride quality
    - g. Performance of door control devices
    - h. Operations of emergency two-way communication device
    - i. Operations of firefighters' service
  4. Test Results:
    - a. In all test conditions, obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Purchaser and Consultant. Tests shall be conducted under both no load and full load condition.
    - b. Temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity one (1) hour running test, stopping at each floor for ten (10) seconds in up and down directions, may be required.
- H. Performance Guarantee: Should Consultant's review identify defects, poor workmanship, variance or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:
1. Replace equipment which does not meet code or Contract Document requirements.
  2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
  3. Perform retesting required by governing code authority, Purchaser and Consultant.
  4. A follow-up final contract compliance review shall be performed by Consultant after notification by Contractor that all deficiencies have been corrected. Provide Consultant with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

#### 1.09 MAINTENANCE

- A. Interim: Not Applicable
- B. Warranty Maintenance: Contractors standard full maintenance agreement including unlimited overtime callback service and minimum monthly inspections shall be provided at no additional cost to the Owner for a period of **two years** after final acceptance. Contractor full maintenance services shall, at a minimum, meet the requirements of ASME A17.1 Section 8.6.

PART 2 PRODUCTS

2.01 SUMMARY

A. 1 Passenger Elevator

Unless specifically identified as "retain existing," provide new equipment.

	Existing Equipment	Disposition
Number:	Car East	Retain Existing
Capacity:	East 3500#	Retain Existing
Class Loading:	Passenger Class A	Retain Existing
Contract Speed:	300 F.P.M.	Retain Existing
Roping:	1:1	Retain Existing
Machine:	Geared	New Geared
Machine Location:	Overhead	Retain Existing
Operational Control:	Selective Collective	Selective Collective Microprocessor-Based System
Motor Control:	DC Variable Voltage	AC Variable Voltage Variable Frequency Microprocessor Based with Digital Closed-Loop Feedback
Power Characteristics:	208 Volts, 3 Phase, 60 Hertz Field Verify	Retain Existing
Stops:	8	Retain Existing
Openings:	8	Retain Existing
Floors Served:	Front; 1-8	Retain Existing
Clear Inside Car:	East 73 Wide X 70 Deep	Retain Existing
Entrance Size:	44 Wide X 84 High	Retain Existing
Entrance Type:	Two Speed, Side Opening	Retain Existing
Door Operation:		High Speed, Heavy-Duty, Door Operator, Minimum Opening Speed 2-1/2 F.P.S.
Door Protection:	Infrared, Full Screen Device	New Infrared, Full Screen Device with Differential Timing, Nudging and Interrupted Beam Time

	Existing Equipment	Disposition
Safety:	Gradual Wedge Clamp	Flexible Guide Clamp-Type B, Car
Guide Rails:	Planed Steel Tees	Retain Existing
Buffers:	Oil	Recondition
Compensation:	None	
Car Enclosure:		Retain Existing Refinish existing stainless. Provide new lighting
Signal Fixtures:		LED Illumination Vandal Resistant Assembly
Hall and Car Pushbutton Stations:		Single Hall Pushbutton Riser with position indicators  Vandal Resistant Car and Hall Pushbuttons
Car Position Indicators:		Single Digital with Car Direction Arrows
In Car Lanterns:		All Car Entrance Columns with Volume Adjustable Electronic Chime or Tone. Sound Twice for Down Direction Vandal Resistant Assembly
Hall Car Position Indicator:		Digital at all Floors
Communication System:		Self-Dialing, Vandal Resistant, Push to Call, Two-Way Communication System with Recall, Tracking and Voiceless Communication
Fixture Submittal:		Submit Brochure Depicting Contractor's Proposed Designs with Bid
Additional Features:		Car and Counterweight Roller Guides  Car Top Inspection Station  Firefighters' Service, Phase I and II, including Alternate Floor Return

Existing Equipment

Disposition

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Accessibility Signage

Stationary Car Return Panel(s)  
Arranged for Surface Applied Car  
Operating Panel(s)

Hoistway Access Switches, Top  
And Bottom Floors

Hoistway Door Unlocking Device,  
All Floors

Platform Isolation

Anti-Nuisance Feature

Independent Service Feature

CCTV Provisions

Machine, Power Conversion Unit,  
and Controller Sound Isolation

Tamper Resistant Fasteners for All  
Fastenings Exposed to the Public

One Year Warranty Maintenance  
with 24-Hour Call-Back Service

No Visible Company Name or Logo

Wiring Diagrams, Operating  
Instructions, and Parts Ordering  
Information

System Diagnostic Means and  
Instructions

Non-Proprietary Control System  
and Diagnostics Provisions

2.02 MATERIALS

A. See Section 01600, Materials.

2.03 CAR PERFORMANCE

A. Car Speed:  $\pm 3\%$  of contract speed under any loading condition.

B. Car Capacity: Safely lower, stop and hold 125% of rated load.

- C. Car Stopping Zone:  $\pm 1/4$ " under any loading condition.
- D. Door Opening Time: Seconds from start of opening to fully open: 2.3
- E. Door Closing Time: Seconds from start of closing to fully closed: 4.1
- F. Car Floor-to-Floor Performance Time: Seconds from start of doors closing until doors are 3/4 open (1/2 open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction: 11.3
- G. Car Ride Quality:
  - 1. Horizontal and vertical acceleration within car during all riding and door operating conditions. Not more than 20 mg peak to peak (adjacent peaks) in the 1 - 10 Hz range.
  - 2. Acceleration and Deceleration: Smooth constant and not less than 3 feet/second<sup>2</sup> with an initial ramp between 0.5 and 0.75 second.
  - 3. Sustained Jerk: Not more than 6 feet/second<sup>3</sup>.
  - 4. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.
- H. Noise and Vibration Control
  - 1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the "A" weighted scale.
  - 2. Vibration Control: All elevator equipment provided under this contract, including power unit, controller, oil supply lines, and their support shall be mechanically isolated from the building structure and electrically isolated from the building power supply and to each other to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.

## 2.04 OPERATION

- A. Selective Collective Microprocessor-Based:
  - 1. Operate car without attendant from pushbuttons in car and located at each floor. When car is available, automatically start car and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
  - 2. Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of car and corresponding to the direction of car travel have been answered.
  - 3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
  - 4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
  - 5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

- B. Other Items:
  - 1. Load Weighing: Provide means for weighing car passenger load. Control system to provide dispatching at main floor in advance of normal intervals when car fills to capacity. Provide hall call by-pass when the car is filled to preset percentage of rated capacity and traveling in down direction. Field adjustment range: 10% to 100%.
  - 2. Anti-Nuisance Feature: If car loading relative to weight in car is not commensurate with number of registered car calls, cancel car calls. Systems employing either load weighing or door protective device for activation of this feature are acceptable.
  - 3. Independent Service: Provide controls for operation of each car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.
- C. Firefighters' Service: Provide equipment and operation in accordance with Code requirements.
- D. Automatic Car Stopping Zone: Stop car within 1/4" above or below the landing sill. Maintain stopping zone regardless of load in car, direction of travel, distance between landings, hoist rope slippage, or stretch.
- E. Remote Monitoring and Diagnostics: Equip each controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic and monitoring computers, keyboards, modems, and programming tools. The system shall be capable of driving remote color CRT monitor(s) that continually scan and display the status of each car and call. Do not provide full monitoring system.
- F. Motion Control: Microprocessor based AC, variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking. Limit the difference in car speed between full load and no load to not more than  $\pm 3\%$  of the contract speed.
- G. Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, close doors
- H. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum 5-year life expectancy. Include required transformer. Provide constant pressure test button in service compartment of car operating panel.

## 2.05 MACHINE ROOM EQUIPMENT

- A. Arrange equipment in existing machine room spaces.
- B. Geared Traction Hoist Machine:
  - 1. Single worm geared or helical geared traction type with AC induction or P.M.S.M. ACV3F motor, brake, gear, drive shaft, deflector sheave, and gear case mounted in proper alignment on an isolated bedplate. Provide bedplate blocking to elevate deflector sheave above machine room floor.
  - 2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
  - 3. Provide hoist machine drip pans to collect lubricant seepage.
  - 4. Drive sheave diameter to hoist rope diameter shall be a minimum of 50:1.

- C. Solid State Power Conversion and Regulation Unit:
1. Provide solid state, alternating current, variable voltage, variable frequency (ACV3F), I.G.B.T. converter/inverter drives.
  2. Design unit to limit current, suppress noise, and prevent transient voltage feedback into building power supply. Provide internal heat sink cooling fans for the power drive portion of the converter panels. Conform to IEEE standards 519-1992 for line harmonics and switching noise.
  3. Isolate unit to minimize noise and vibration transmission. Provide isolation transformers, filter networks, and choke inductors.
  4. Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative transients induced into the mainline feeders or the building standby power generator.
  5. Supplemental direct-current power for the operation of hoist machine brake, door operator, dispatch processor, signal fixtures, etc., from separate static power supply.
- D. Encoder: Direct drive, solid-state, digital type. Update car position at each floor and automatically restore after power loss.
- E. Controller: UL/CSA labeled.
1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.
  2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
  3. Microprocessor-Related Hardware:
    - a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
    - b. Provide power supplies with noise suppression devices.
    - c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
    - d. Design control circuits with one leg of power supply grounded.
    - e. Safety circuits shall not be affected by accidental grounding of any part of the system.
    - f. System shall automatically restart when power is restored.
    - g. System memory shall be retained in the event of power failure or disturbance.
    - h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
  4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
  5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
  6. Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary to monitor items outlined in Section 2.13. Provide interface only.
- F. Sleeves and Guards: Provide 2" steel angle guards around cable or duct slots through floor slabs or grating. Provide rope and smoke guards for sheaves, cables, and cable slots in machine room
- G. Machine and Equipment Support Beams: Retain existing in place. Provide all required supplemental supports and attachments.

- H. Governor: Centrifugal-type, car driven machine room mounted with pull-through jaws and bi-directional shutdown switches. Provide required bracketing and supports for attachment to building structure.
- I. Emergency Brake:
  - 1. Provide means to prevent ascending car over-speed and unintended car movement per Code.
  - 2. Acceptable emergency brake devices:
    - a. BODE Rope Brake
    - b. Hollister-Whitney Rope Gripper
  - 3. Mount the auxiliary brake on suitable structural steel supports. Provide a drawing showing the supports, stamped by Professional Engineer verifying the adequacy of the support provided.
  - 4. Provide control circuits to enable the device to function as required by Code.
  - 5. Alternately, code compliant redundant sheave brake may be provided.

## 2.06 HOISTWAY EQUIPMENT

- A. Guide Rails: Retain main and counterweight guide rails in place.
  - 1. Clean rails and brackets. Remove rust.
  - 2. Check all rail and bracket fastenings and tighten.
  - 3. Realign rails as required to provide smooth car ride.
  - 4. Provide supplemental rail brackets and/or backing as required by Code or to enhance car ride quality.
- B. Buffers, Car, and Counterweight: Retain existing.
  - 1. Drain, flush, refill, and test.
  - 2. Rebuild as required and paint.
  - 3. Apply machinists blue to the pistons
  - 4. Retrofit buffer access ladder and platform.
- C. Sheaves: Machined grooves and sealed bearings. Provide mounting means to machine beams, machine bedplate, car and counterweight structural members, or building structure.
- D. Counterweight: Retain existing. Replace all rollers.
- E. Counterweight Guard: Metal guard in pit.
- F. Governor and Encoder Pit-tensioning Sheaves: Retain existing. Rebuild as required. As a minimum completely disassemble, clean, replace worn or faulty parts, and recalibrate governor.
- G. Hoist and Governor Ropes:
  - 1. Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated wedge type shackles.
  - 2. Governor rope to suit Contractor's specification.
- H. Compensation: None provided in existing equipment. Should Contractors design call for the addition of compensation, the following shall be provided at no additional cost to the Owner. Encapsulated chain with pit guide assembly. Pit mounted guide assembly shall provide quiet, effective restraint without excessive wear of components. Inhibit rubbing or chafing against hoistway or equipment within hoistway or pit. Application must meet performance/noise level requirement of specification.

- I. Terminal Stopping: Provide normal and final devices.
- J. Electrical Wiring and Wiring Connections:
  - 1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Provide four pair of spare shielded communication wires in addition to those required to connect specified items. Tag spares in machine room.
  - 2. Conduit: Painted or galvanized steel conduit, EMT, or duct. Conduit size, 1/2". Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
  - 3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway. Provide two (2) RG-6/U coaxial CCTV cables within traveling cable from car controller to car top, plus 3'-0" excess loop at both ends. Provide two (2) pair 14 gauge wire for CCTV power. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Provide four pair of spare shielded communication wires in addition to those required to connect specified items. Tag spares in machine room.
  - 4. Auxiliary Wiring: Connect fire alarm initiating devices, emergency two-way communication system, CCTV, and announcement speaker in each car controller in machine room.
- K. Entrance Equipment: Retain existing. Refurbish/replace and adjust assemblies to ensure smooth and quiet mechanical open and close of doors.
  - 1. Door Hangers and Rollers: Replace all rollers.
  - 2. Door Track: Clean all tracks.
  - 3. Door Interlocks: replace all contacts.
  - 4. Door Closers: Refurbish and/or replace as required
- L. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.
- M. Hoistway Access Switches: Mount in wall top and bottom floor(s). Provide switch with faceplate.
- N. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors and hoistway fascia in location visible from within car.
- O. Provide under car access platform as required by code.
- P. Provide pit inspection station as allowed by code.
- Q. Pit Ladder: Retain Existing, check and tighten all fastenings.

## 2.07 HOISTWAY ENTRANCES

- A. Frames: Retain existing. Securely mount braille plates at code required height. Securely mount 3" Car Identification plate at main landing.
- B. Door Panels: Retain existing. Provide new door gibs with fire tabs where needed. Minimum two gibs per panel, one at leading edge, and one at trailing edge of each panel

- C. Sight Guards: Retain existing. Replace damaged sight guards.
- D. Sills: Retain existing. Scrape and clean all sills, paint full length of sills with durable black, epoxy coating.
- E. Sill Supports: Retain existing. Check and tighten all fastenings.
- F. Fascia, Toe Guards, and Hanger Covers: Retain existing. Provide as required where damaged or missing. Check and tighten all fastenings.
- G. Struts and Headers: Retain existing. Check and tighten all fastenings.  
Finish of Frames and Doors: Retain Existing

## 2.08 CAR EQUIPMENT

- A. Frame: Retain Existing. Check and tighten all fastenings.
- B. Safety Device: New Type "B," flexible guide clamp. Retrofit new safety to existing car frame.
- C. Platform: Retain existing. Reinforce if required. Check and tighten all fastenings.
- D. Platform Apron: Provide new extended platform apron to meet Code. Minimum 14 gauge steel, reinforced and braced to car platform with Contractor's standard finish.
- E. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe. Elsco Model A or approved equal.
- F. Finish Floor Covering: Provided under other sections.
- G. Sills: Retain existing. Clean, check and tighten all fastenings.
- H. Doors: Retain existing. Retrofit dual gibs, one at trailing edge and one at leading edge of each panel.
- I. Door Hangers: Retain existing. Replace all rollers. Check and tighten all fastenings.
- J. Door Track: Retain existing. Clean and sand for smooth, quiet operation. Check and tighten all fastenings.
- K. Door Header: Retain existing. Check and tighten all fastenings.
- L. Door Electrical Contact: Prohibit car operation unless car door is closed.
- M. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, while hoistway doors remain open.
- N. Restricted Opening Device: Restrict opening of car door(s) outside unlocking zone. Plunger type restrictors not acceptable.
- O. Door Operator: High speed, heavy-duty door operator capable of opening doors at no less than 2-1/2 f.p.s. Accomplish reversal in no more than 2-1/2" of door movement. Provide

solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.

- P. Door Control Device:
1. Infrared Reopening Device: Black fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open
  2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0 - 25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
  3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0 - 1.5 seconds after beams are reestablished.
  4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
    - a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
    - b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use hall call time when car responds to coincidental calls.
- Q. Car Operating Panel:
1. One car operating panel(s) with faceplate(s), consisting of a metal box containing vandal resistant operating fixtures, mounted behind the car stationary front return panel(s). Faceplate(s) shall be hinged and constructed of stainless steel, satin finish.
  2. Suitably identify floor buttons, alarm button, door open button, door close button and emergency push-to-call button with tactile symbols recessed flush rear mounted. Configure plates per local building code accessibility standards including Braille. Locate operating controls no higher than 48" above the car floor; no lower than 35" for emergency push-to-call button and alarm button.
  3. Provide minimum 3/4" diameter raised or flush floor pushbuttons which illuminate to indicate call registration.
  4. Provide alarm button to ring bell located on car, and sound distress signal at control panel. Illuminate button when actuated.
  5. Provide keyed stop switch at bottom of car operating panel faceplate. Mark device to indicate "run" and "stop" positions.
  6. Provide "door open" button to stop and reopen doors or hold doors in open position.
  7. Provide "door close" button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters' operation.
  8. Provide firefighters' locked box as required by code.
  9. Re-Key west elevator to match FEOK1.
  10. Do not provide service compartment, all devices shall be mounted in the car operating panel.
  11. Include the following controls in car operating panel with function and operating positions identified by permanent signage or engraved legend:
    - a. Inspection keyswitch.
    - b. Light keyswitch.
    - c. Three-position exhaust blower keyswitch.
    - d. Independent service keyswitch.

- e. Momentary keyswitch for battery pack emergency lighting test.
- 12. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
  - a. Car number on main car operating panel.
  - b. "No Smoking" on main car operating panel.
  - c. Car capacity in pounds on main car operating panel
- R. Car Top Control Station: Mount to provide safe access and utilization while standing in an upright position on car top.
- S. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top and bottom of car. Include on/off switch and lamp guard. Provide additional GFCI protected outlet on car top for installation of car CCTV.
- T. Communication System:
  - 1. "Push to Call," two-way communication instrument in car with automatic dialing, tracking, and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.
    - a. "Push to Call" button or adjacent light jewel shall illuminate and flash when call is acknowledged. Button shall match car operating panel pushbutton design. Provide uppercase "PUSH TO CALL" "HELP ON THE WAY" engraved signage adjacent to button.
    - b. Provide "Push to Call" button tactile symbol, engraved signage, and Braille adjacent to button mounted integral with car front return panel.
  - 2. Provide two-way communication to emergency personnel. Required in buildings with over 60' of travel.

## 2.09 CAR ENCLOSURE

- A. Car Enclosure Passenger/Service Elevator: Retain existing. Modify as required for application of new signal and pushbutton fixtures. Check and tighten all fasteners.
  - 1. Re-Clad interior of existing canopy with #4 satin stainless steel. Cladding shall be securely mounted.
  - 2. Ventilation: Two-speed mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet requirements of Item 2.03, H. Ventilation shall shut off after adjustable period (60 – 180 seconds) of no elevator demand.
  - 3. Lighting: Provide LED fixtures with wiring and hookup to provide minimum 10 footcandle illumination. Fixtures shall be vandal resistant. Lighting shall shut off after adjustable period (60 – 180 seconds) of no elevator demand. Guard top of lights from damage.

## 2.10 HALL CONTROL STATIONS

- A. Pushbuttons: Provide 1 riser with flush mounted faceplates. Include pushbuttons for each direction of travel which illuminate to indicate call registration. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency situation as part of faceplate. Pushbutton design shall match car operating panel pushbuttons. Provide vandal resistant pushbutton and light assemblies. Provide enlarged faceplate to cover existing wall blockout and facilitate handicapped access requirements. Provide any cutting and patching required. Provide vandal resistant integral car position indicator, ½" to 1" high, at all landings.

## 2.11 SIGNALS

- A. Car Direction Lantern: Provide flush-mounted car lantern in all car entrance columns. Illuminate up or down LED lights and sound electronic tone once for up and twice for down direction travel as doors open. Sound tone once for up direction and twice for down direction. Sound level shall be adjustable from 0 - 80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor. Provide adjustable car door dwell time to comply with ADA requirements relative to hall call notification time. Car direction lenses shall be arrow shaped with faceplates. Lenses shall be minimum 2-1/2" in their smallest dimension. Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.
- B. Car Position Indicator: Vandal Resistant, alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 2" high to indicate floor served and direction of car travel. Locate fixture in each car operating panel. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel.
- C. Hall Position Indicator, Alpha-numeric digital indicator containing floor designations and direction arrows 1/2" to 1" high to indicate floor served. Mount integral with hall button stations all floors. Provide vandal resistant indicator and light assemblies.
- D. Faceplate Material and Finish: Stainless steel Satin finish all fixtures.
- E. Voice Synthesizer: Provide electronic device with easily reprogrammable message and female voice to announce car direction, floor, emergency exiting instructions, etc.
- F. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover per Local Fire Authority requirements.

## PART 3 EXECUTION

### 3.01 SITE CONDITION INSPECTION

- A. Prior to beginning installation of equipment, examine hoistway and machine room areas. Verify no irregularities exist which affect execution of work specified.
- B. Do not proceed with installation until work in place conforms to project requirements.

### 3.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in Contractor's original, unopened protective packaging.
- B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.
- C. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.

### 3.03 INSTALLATION

- A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

- B. Install machine room equipment with clearances in accordance with referenced codes, and specification.
- C. Install all equipment so it may be easily removed for maintenance and repair.
- D. Install all equipment for ease of maintenance.
- E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.
- F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
  - 1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
  - 2. Machine room equipment, and pit equipment.
  - 3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

#### 3.04 FIELD QUALITY CONTROL

- A. Work at jobsite will be checked during course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.
- B. Have Code Authority acceptance inspection performed and complete corrective work.

#### 3.05 ADJUSTMENTS

- A. Static balance car to equalize pressure of guide shoes on guide rails.
- B. Lubricate all equipment in accordance with Contractor's instructions.
- C. Adjust motors, power conversion units, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

#### 3.06 CLEANUP

- A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.
- B. Remove all loose materials and filings resulting from work.
- C. Clean and paint machine room equipment and floor.
- D. Clean and paint pit floor.
- E. Scrape, clean, and paint all pit equipment with rust preventative enamel.
- F. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.

### 3.07 CONSULTANT'S FINAL OBSERVATION AND REVIEW REQUIREMENTS

- A. Review procedure shall apply for individual elevators, portions of groups of elevators and completed groups of elevators accepted on an interim basis, or elevators and groups of elevators completed, accepted, and placed in operation.
- B. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when all Contractors' tests are complete and all elements of work or a designated portion thereof are in place and elevator or group of elevators are deemed ready for service as intended.
- C. Furnish labor, materials, and equipment necessary for Consultant's review. Notify Consultant five (5) working days in advance when ready for final review of elevator or group of elevators.
- D. Consultant's written list of observed deficiencies of materials, equipment and operating systems will be submitted to Contractor for corrective action. Consultant's review shall include as a minimum:
  - 1. Workmanship and equipment compliance with Contract Documents.
  - 2. Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
  - 3. Performance of following is satisfactory:
    - a. Starting, accelerating, running
    - b. Decelerating, stopping accuracy
    - c. Door operation and closing force
    - d. Equipment noise levels
    - e. Signal fixture utility
    - f. Overall ride quality
    - g. Performance of door control devices
    - h. Operations of emergency two-way communication device
    - i. Operations of firefighters' service
  - 4. Test Results:
    - a. In all test conditions, obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Purchaser and Consultant. Tests shall be conducted under both no load and full load condition.
    - b. Temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity one (1) hour running test, stopping at each floor for ten (10) seconds in up and down directions, may be required.
- E. Performance Guarantee: Should Consultant's review identify defects, poor workmanship, variance or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:
  - 1. Replace equipment which does not meet code or Contract Document requirements.
  - 2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
  - 3. Perform retesting required by governing code authority, Purchaser and Consultant.
- F. A follow-up final contract compliance review shall be performed by Consultant after notification by Contractor that all deficiencies have been corrected. Provide Consultant with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

### 3.08 PURCHASER'S INFORMATION

- A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
1. Straight-line wiring diagrams of "as-installed" elevator circuits with index of location and function of components. Provide one PDF master on flash drive. Mount one laminated set wiring diagrams in elevator machine room. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser's property.
  2. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
  3. Provide any necessary interface cards required for equipment maintenance, code mandated testing, and troubleshooting.
  4. Lubrication instructions including recommended grade of lubricants.
  5. Parts catalogs for all replaceable parts including ordering forms and instructions.
  6. Four sets of keys for all switches and control features properly tagged and marked.
  7. Neatly bound instructions explaining all operating features including all apparatus in the car and lobby control panels.
  8. Neatly bound maintenance and adjustment instructions explaining areas to be addressed, methods and procedures to be used, and specified tolerances to be maintained for all equipment.
  9. Diagnostic equipment complete with access codes, adjusters' manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system, and performance of routine safety tests.
- B. Warranty Preventive Maintenance Agreement: Furnish properly executed contract for two year warranty maintenance. Contractor's standard full maintenance agreement with unlimited overtime callback service and minimum monthly inspections at no additional cost to the Owner for a period of two years.
- C. Acceptance of such records by Purchaser/Consultant shall not be a waiver of any Contractor deviation from Contract Documents or shop drawings or in any way relieve Contractor from his responsibility to perform work in accordance with Contract Documents.

END OF SECTION

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**SECTION 15010**  
**BASIC MECHANICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Basic Mechanical Requirements specifically applicable to Division 15 Sections.

**1.2 SCOPE OF WORK**

- A. The following description is a general description of the HVAC work for this project. This work description is not all inclusive but is offered to give the Contractor a general idea of the scope of the project.
1. HVAC work includes but is not limited to the following:
    - a. Installation of new mini-split air conditioning system serving the elevator penthouse.
    - b. Removal and installation of insulated metal panels where an existing fan, louver and damper were located.

**1.3 DEFINITIONS**

- A. The following words or phrases have special meaning when used in the articles of this division and in any other requirements applicable to this division:
1. "Exposed to View" or "Exposed" — shall have reference to and mean that the pipes, ducts, etc., insulated or otherwise, in the completed structure are visible within any normally occupied space, room or area.
  2. "In Concealed Spaces", "Concealed" or "Not Exposed to View" — shall have reference to and mean that the pipes, duct, etc., insulated or otherwise are concealed and not exposed to view within furred spaces, above suspended ceilings, pipe chases, etc.
  3. "Unfinished Spaces" or "Unfinished Rooms" — shall have reference to areas such as Machine Rooms, Equipment Rooms, or similar areas. Where the words "In Finished Areas" or "Finished Rooms" are used, it shall have reference to rooms or spaces, such as, Reading rooms, Offices, Public Corridors, etc.
  4. "Finished Rooms or Spaces" shall refer to areas similar to offices, public corridors, and public toilet rooms.
  5. "Provide" — shall be taken to mean "furnish and install" meaning to purchase and deliver to the job site and the installation thereof.
  6. "Piping" — shall include, in addition to pipe all fittings, valves, hangers, and other supports, expansion compensators, anchors, and accessories related to such piping including associated insulation.
  7. "Ductwork" — shall include, in addition to ducts, all fittings, transitions, dampers, hangers and other supports, fire dampers, access panels, associated insulation and accessories related to such ductwork.
  8. "Contractor" in Specifications and Drawing refers to respective Contractor performing that portion of work.
  9. "Invert Elevation" (I.E.) means elevation of inside bottom of pipe or duct.
  10. "Mechanical Work" is work in Division 15.

NOTE: The words "Contractor shall" are implied and shall be so understood wherever the directions "furnish," "install" or "provide" are used.

#### 1.4 SPECIAL CONDITIONS

- A. Minor items and accessories or devices reasonably inferable as necessary to the complete and proper operation of any system shall be provided by the Contractor for such system whether or not they are specifically called for by the Specifications or Drawings.
- B. Where work specified in other sections of the specifications connects to equipment specified in Division 15 Sections, check the required connection to such equipment.

#### 1.5 CODES AND STANDARDS

- A. The Work governed by this Division shall comply with the latest editions of the following applicable standard specifications and codes. For other standard specifications, if included by reference, see Division 1 of the Specifications.

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AIA	American Institute of Architects
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASE	Association of Safety Engineers
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute
EPA	Environmental Protection Agency
FIA	Factory Insurance Association
FM	Factory Mutual Insurance Association
HYDI	Hydronics Institute
IBC	International Building Codes
IDPH	Illinois Department of Public Health
IEEE	Institute of Electrical and Electronics Engineers
MCAA	Mechanical Contractors Association of America
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Assoc.
NFPA	National Fire Protection Association
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractor's Association
UL	Underwriter's Laboratories, Inc.

#### 1.6 WORK BY OWNER

- A. The following work shall be by the Owner:
  - 1. None.

**1.7 OWNER-FURNISHED PRODUCTS**

- A. The following products shall be furnished by the Owner and installed by the Contractor:
  - 1. None.

**1.8 PROJECT/SITE CONDITIONS**

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

**1.9 CONTRACTOR USE OF PREMISES**

- A. Refer to Division 1.
- B. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Use of premises by Owner to conduct normal activities.
    - a. Tie-ins to existing systems must be done in manner so as not to interfere with Owner's operations. All shut downs of existing services require a three day notice minimum in writing.
- C. Schedule the Work to accommodate this requirement.
- D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- E. The Owner will be responsible for the identification and abatement of all hazardous materials and asbestos associated with the project. Although great care will be taken to eliminate any risks, the Contractor must be aware that hazardous materials may exist on site. Therefore, the Contractor shall immediately suspend work and notify the Owner if asbestos or other hazardous material is suspected in the work area of the project.

**1.10 WORK SEQUENCE**

- A. Coordinate mechanical schedule with other trades and other operations.

**1.11 REFERENCE STANDARDS**

- A. Quality Assurance
  - 1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
  - 2. Conform to reference standard by date of issue current on date of Contract Documents date for receiving bids date of Owner-Contractor Agreement when there are no Bid dates specified.
  - 3. Obtain copies of standards when required by Contract Documents.
  - 4. Maintain copy of applicable standard at job site during submittals, planning and progress of the specific work, until Substantial Completion.
  - 5. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
  - 6. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

- B. Reference Standards and Specification Abbreviations
  - 1. Refer to Division 1 and Division 15, Applicable Sections.

#### **1.12 SUBMITTALS**

- A. Shop drawings and samples shall be submitted in compliance with the Conditions of the Contract and General Requirements.
- B. Submittals shall contain outline dimensions, operating and maintenance clearances and sufficient engineering data to indicate compliance with the specifications. Each submittal shall be clearly labeled as indicated in the Conditions of the Contract and General Requirements.
- C. Each piece of equipment shall be identified by the number shown in the schedules and by specification article number pertaining to the item. Shop drawings shall as a minimum be ¼" equals 1'-0" scale, and shall be newly prepared by the Contractor and not reproduced from the Architect's drawings. Layouts shall be made for all floor plans including all ductwork, piping, electrical distribution and other mechanical equipment. Layouts shall show clearances of piping, ducts, etc., above floor.
- D. Contractor shall obtain Engineer's approval on all the work before any equipment is purchased, or any work installed. Contractor shall also secure approval of the Governmental Authorities having jurisdiction on all equipment and on the layout of the complete system.
- E. The Engineer's review and approval of shop drawings is a gratuitous assistance and in no way does it relieve the Contractor from responsibility for errors or omissions which may exist on the shop drawings. Where such errors or omissions are discovered later, they must be made good by the Contractor, without any additional cost to the Owner, irrespective of any approval by the Engineer.
  - 1. The Contractor shall incorporate with his shop drawings, a letter indicating all deviations from the plans and/or specifications. If in the opinion of the Architect, the deviations are not equal, the Contractor will be required to furnish the item as specified and as indicated on the drawings.
  - 2. Record documents shall be submitted in compliance with the requirements of the Specifications.

#### **1.13 QUALITY CONTROL**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions and workmanship to product Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.
- E. Work to be performed by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

- G. Manufacturers' Field Services and Reports
  - 1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of installation, quality or workmanship, start-up of equipment, testing, adjusting and balancing of equipment and troubleshooting as applicable and to initiate instructions when necessary.
  - 2. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
  - 3. Submit report in duplicate within ten (10) days of observation to Architect for review.

#### **1.14 CONTRACT CLOSEOUT**

- A. Final Cleaning
  - 1. Refer to Division 1.
  - 2. Execute final cleaning prior to final inspection.
- B. Adjusting
  - 1. Adjust operating products and equipment to ensure smooth and unhindered operation.
- C. Project Record Documents
  - 1. Refer to Division 1.
  - 2. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
    - a. Field changes of dimension and detail.
    - b. Details not on original Contract Drawings.
  - 3. Delete Architect's title block and seal from all documents.
  - 4. Submit documents to Architect with claim for final application for payment.

#### **1.15 SPARE PARTS AND MAINTENANCE DATA**

- A. Provide products, spare parts, maintenance and materials in quantities specified in individual specification sections.
- B. Deliver to project site and place in location as directed; obtain receipt prior to final payment.

#### **1.16 WARRANTIES**

- A. Provide notarized copies.
- B. Execute and assemble documents from Subcontractors, suppliers and manufacturers.
- C. Provide table of contents and assemble in 3-D side ring binder with durable cover.
- D. Submit prior to final application for payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

#### **1.17 REGULATORY REQUIREMENTS**

- A. Conform to International Mechanical Code with State of Wisconsin Amendments
- B. Obtain permits and request inspections from City of Milwaukee Building Department.

- C. Conform to all other governing agencies and authorities.

## **PART 2 - PRODUCTS**

### **2.1 MATERIAL AND EQUIPMENT**

- A. Refer to Division 1.
- B. Products
  - 1. Products: Means new material, machinery, components, equipment, fixtures and systems forming Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of Work. Products may also include existing materials or components required for reuse.
  - 2. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
  - 3. Provide interchangeable components of same manufacturer for similar components.
- C. Transportation and Handling
  - 1. Transport and handle products in accordance with manufacturer's instructions.
  - 2. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and products are undamaged.

### **2.2 STORAGE AND PROTECTION**

- A. Refer to Division 1.
- B. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

### **2.3 PRODUCT OPTIONS**

- A. Refer to Division 1.
- B. Products Specified by Reference Standards or by Description only: Any product meeting those standards or description.
- C. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications; no options or substitutions allowed.
  - 1. Documents have been prepared utilizing a single manufacturer as the basis of design. Contractor shall be responsible for coordinating any varying

requirements (e.g. space requirements, electrical requirement) when utilizing the other acceptable manufacturers.

### **PART 3 - EXECUTION**

#### **3.1 SCOPE**

- A. Work included under Division 15, Mechanical Work, shall include all labor, services, materials and equipment and performance of all work required for installation of mechanical systems as shown on Drawings and as herein specified in following sections.

#### **3.2 INTERPRETATION OF CONTRACT DOCUMENTS**

- A. Should there be discrepancy or a question of intent, refer matter to Architect/Engineer for decision before ordering any equipment or materials or before starting any related work.
- B. Drawings and Specifications are to be taken together. Work specified and not shown or work shown and not specified shall be performed or furnished as though mentioned in both Specifications and Drawings. If there is discrepancy between Drawings and Specifications as to quantity or quality to be provided, the greater quantity or better quality shall be provided.
- C. Minor items and accessories or devices reasonably inferable as necessary to complete and proper installation and operation of any system shall be provided by Contractor for such system whether or not specifically called for by Specifications or Drawings.
- D. Architect/Engineer may change location of any equipment 5' and any piping, ductwork, conduit, etc. 10' in any direction without extra charge, provided such changes are made before installation.
- E. Locations of items not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to review and approval by Architect.
- F. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
  - 1. Where headroom or space conditions appear inadequate, notify Architect or Owner's field representative before proceeding with installation.
  - 2. Duct and pipe rerouting and duct size changes shall be made at no additional cost to the Owner.
- G. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit installation of other work without delay.
- H. Where there is evidence that parts of the Work specified in Division 15 will interfere with other work, assist in working out space conditions to make satisfactory adjustments, revise and submit coordinated shop drawings.
- I. After review and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other sections or for proper execution of the work.
- J. Work installed before coordinating with other work so as to cause interference with other work shall be changed and corrected without additional cost to the Owner.

- K. Drawings are diagrammatic in nature and are a graphic representation of requirements and shall be followed as closely as actual building construction will permit. All changes from the plans necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to rules of the Governmental Authorities having jurisdiction, NFPA, OSHA and the Owner's Insurance Underwriters, shall be made by the Contractor without extra cost to the Owner.
- L. The layout of the piping, ductwork, equipment, etc., as shown on the drawings shall be checked and exact locations shall be determined by the dimensions of the equipment approved and the Contractor shall obtain approval for the revised layout before the apparatus is installed. The Contractor shall field measure or consult existing record Architectural and Structural Drawings if available for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, etc.
- M. Omission in the Drawings and/or Specifications of any items necessary for the proper completion or operation of the work outlined in this specification shall not relieve the Contractor from furnishing same without additional cost to the Owner.
- N. The Equipment Shop Drawings will be furnished to the Contractor before roughing-in. Contractor shall not install any piping or ductwork for said equipment until he has received approved shop drawings for same.

### **3.3 PROJECT/SITE CONDITIONS**

- A. Each Contractor shall visit the site prior to bid submission to determine all existing conditions that may affect his work and shall make appropriate allowances for such conditions in his bid. Failure to visit the site shall not be cause for a request for additional compensation later in the project during construction.
- B. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- C. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

### **3.4 ALTERATIONS IN PRESENT BUILDING AND SYSTEMS**

- A. Contractor shall take particular note of the revisions and alterations to the existing systems, facilities and equipment due to the new construction as indicated on the Drawings and/or in Specification. Contractor shall remove, reroute or alter all services, ductwork, etc., as required or as indicated on the drawings.
  - 1. The Contractor shall maintain all services in the existing building. In case, where new service connections are to be made to existing services and service interruptions can in no way be avoided, the service interruptions shall be with the minimum of inconvenience to the Owner and the work shall be done at such time of any day, Saturday and Sunday included, and only as directed by the Owner or the Architect.

### **3.5 ERECTION & WORKMANSHIP**

- A. Contractor is to be responsible for all work fitting into place in satisfactory, neat and workmanlike manner in every particular, to approval of Architect/Engineer.
- B. Unless explicitly stated to contrary, each Contractor shall furnish and install each item of equipment or material hereinafter specified, complete with all necessary fittings,

supports, trim, piping, insulation, etc., as required for complete and operating installation.

- C. Equipment and materials shall be installed according to manufacturer's instruction unless otherwise specifically directed by Contract Documents.
- D. Contractor shall provide all necessary OSHA approved rigging, scaffolding, tools, tackle, labor, etc., necessary for the complete installation of the equipment.
- E. Contractor shall adapt his work to job conditions and make such changes as required and permitted by the Architect such as moving his work to clear beams, joints, light fixtures, etc., adjusting risers, etc. avoiding interferences with windows and openings, etc. raising or lowering his work to permit the passing of ductwork or the work of other trades, etc., all as required or as job conditions dictate, without any additional costs to the Owner.
- F. All appliances and equipment shall be installed and connected with best engineering practices and in accordance with the manufacturer's best instructions and recommendations.
- G. Work done by Contractor at the site in the execution of this Project shall be performed only by skilled mechanics, recognized as such in their respective trades in the direct employ either of the Contractor proper or of affiliate firms which have a longstanding and continuing formal agreement with the Contractor for providing the rendered services on similar work of this type.

### **3.6 PROTECTION FROM INJURY**

- A. All pipes, fixtures, traps, equipment, and other parts of the Work shall be protected against injury by freezing or exposure to the weather during construction while stored or installed in place.

### **3.7 MECHANICAL AND ELECTRICAL WORK COORDINATION**

- A. Refer to Division 1.
- B. Provide coordination for type of mechanical and electrical work required for this project for duration of work.
- C. Submittals
  - 1. Coordinate mechanical and electrical work of Divisions 15 and 16 with work of each other and of other Divisions.
  - 2. Coordinate progress schedules, including dates for submittals and for delivery of products.
  - 3. Coordinate location and verify size of pipes, equipment, fixtures, conduit, ducts, openings, switches, outlets, fire sprinkler heads, fire hose cabinets, etc., in progress of the Work. Architectural Drawings shall take precedence over Mechanical and Electrical Drawings.
  - 4. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- D. Coordination of Submittals
  - 1. Review shop drawings, product data, and sample for compliance with Contract Documents and for coordination among work of all sections of Project Manual. Transmit to Architect.

2. Check field dimensions and clearances and relationship to available space and anchors.
  3. Check compatibility with equipment and work of other sections, electrical characteristics and operational control requirements.
  4. Check motor voltages and control characteristics.
  5. Coordinate controls, interlocks, wiring of pneumatic switches and relays.
  6. Coordinate wiring and control diagrams.
  7. Review effect of any changes on work of other sections.
  8. Verify and coordinate maintenance of Record Documents.
- E. Coordination of Substitutions and Modifications
1. Review proposals and requests from subcontractors.
  2. Verify compliance with Contract Documents and for compatibility with work and products of other sections.
  3. Submit to Architect with recommendation for action.
- F. Observation of Work
1. Observe work for compliance with Contract Documents.
  2. Maintain list of observed deficiencies and defects; promptly submit to Architect.
- G. Documentation
1. Observe and maintain a record of tests. Record:
    - a. Specification section number, product, and name of subcontractor.
    - b. Name of testing agency and name of inspector.
    - c. Name of manufacturer's representative present.
    - d. Date, time, and duration of tests.
    - e. Type of test, and results.
    - f. Retesting required.
  2. Assemble background documentation for dispute and claim settlement by Architect.
  3. Submit copies of documentation to Architect upon request.
- H. Equipment Start-Up
1. Verify utilities, connections and controls are complete and equipment is in operable condition.
  2. Observe start-up and adjustments; record time and date of start-up and results.
  3. Observe equipment demonstrations to Owner; record times and additional information required for Operation and Maintenance Manuals.
- I. Inspection and Acceptance of Equipment
1. Prior to inspection, verify that equipment is tested and operational, and clean.
  2. Assist Architect with inspection. Prepare list of items to be completed and corrected.

### **3.8 CUTTING AND PATCHING**

- A. Refer to Division 1.
- B. Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
  2. Integrity of weather-exposed or moisture-resistant element.

3. Efficiency, maintenance, or safety of any operational element.
  4. Visual qualities of sight-exposed elements.
  5. Work of Owner or separate contractor.
- C. Include in request:
1. Effect on work of Owner or separate contractor.
  2. Written permission of affected separate contractor.
  3. All items requested in Division 1.
- D. Examination
1. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
  2. After uncovering existing work, inspect conditions affecting performance of work.
  3. Beginning of cutting or patching means acceptance of existing conditions.
- E. Preparation
1. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
  2. Provide protection from elements for areas which may be exposed by uncovering work.
  3. Maintain excavations free of water.
- F. Cutting and Patching
1. Execute cutting, fitting, and patching including excavation and fill to complete work.
  2. Fit products together to integrate with other work.
  3. Uncover work to install ill-timed work.
  4. Remove and replace defective or non-conforming work.
  5. Remove samples of installed work for testing when requested.
  6. Provide openings in work for penetration of mechanical and electrical work.
- G. Performance
1. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
  2. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
  3. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
  4. Restore work with new products in accordance with requirements of Contract Documents.
  5. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
  6. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated fire resistant material to full thickness of the penetrated element.
  7. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

### **3.9 ACCESS PANELS**

- A. Where control valves, shut-off valves, drip traps, heating coils, dampers, pull boxes or other specialties, which require service or adjustment, are installed above inaccessible type furred ceilings or within furred walls, Contractor whose equipment is involved shall furnish and install access panels as required.
- B. Access panels shall be of sufficient size to make possible servicing, adjustment, removal and replacement of concealed equipment through opening provided. Panels shall be sized as shown on drawings, or if sizes are not shown, shall be minimum of 16" x 24" in walls and 24" x 24" in ceilings.
- C. Contractor shall confer with other trades with respect to access panel locations, and shall wherever practical group valves, traps, dampers, etc. in such way as to be accessible from single panel and eliminate as many access panels as possible.
- D. Submit shop drawings for review before ordering panels. Where fire rating is required, furnish label doors compatible with fire rating of assembly.

### **3.10 FIRE RATED PENETRATIONS**

- A. Sleeves for pipes and ducts through fire rated and fire resistive floors and walls shall be constructed of materials classified by UL to provide fire stopping equal to time rating of construction being penetrated. Use asbestos free materials that comply with applicable codes and have been tested under positive pressure in accordance with UL 1479 or ASTM E 814.
- B. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
- C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- D. Where floor openings without penetrating items are more than 4" in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
- E. Protect materials from damage on surfaces subject to traffic.
- F. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- G. Keep areas of work accessible until inspection by applicable code authorities.
- H. Perform under this section patching and repairing of fire stopping caused by cutting or penetration by other trades.
- I. Clean up spills of liquid components.
- J. Neatly cut and trim materials as required.
- K. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

### **3.11 PROTECTION OF ELECTRICAL EQUIPMENT**

- A. Contractor shall furnish and install sheet metal drain pans beneath piping that is routed above electrical equipment and/or above the 3' access space in front of such equipment. Electrical equipment, for the purpose of addressing drain pan requirements, shall be defined as free-standing or wall-mounted switchgear, transformers, distribution boards or motor control centers. Piping includes, but is not limited to, plumbing, fire protection, mains (not branch piping with sprinkler heads), hydronic heating or cooling, steam and condensate, and fuel systems.

1. Drain pans shall be 20 gauge galvanized sheet metal with a minimum 4" high turned up edge. Bottom of drain pan shall slope to a single drainage point at 1/8" per foot. A 1" diameter clear plastic tube shall allow collected fluid to drain to the nearest open site floor drain. Secure plastic tubing to building structure only.
  2. Drain pan shall be hung from building structure with angle iron trapeze hangers (no hanger shall penetrate the drain pan). Consider drain pan to be full of water for hanger load calculations.
  3. Drain pans shall include liquid detectors with alarms only if noted on the drawings.
- B. Provide sprinkler heads beneath drain pan only as required by NFPA.
- C. Contractor shall include provisions to adjust the local lighting layout, at no extra cost to Owner, in order to accommodate any detrimental effect the drain pan has on the illumination of the electrical equipment and access space

### 3.12 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence or other conditions which may cause damage.
- D. Verify that tests, meter readings and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible manufacturer's representative or Contractors' personnel 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.
- H. Submit a written report in accordance with paragraph 1.14 previously specified that equipment or system has been properly installed and is functioning correctly.

### 3.13 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
  1. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.
  2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

- C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION

**SECTION 15140**  
**SUPPORTS, ANCHORS AND SLEEVES**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Pipe and equipment hangers, supports and associated anchors.
- B. Duct hangers and supports.
- C. Equipment bases and supports (including roof curbs).
- D. Sleeves and seals.
- E. Vertical-piping clamps.
- F. Saddles and shields.
- G. Miscellaneous materials.
- H. Anchors.
- I. Flashing and sealing equipment and pipe stacks.

**1.2 REFERENCES**

- A. ANSI/ASME B31.1 - Power Piping.
- B. AWS - Specifications for Qualification of Welding Procedures and Welders.
- C. ASTM A36 - Steel Plates, Shapes and Bars.
- D. ASTM C150 - Portland Cement.
- E. ASTM C404 - Uniformly Graded Natural Sand.
- F. ASTM E-814 - Fire Tests of Through-Penetration Fire Stops.
- G. AWWA - American Water Works Associations.
- H. BOCA - Basic/National Building Code.
- I. ICBO - Uniform Building Code.
- J. MSS - Manufacturers Standardization Society.
- K. NRB 243 - National Research Board Report Number.
- L. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- M. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.
- N. NFPA 101 - Code for Safety to Life from Fires in Buildings and Structures.
- O. SBCCI - Standard Building Code.
- P. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.
- Q. UL - Underwriters Laboratories.
- R. UL 1479 - Firestops, Fire Tests of Through-Penetration.
- S. FM - Factory Mutual.

**1.3 QUALITY ASSURANCE**

- A. Refer to Division 1 and Section 15010.
- B. Comply with product data under provisions of Section 01400.
- C. Supports for Sprinkler Piping: In conformance with NFPA 13.

- D. Supports for Standpipes: In conformance with NFPA 14.
- E. UL and FM Compliance: Provide products which are UL listed and FM approved.
- F. MSS Standard Compliance:
  1. Provide pipe hangers and supports of which materials, design and manufacture comply with MSS SP-58.
  2. Select and apply pipe hangers and supports, complying with MSS SP-69.
  3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
  4. Terminology used in this section is defined in MSS SP-90.

#### **1.4 SUBMITTALS**

- A. Refer to Division 1 and Section 15010.
- B. Submit product data under provisions of Section 01300.
- C. Indicate hanger and support framing and attachment methods.

### **PART 2 - PRODUCTS**

#### **2.1 ACCEPTABLE MANUFACTURERS - PIPE HANGERS AND SUPPORTS**

- A. B-Line Systems, Inc.
- B. Fee and Mason Manufacturing Company
- C. ITT Grinnell Corporation
- D. Substitutions: Under provisions of Division 1 and Section 15010.

#### **2.2 PIPE HANGERS AND SUPPORTS (BASED ON B-LINE SYSTEMS, INC.)**

- A. Wall Supports, Brackets, Pipe Rolls, U-bolts
  1. Wall Support for Single Pipes to 4": Carbon steel straight one hole J-hook plain finish painted with one coat of rust-inhibiting primer. Fig. B3190.
  2. U-Bolts: Carbon steel with hex nuts to support, anchor or guide cold piping on wall brackets. Fig. B3188.
- B. Pipe Insulation Shields
  1. Shield for Copper Tubing Sizes to 3": Galvanized 18 gauge x 12" long steel saddle with 4 lb density polyurethane insulation insert with vapor barrier jacket.

#### **2.3 INSERTS**

- A. Poured Concrete Slab
  1. After Concrete is Poured: Where supports in slabs are required after concrete has been poured, self-drilling expansion threaded inserts with conical plugs are to be provided and installed in accordance with manufacturer's recommendations. Model Red Head manufactured by Phillips Drill Company.

#### **2.4 SLEEVES**

- A. Sleeves for Pipes Through Non-fire Rated Beams, Walls and Footings: Form with standard weight galvanized steel pipe or 18 gauge galvanized steel.
- B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed complying with ASTM E814. Fire penetrators manufactured by ProSet Systems.

- C. Penetration Stuffing and Damming Materials
  - 1. Fire, Smoke and Fume Stops: Fiberglass batt insulation, mineral wool or backer block where damming is required.
  - 2. Non-Fire Rated Penetrations: Fiberglass batt insulation or mineral wool.
- D. Caulking
  - 1. Fire, Smoke and Fume Stops
    - a. Cracks, voids or holes up to 4" diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal and capable of expanding 10 times when exposed to temperatures of 250F to 350F and have I.C.B.O., B.O.C.A.I. and S.B.C.C.I. (NRB243) and NFPA 101 approved ratings to three hours per ASTM E-814 (UL 1479). Use Chase Foam CTC-PR-855, where approved by the governing agencies.
    - b. Opening 4" or greater: Use intumescent elastomer sealing system capable of passing 3-hour fire test in accordance with ASTM E-814 (UL 1479), consisting of wall wrap or liner, partitions and end caps capable of expanding 10 times when exposed to temperatures of 250F to 350F.
    - c. Materials shall be UL listed fire barrier caulk, wrap/strip, moldable putty and sheet forms.
    - d. Subject to compliance with requirements, provide fire barrier penetration seals by one of the following:
      - (1) 3M Fire Protection Products
      - (2) Chase Technology Corporation
      - (3) Nelson; Unit of General Signal
    - e. Use proper UL through-penetration firestop systems required for materials passing through sleeves.
  - 2. Other areas, Pecora "AC20" acrylic or equal.

## 2.5 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping. Insulated copper pipe will not require copper plated hangers and supports.
- D. Duct hangers shall comply with SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

## 2.6 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.
- C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

## 2.7 FINISH

- A. Prime coat exposed steel hangers, guides, anchors and supports. Hangers, guides anchors and supports located in crawl spaces, pipe shafts and suspended ceiling spaces are not considered exposed.

## PART 3 - EXECUTION

### 3.1 INSERTS

- A. In remodeled areas, provide expanding concrete anchors. Holes for expanding fasteners to be drilled either by carbide bit or by teeth on fastener itself. Expansion shield to be "set" by driving it into hole and expanding it with conical plug.

### 3.2 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>MAX. HANGER SPACING</u>	<u>HANGER DIAMETER</u>
½" to 1¼"	6'-6"	⅜"

- B. Install hangers to provide minimum ½" space between finished covering and adjacent work.
- C. Place a hanger within 12" of each change in direction of piping and at each vertical drop riser to equipment.
- D. Use hangers with 1½" minimum vertical adjustment.
- E. Support vertical piping at every floor.
- F. Support riser piping independently of connected horizontal piping.
- G. Pipes shall not be supported from ducts, electrical conduits or other piping.
- H. Support pipes such that piping is hung free of dependence on pipe sleeves for supports.
- I. Provide all auxiliary steel required for pipe supports.
- J. Threaded pipe, chains, wire and perforated straps will not be accepted. Stagger and distribute hangers on parallel piping to avoid overloading of existing or new construction.

### 3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment roof bases constructed of UV resistant composite material.
- B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct support of steel members or as recommended by equipment manufacturer. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

### 3.4 SLEEVES

- A. Where pipes which pass through sleeves are to be insulated, the sleeves shall be of sufficient size to permit the full specified thickness of insulation to pass through sleeves.
- B. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. All pipe penetrations shall be fire-stopped as necessary to restore the original fire rating of the

floor or wall system. The annular void around the pipe shall not be filled with mineral wool, fiberglass insulation, cement, grout or similar non-rated materials that fail to expand when exposed to heat.

- C. Install stainless steel escutcheons at finished surfaces.
- D. The contractor shall not drill holes through, cut or otherwise damage any beam or column of the building's structural frame.
- E. Installation of Fire, Smoke and Fume Stopping Materials:
  - 1. Penetration shall be free of debris and dirt.
  - 2. Dam the penetration (when required) with an acceptable material.
  - 3. Apply material to the penetration. Use a caulking gun, putty knife or other normal trade tools per manufacturer's instructions.
  - 4. Provide proper material thickness to assure that fire rating is equal to or greater than floor or wall pipe is penetrating.

### **3.5 ADJUSTING AND CLEANING**

- A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
- B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- D. Clean sleeves with fire, smoke and fume stopping materials as follows.
  - 1. Remove damming materials where necessary after material has cured.
  - 2. Clean up adjacent surfaces with Xylene or other approved cleaning agent.

END OF SECTION

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**SECTION 15242  
VIBRATION ISOLATION**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Vibration isolation devices included in this section are:
  - 1. Vibration Isolators
    - a. Restrained spring isolators (Type VI-4)
  - 2. Flexible Pipe Connectors
    - a. Bronze hose flexible connectors

**1.2 DEFINITIONS**

- A. ICC-ES: ICC-Evaluation Service.
- B. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California

**1.3 CODES AND STANDARDS (USE LATEST EDITIONS)**

- A. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
  - 1. ASHRAE 2007 Applications Handbook Chapter 47, Sound and Vibration Control
- B. International Building Codes
  - 1. International Building Code (IBC)
- C. Manufacturers Standardization Society (MSS)
  - 1. MSS SP-58-02: Pipe Hangers and Support Materials, Design and Manufacture
- D. Occupational Safety and Health Administration (OSHA)
  - 1. 29CFR 1910.95 – Occupational Noise Exposure

**1.4 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

**1.5 SUBMITTALS**

- A. To be provided to the Vibration Isolation Manufacturer's Representative:
  - 1. A complete set of shop drawings for all equipment to receive vibration isolation from which the Vibration Isolation Manufacturer's Representative shall base the selection of vibration isolators and design of supplementary bases. The drawings shall include locations of all mechanical equipment to receive vibration isolation devices, operating weight of the equipment to be isolated and the distribution of weight to the support points.

- B. Submit the following to the Engineer:
1. Product Data: For each vibration isolation device, provide the following:
    - a. Manufacturer name
    - b. Isolator type and model number
    - c. Material and construction of finish
    - d. Dimensional data
    - e. Rated load, rated deflection, and overload capacity
    - f. For spring vibration isolation devices include:
      - (1) Spring diameters
      - (2) Static deflection
      - (3) Free height
      - (4) Compressed spring height and solid spring height
    - g. Drawings or schedule indicating which isolators are to be used on which equipment at a particular locations
  2. For flexible pipe connectors provide the following:
    - a. Maximum allowable temperature and pressure rating
    - b. Overall face-to-face length
    - c. Live length
    - d. Hose wall thickness
    - e. Hose convolutions per foot and per assembly
    - f. Fundamental frequency of assembly
    - g. Braid structure and total number of wires in braid (for stainless steel only)
  3. Provide a complete layout of piping to be isolated, including vertical risers, showing size or weight and support points of the piping system to the vibration isolation materials manufacturer for selection and layout of isolation hangers.
  4. Field quality-control test reports.

## **PART 2 - PRODUCTS**

### **2.1 VIBRATION ISOLATORS**

- A. Acceptable Manufacturers
1. Kinetics Noise Control
  2. Mason Industries
  3. Vibro Acoustics
- B. General requirements applicable to all isolators:
1. Outside Spring Diameter: Not less than 80% of the compressed height of the spring at rated load.
  2. Minimum Additional Travel Distance to Solid: 50% of the required deflection at rated load.
  3. Lateral Stiffness: More than 80% of rated vertical stiffness.
  4. Overload Capacity: Support 200 % of rated load, fully compressed, without deformation or failure.
  5. Operating static deflection: Refer to the Applications table in Part 3.

6. Materials:
    - a. Indoor: Housings and springs shall be powder coated steel and hardware shall be electro-galvanized.
    - b. Outdoor: Hot dip galvanized housings and cadmium plated spring elements in compliance with ASTM A123.
  7. Springs shall be color coded to indicate load capacity.
- C. Restrained Spring Isolators (**Type VI-4**)
1. Freestanding, steel, open-spring isolators with limit-stop restraint
  2. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; baseplate with factory drilled bolt holes for bolting to mounting surface, bonded to 1/4" thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation. Vertical limit stops shall be out of contact during normal operation. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 1/2" to avoid bumping and interfering with the spring action.
  3. For equipment located outside, limit stops shall resist wind velocity up to 130 mph.
  4. Restraint: Limit stop as required for equipment. Restraining bolts shall have rubber grommets to provide cushioning in the vertical as well as horizontal directions. The hole through the bushing shall be a minimum of 3/4" larger in diameter than the restraining bolt.
  5. Basis of Design: Mason Industries Type SLR

## 2.1 FLEXIBLE PIPE CONNECTORS

- A. Acceptable Manufacturers
  1. Mason Industries
  2. Metraflex
  3. Twin City Hose
- B. Bronze Hose Flexible Connectors
  1. For pipe up to 2":
    - a. Connectors shall be constructed of bronze hose and braided outer covering. End connections shall be female copper tube designed for braze connections.
    - b. Connectors shall be cleaned, de-greased, and bagged to protect from contamination.
    - c. Connectors shall be tested and approved by Underwriters Laboratories for refrigeration service.
    - d. Rated for a minimum operating pressure of 170F at up to 70F.
    - e. Length shall be per manufacturer's recommendations.
    - f. Basis of Design: Metraflex Model BBT

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. The Contractor shall consult with the local representative of the vibration isolation materials manufacturer, prior to installing any devices, in order to obtain guidance for this project’s specific installation requirements.

**3.2 APPLICATION**

- A. Provide vibration isolation devices for equipment per the following schedule.
  - 1. The base type defined below indicates that bases independent of the equipment are required; the base type is not intended to define an equipment-specific factory base. Where “none” is indicated, the equipment and its integral factory-provided base shall be mounted directly on the defined isolators.

Isolated Equipment			Upper Floors (Spans up to 30 ft)		Comment
Type	HP or size	RPM	Base Type	Vibration Isolator	
				Type	
Condensing Units	All	All	None	VI-4	2"

**3.3 INSTALLATION**

- A. General vibration isolation requirements:
  - 1. The Vibration Isolator Manufacturer or the Manufacturer’s Representative shall:
    - a. Supply isolator and other related equipment including rails, resilient pipe supports, fan and motor bases and structural steel forms for concrete inertia blocks wherever required.
    - b. Be responsible for proper isolator sizing to accomplish the uniform static deflection according to distribution of weight based on factory certified manufacturer’s drawings of equipment to be isolated.
    - c. Select springs to operate at 2/3 maximum compression or provide alternate recommendation.
  - 2. Refer to Applications Table for base type, isolator type and required deflection for each type of equipment.
  - 3. All motor driven mechanical equipment shall be isolated from the building structure by means of vibration isolators. If specific equipment type is not listed in the Application Table, the Contractor shall notify Engineer in writing and obtain specification from Engineer or provide vibration isolation per 2003 ASHRAE Handbook HVAC Applications Table 42.
  - 4. No rigid connections between isolated equipments and building structure shall be made that degrades the vibration isolations systems; electrical conduit connections to isolated equipment shall be looped to allow free motion of isolated equipment. Coordinate with Electrical Contractor.

- B. Requirements for flexible pipe connectors:
1. Install flexible pipe connectors on pipes connected to all rotating or reciprocating equipment and equipment supported by vibration isolation.
  2. Provide the following types of flexible connectors at equipment:

System/Location	Flexible Connector Type	Comments
Refrigerant piping connected to remote-mounted condensing units.	Bronze	

3. Provide flexible connectors suitable for pressure, temperature and fluid involved.
  4. Equipment flexible connectors shall be located between shutoff valves and the equipment.
  5. Flexible connectors shall not be used as compensators for piping misalignment. Pipe connections shall be properly center-to-center aligned.
- C. On completion of installation of all isolation materials and before start-up of isolated equipment all debris shall be cleared from areas surrounding and from beneath all isolated equipment, leaving equipment free to move on the isolation supports.

### 3.4 INSPECTION

- A. On completion of installation of all noise and vibration isolation devices, the local Manufacturer's Representative shall inspect the completed system and furnish the report to Architect/Engineer indicating installation errors or other faults in the system that affect the isolating system performance. The report shall indicate whether the isolation equipment has been properly installed or, if it requires correcting, the steps needed to properly complete the work. The final report shall certify that the deficiency listed have been corrected, the equipment has been properly installed and functional.

END OF SECTION

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**SECTION 15250  
THERMAL INSULATION**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Products furnished and installed under this section:
  - 1. Insulation.
  - 2. Protective coverings.
  - 3. Accessories.

**1.2 DEFINITIONS**

- A. Piping Insulation: Thermal insulation applied to prevent heat transmission to or from a piping system (temperature range of -100F to +1500F).
- B. Vapor Retarder Jacket: Insulation jacket material which impedes the transmission of water vapor.
- C. Insert: Spacer placed between the equipment support system and the equipment to allow for the space required for insulation.
- D. Insulation Shield: Buffer material placed between the equipment support system and the insulation to prevent the insulation material from crushing.

**1.3 CODES AND STANDARDS**

- A. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Midwest Insulation Contractors Association (MICA) - Commercial and Industrial Insulation Standards.
- D. North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- G. NFPA-90A - Installation of Air Conditioning and Ventilation Systems.
- H. NFPA-90B - Warm Air Heating and Air-Conditioning Systems.
- I. ASHRAE Standard 90.1-1989 Energy Efficient Design of New Buildings Except New Low-Rise Residential Buildings.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum five years documented experience.
- C. Products: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84 or NFPA 255 or UL 723.

D. No insulation product shall support or promote mold or fungus growth.

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide a schedule, listing each type of insulation, thickness, density, type of protective covering, etc., and the work and service to which each type of insulation is to be applied. The schedule shall be submitted in quantities consistent with that required in the Conditions of the Contract. No insulation shall be purchased or installed until the schedule is reviewed by the Engineer.
- C. Manufacturer's Installation Instructions: Indicate specific installation instructions per the manufacturers of the various products and indicate how the system (combination of products) will be assembled. Highlight critical environmental factors such as drying time, etc., as well as any variations between the manufacturer's installation instructions and the specified installation instructions along with a reason for the difference.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Deliver products to site in containers with manufacturer's stamp or label affixed showing fire hazard indexes of products.
- C. Protect products against dirt, water, chemical and mechanical damage before, during and after installation. Do not install damaged or wet insulation; remove from project site. Damage to products prior to final acceptance of the Work shall be repaired or replaced at no additional cost to Owner.
- D. Where existing insulation has been removed or disturbed, due to new connections and/or alterations, repair and replace existing insulation using materials that match existing, except where existing insulation includes asbestos material.
- E. Existing insulation containing asbestos materials (or thought to contain asbestos materials) must be removed by Owner, either totally or in part, in strict accordance with OSHA Regulations utilizing OSHA approved Contractors. Repair and/or replacement of existing insulation containing asbestos shall be with new products as specified herein.
- F. Maintain ambient conditions required by the manufacturer of each product.

## 1.7 WARRANTY

- A. One year warranty on products and complete installation commencing at the time of Substantial Completion.

## 1.8 MAINTENANCE

Not Applicable

## PART 2 - PRODUCTS

### 2.1 INSULATION

- A. Acceptable Manufacturers:
  - 1. Johns Manville
  - 2. Owens-Corning
  - 3. Knauf

4. Armstrong
  5. Certainteed Corp.
- B. Type FEP: *Flexible elastomeric plastic* insulation; ANSI/ASTM C534; 'k' value of 0.27 at 75F mean temperature. Thickness shall be ½".

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Install products only after piping, ductwork and equipment have been tested and approved.
- B. Verify that surfaces are clean and dry with any and all foreign material removed.
- C. Provide drop cloths or other means of protecting all equipment from drops, spattering, etc. which may be caused by the application of insulating products.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's and NAIMA instructions.
- B. Whenever insulated pipes or ducts pass through sleeves or openings, the full specified thickness of the insulation shall pass through the sleeve or opening, except for sleeves located in fire rated partitions or floors. Space between pipe and sleeve located in fire rated partition or floor shall be sealed.
- C. Contractor shall note that all adhesives shall be applied as specified, in continuous bands for complete coverage. The "spot" application of adhesives is not permitted.
- D. Neatly finish insulation at supports, protrusions and interruptions.
- E. Contractor shall coordinate with support and firestopping requirements as noted elsewhere in the Contract Documents.

**3.3 APPLICATION (PIPING)**

- A. Schedule

INSULATION	OPERATING	
	<u>TYPE</u>	<u>TEMP (F)</u>
<u>Cooling Systems (Refrigerant and Other Cold Fluid Lines)</u>		
Refrigerant (Suction)	FEP	32
Cooling Coil Condensate Drain Piping	GFP	50

Use maximum fluid temperature for those systems where fluid temperature is above ambient temperature, minimum fluid temperature for those systems where fluid temperature is below ambient temperature.

- B. Indoor Pipe
  1. End joints shall be sealed with insulation manufacturer's recommended cement.
  2. All fittings, valves, strainers, flanges, etc. shall be insulated with fabricated mitered or molded segments of insulation equal in thickness to the adjoining pipe insulation. Segments shall be firmly butted and sealed with insulation manufacturer's insulating cement.

C. Exterior Pipe

1. Insulate the same as for "Indoor, Concealed Pipe."

**3.4 ADJUSTING**

Not Applicable

**3.5 CLEANING**

A. All empty cartons, containers, etc. which have contained insulating materials shall be removed from the site and premises by the Contractor as soon as possible after their contents have been removed.

END OF SECTION

**SECTION 15535**  
**REFRIGERANT PIPING AND SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Flexible connections.

**1.2 RELATED SECTIONS**

- A. Section 15010 - Basic Mechanical Requirements
- B. Section 15250 - Thermal Insulation.

**1.3 REFERENCES**

- A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- B. ANSI/ASHRAE 34 - Number Designation of Refrigerants.
- C. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. ANSI/ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes.
- E. ANSI/ASME B31.5 - Refrigeration Piping.
- F. ANSI/ASTM B32 - Solder Metal.
- G. ANSI/ASTM B88 - Seamless Copper Water Tube.
- H. ANSI/AWS A5.8 - Brazing Filler Metal.
- I. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- J. MIL-I-631C - (Construction at Solenoid Valve Coils)
- K. MIL-V-23450C - Valves, Expansion, Thermostatic, Refrigerant 12 and Refrigerant

**1.4 SUBMITTALS**

- A. Submit shop drawings under provisions of Division 1 and Section 15010.
- B. Submit shop drawings indicating schematic layout of system, including equipment, critical dimensions, and sizes. Shop drawings shall be submitted on the following:
  - 1. Piping and fittings
  - 2. Refrigerant
  - 3. Flexible Connectors
- C. Submit product data under provisions of Division 1 and Section 15010.
- D. Submit product data indicating general assembly of specialties, including manufacturer's catalogue information.

- E. Submit manufacturer's installation instructions under provisions of Division 1 and Section 15010.
- F. Submit design data as a submittal under provisions of Division 1 and Section 15010.
- G. Submit data indicating pipe sizing.
- H. Submit Test reports indicating results of leak test, acid test.

### **1.5 PROJECT RECORD DOCUMENTS**

- A. Submit documents under provisions of Division 1 and Section 15010.
- B. Accurately record exact locations of equipment and refrigeration accessories on record drawings.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site under provisions of Division 1.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Store and protect products under provisions of Division 1.
- D. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

## **PART 2 - PRODUCTS**

### **2.1 PIPING**

- A. Copper Tubing to 7/8" OD: ANSI/ASTM B88, Type K, annealed.
  - 1. Fittings: ANSI/ASME B16.26 cast copper.
  - 2. Joints: Flared.

### **2.2 REFRIGERANT**

- A. Refrigerant: ANSI/ASHRAE 34; R-410A : R-32/125 blend.
- B. Contractor shall provide a full refrigerant charge for all new systems.

### **2.3 FLEXIBLE CONNECTORS**

- A. Corrugated bronze hose with single layer of stainless steel exterior braiding, minimum 9" long with copper tube sweat connections, silver soldered each end; for maximum working pressure 450 psi. at 70 F. Series 401M by Flexonics.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.2 INSTALLATION**

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Provide non-conducting dielectric connections when joining dissimilar metals.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access to concealed valves and fittings.
- I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- K. Insulate piping; refer to Section 15250.
- L. Install flexible connectors at right angles to axial movement of compressor.
- M. Fully charge completed system with refrigerant after testing.

### **3.3 APPLICATION**

- A. Provide line size liquid indicators in main liquid line leaving condenser.
- B. Provide permanent filter-driers in systems utilizing hermetic compressors.
- C. Provide refrigerant charging (packed angle) valve connections in liquid line between receiver shut-off valve and expansion valve.
- D. Utilize flexible connectors at or near compressors where within piping configuration does not absorb vibration.

### **3.4 FIELD QUALITY CONTROL**

- A. Test refrigeration system in accordance with ANSI/ASME B31.5.
- B. Pressure test piping with dry nitrogen for a proof test of 450 psig and a leak test of 300 psig. Perform final tests at 27" vacuum and 300 psig using electronic leak detector. Test to no leakage.

END OF SECTION

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**SECTION 15681**  
**PACKAGED AIR-COOLED MINI-SPLIT AIR-CONDITIONING SYSTEMS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This section includes specifications for mini-split air conditioning and heat pump systems for use with air-cooled condensing units. Included are the following topics:
  - 1. GENERAL
    - a. Scope of Work
    - b. Related Work
    - c. Reference
    - d. Reference Standards
    - e. Quality Assurance
    - f. Submittals
    - g. Operation and Maintenance Data
    - h. Delivery, Storage and Handling
    - i. Warranty
  - 2. PRODUCTS
    - a. Units up to 5 Tons
    - b. Indoor Unit
    - c. Condensing Unit
    - d. Power Wiring
    - e. Controls
    - f. Refrigerant Piping Sizing
  - 3. EXECUTION
    - a. Installation
    - b. Startup
    - c. Agency Training

**1.2 RELATED WORK**

- A. Section 15010 - Basic Mechanical Requirements
- B. Section 15535 - Refrigerant Piping
- C. Section 15242 – Vibration Isolation

**1.3 REFERENCE**

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

**1.4 REFERENCE STANDARDS**

- A. AHRI 210/240 - Unitary Air Conditioning and Heat Pump Equipment
- B. AHRI 365 - Commercial and Industrial Unitary Air Conditioning Condensing Units
- C. ASHRAE 15 - Safety Standard for Refrigeration Systems
- D. ASHRAE 90.1 (2004 edition) - Energy Standard for Buildings Except Low Rise Residential Buildings
- E. NEC - National Electrical Code

F. UL - Underwriters Laboratory

## **1.5 QUALITY ASSURANCE**

- A. Refer to Division 1, General Conditions, Equals and Substitutions.
- B. Unit Energy Efficiency Ratio (EER), Seasonal Energy Efficiency Ratio (SEER), Coefficient of Performance (COP) and Integrated Part Load Value (IPLV) shall meet the minimum applicable requirements of ASHRAE 90.1(2004 edition). Units that are labeled ENERGY STAR® will be acceptable.
- C. Rate unit performance in accordance with the latest edition of ARI Standard 365 or ARI Standard 210/240, whichever is applicable for the equipment.
- D. Construct units in accordance with ASHRAE 15, UL standards and the NEC. Units shall carry the UL label.
- E. Factory run test units to see that each control device operates properly. Pressure test, evacuate, charge with holding charge of refrigerant and full oil charge prior to shipping from the factory.

## **1.6 SUBMITTALS**

- A. Refer to Division 1, General Conditions, Submittals
- B. Submit air cooled condensing unit shop drawings including the following information: specific manufacturer and model numbers, dimensional and weight data, required clearances, materials of construction, capacities and ratings, stages of unloading capacity achievable without hot gas bypass (and with hot gas bypass if applicable), refrigerant type and charge, component information, size and location of piping connections, electrical connections, wiring diagrams and information for all specialties and accessories.
- C. Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts lists, controls and accessories.
- D. At substantial completion, submit warranty certificate and copy of start-up report.

## **1.7 OPERATION AND MAINTENANCE DATA**

- A. All operations and maintenance data shall comply with the submission and content requirements specified under Division 1 and Section 15010.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- A. Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.
- B. Ship units to jobsite fully assembled

## **1.9 WARRANTY**

- A. Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of project.
- B. Provide a five year parts warranty on the compressor(s) beginning upon substantial completion of project.

## **PART 2 - PRODUCTS**

### **2.1 UNITS UP TO 5 TONS**

- A. Manufacturers: Carrier, Mitsubishi, Sanyo or approved equal.
- B. Provide factory assembled, outdoor mounted, air-cooled condensing unit suitable for on grade or rooftop installation. Include compressor, air cooled condenser, refrigerant, lubrication system, interconnecting wiring, safety and operating controls, motor starting components and additional features as specified herein or required for safe, automatic operation. Capacity and steps of unloading as indicated in the equipment schedule.
- C. Provide indoor, direct expansion, high wall mounted fan coil. Include cooling coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall mounting bracket and mounting hardware.
- D. Provide unit with factory installed low ambient cooling option and wind baffle kit. Unit shall be capable of cooling down to 0°F ambient by regulating compressor capacity and condenser fan speed.
- E. Refrigerant is to be R-410A. Performance shall not be less than 13 SEER at AHRI standard rating conditions.

### **2.2 INDOOR UNIT**

- A. Cabinet
  - 1. Cabinet shall be fully insulated, attractively styled, and constructed of high impact white plastic.
  - 2. An integral, motorized, multi-position, horizontal air sweep louver shall be provided for uniform air distribution, up and down.
- B. Fan
  - 1. Fan shall be tangential direct-drive blower type with air intake at the top of the unit and discharge at the bottom front.
- C. Coil:
  - 1. Coil shall be copper tube with aluminum fins. Fins shall be bonded to the tubes by mechanical expansion.
  - 2. All tube joints shall be brazed with phosphor copper or silver alloy.
  - 3. The coil shall be pressure tested at the factory.
  - 4. A sloped plastic drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap.
- D. Motors:
  - 1. Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motor shall have a minimum of three selectable speeds.
- E. Filters:
  - 1. Unit shall have a return filter track with factory supplied cleanable filters.

## **2.3 CONDENSING UNIT**

### **A. CABINET**

1. Construct cabinet of heavy gauge, galvanized steel coated with weather resistant paint. Provide removable access panels to facilitate full access to the compressor, fan and control components.

### **B. COMPRESSOR**

1. Provide hermetic reciprocating or scroll type compressor with built in motor winding temperature and current protection, liquid and suction service valves, gage ports, sight glass and liquid line filter dryer. Provide crankcase heater with reciprocating type compressors. Mount compressors on vibration isolators.

### **C. CONDENSER**

1. Provide condenser coils with aluminum alloy plate fins mechanically fastened to seamless copper tubing with integral subcooler. Construct coils with design working pressure suitable for the refrigerant. Condenser guard shall be provided.
2. Provide direct-drive statically and dynamically balanced propeller type fans with horizontal discharge as indicated on the drawings and guards constructed of heavy gage PVC coated wire or galvanized steel.

## **2.4 POWER WIRING**

- A. Provide factory installed 24-volt control circuit with fusing; control power transformer and all associated internal wiring. Provide a single point power connection to the unit(s). Provide factory installed magnetic contactors for compressor and condenser motors.

- B. Electrical characteristics shall be as indicated in the equipment schedule.

## **2.5 CONTROLS**

- A. Controls shall consist of a microprocessor based control system which shall control space temperature, determine optimum fan and compressor speeds, and run self diagnostics.

- B. Provide high/low refrigerant pressure cutouts with manual reset and anti-short cycle compressor timer.

- C. Provide "low ambient" controls and accessories needed so that unit is capable of operating down to ambient temperature of 0°F.

## **2.6 REFRIGERANT PIPING SIZING**

- A. The unit manufacturer shall verify the final refrigeration pipe sizing process to insure conformance to specific unit requirements such as max lengths, refrigerant velocities, unloading considerations and proper oil return. This contractor shall provide refrigeration piping drawings from the field which details the way the piping will actually be installed.

- B. Refrigerant piping shall comply with Section 15535 – Refrigerant Piping.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install units, piping and accessories in accordance with the manufacturer's written instructions and recommendations. Mount exterior unit on a composite pad on the roof as indicated on the drawings.
- B. Maintain adequate service access and airflow clearances for all components as recommended by the manufacturer and as indicated on the drawings.
- C. Charge unit(s) with full oil charge and refrigerant charge based on the entire refrigeration system pipe size and length.
- D. Provide all control wiring in conduit in compliance Division 16 - Electrical.
- E. Coordinate power wiring requirements with the electrical trade.
- F. Provide condensate drain piping. Piping shall be constructed of Type L hard drawn copper tubing.

### **3.2 STARTUP**

- A. Adjust units for maximum operating efficiency, adjust all controls to required final settings and demonstrate that all components are functioning properly. Submit four copies of a written startup report following the initial start up. Include in the report: work done to the system, all readings taken, a statement certifying that the refrigeration system(s) are leak free and a statement certifying that the unit(s) have been placed in proper running condition as recommended by the manufacturer and as intended in the drawings and specifications.

### **3.3 AGENCY TRAINING**

- A. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 1 hour.

END OF SECTION

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**SECTION 16010**  
**BASIC ELECTRICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

A. This Section includes general administrative and procedural requirements for electrical installations, and shall apply to all phases of the work specified, indicated on the drawings, or required to provide for complete installation of electrical systems for this project. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

1. Submittals.
2. Record documents.
3. Maintenance manuals.
4. Rough-ins.
5. Electrical installations.
6. Cutting and patching.
7. Warranties.
8. Temporary.
9. Coordination with local utilities.

**1.2 DEFINITIONS**

A. The following definitions shall apply throughout the contract documents:

1. Architect/Engineer: Architect or Engineer.
2. Code: All applicable local, state, and national codes - latest edition.
3. Contractor: Any contractor performing work required by the Contract Documents.
4. Electrical: All electrical work required by the contract documents.
5. Furnish: Supply and deliver to the site ready for installation.
6. Indicated: Noted, scheduled, or specified.
7. Installed: Erected, mounted, secured, connected, and ready for use.
8. Mechanical: All mechanical work required by the contract documents.
9. Provide: Furnish, install, and connect, complete and ready for use.

**1.3 CODES AND STANDARDS**

- A. Codes: The electrical system shall comply with the National Fire Protection Association (NFPA), American National Standards Institute (ANSI), Occupational Safety and Health Administration (OSHA), and all other state, local, municipal, and national bureaus and departments which have authority over this project: anything in these contract documents notwithstanding. All systems and components shall be FM approved and listed and labeled by UL. This shall not be construed as waiving compliance with any requirements of the plans and specifications that may be in excess of any requirements of any applicable code.
- B. Workmanship: The work shall be performed by competent craftsman, skilled in the trade involved, and shall be done in a manner consistent with the NECA National Electrical Installation Standards.

- C. Where there is a conflict between the code and contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by code, but are less stringent than those specified, shall not be substituted.
- D. Permits: The contractor shall familiarize themselves with all requirements regarding all permits, fees, etc. and shall comply with them. The contractor at his expense shall obtain all permits, licenses, inspections, and arrangements required for the execution of the work. All utilities shall be installed in accordance with the local rules and regulations, and the contractor shall pay all charges.
- E. All permits and certificates of inspection shall be turned over to Owner prior to request for final payment.

#### **1.4 QUALITY ASSURANCE**

Not Applicable

#### **1.5 SUBMITTALS**

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS" and as indicated in this section.
- B. Where required by other sections of this specification/project manual, the contractor shall submit shop drawings, product data, or samples to the Architect/Engineer for review through the general contractor. If no general contractor is assigned, the contractor may submit directly to the Architect/Engineer.
- C. Unrequired submittals will not be reviewed. Faxed, emailed, or incomplete submittals will not be reviewed.
- D. Submittals shall be numbered consecutively and referenced to the section number of the specification section.
- E. For shop drawings and product data submittals, the contractor shall submit a minimum of six copies for review to the Engineer through the General Contractor. If no general contractor is assigned the submittals may be sent directly to the Architect/Engineer for review.
- F. Additional copies may be required by individual sections of these Specifications.
- G. Shop drawings are drawings, diagrams, schedules, and other data specifically prepared for this project by the Contractor, or any manufacturer, supplier, or distributor to illustrate some portion of the work
- H. Shop drawing shall be drawn to accurate scale and adequate size to illustrate required details. Maximum sheet size shall be 30" x 42". For each shop drawing sheet larger than 11" x 17", submit one drawing on reproducible media, and one blueline or photocopied print. The Architect/Engineer's action shall be indicated on the reproducible drawing, and that drawing shall be returned to the contractor.
- I. Product data are illustrations, standard schedules, performance charts, instruction brochures, diagrams, and other information furnished by the contractor to illustrate a material, product, or system for some portion of the work.
- J. Samples are physical examples furnished by the contractor to illustrate materials, equipment, or workmanship, and to establish the standards by which the work will be performed.

- K. All submittals shall clearly indicate proposed items, capacities, characteristics, and details in conformance with the contract documents. All equipment items shall be marked with the same item number as used on the drawings or schedules. The manufacturer shall certify capacities, dimensions, and special features required.
- L. Submittals shall indicate manufacturer's delivery time for the item after review by the Architect/Engineer.
- M. The Architect/Engineer shall review or take other appropriate action upon receipt of the contractor's submittals such as shop drawings, product data and samples, but only to determine conformance with the design concept of the work and the information given in the contract documents.
- N. The contractor shall not be relieved of responsibility for any deviation from the requirements of the contract documents by the Architect/Engineer's review of shop drawings, product data, or samples. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data, or samples by the Architect/Engineer's review of those drawings.
- O. No portion of the work requiring submission of a shop drawing, product data, or sample shall commence until the Architect/Engineer has reviewed the submittal. All such portions of the work shall be in accordance with reviewed submittals.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing, and shall be inspected for damage prior to acceptance.
- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer's ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components; replace with new.
- E. Equipment furnished by others. The contractor shall be responsible for receiving, uncrating, inspecting, storing, and installing of Division 16 equipment listed as furnished by others.

**1.7 SPARE PARTS**

Not Applicable

**1.8 WARRANTIES**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.

- C. Any manufacturer's warranties concerning any item installed shall be to the benefit of Owner.
- D. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- E. The repair of faulty workmanship shall be considered to be included in the contract.

## 1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 4. Servicing instructions and lubrication charts and schedules.
- B. The Contractor shall prepare three Operating and Maintenance Manuals for the equipment furnished. Manuals shall be submitted to the Architect/Engineer for review and distribution to Owner within thirty (30) days prior to substantial completion of the project. The Architect/Engineer may reject manuals not meeting the following requirements:
  - 1. Each manual shall be assembled in a three-ring binder with a hard cover and plastic finish. Binders shall not exceed 3" thick. Where more than one binder is required, the manuals shall be separated into logical groupings. Where loose-leaf inserts are used, the sheets shall be reinforced to prevent tearing from continuous usage. Each binder shall have the following information clearly printed on its cover:
    - a. Project name and address.
    - b. Portion of the work covered by each volume (if more than one volume is in the set). Where more than one volume is required, label each volume as "Volume \_\_\_ of \_\_\_."
    - c. Name, address, and telephone number of the Contractor and all Sub-Contractors including night and emergency numbers.
  - 2. The manual shall include, but shall not be limited to, the following:
    - a. A complete index.
    - b. Names, Addresses, and Telephone Numbers: The list shall include the manufacturer and local representative who stocks and furnishes repair parts for all items of equipment and shall be typed on a single page in the front of the binder.
    - c. Start-Up, Operation, and Shutdown Procedures: Provide a written description of procedures for start-up, operation, and shutdown

procedures for each electrical item or system. This description shall include switches to operate, buttons to push, etc., in proper sequence, and locations of buttons and switches. The description shall include item references or labels used in the contract documents unless otherwise instructed in advance by Owner.

- d. Equipment Accessory Schedule: Upon completion of the work, the Contractor shall furnish Owner with a complete equipment accessory schedule listing each piece of equipment and the related size, type, number required, and the manufacturer of all renewable items.
- e. Manufacturer's Operation and Maintenance Manuals and Parts List.
- f. Emergency Procedures: Provide a written description of emergency operating procedures or a list of service organizations (including complete business address and telephone numbers) capable of rendering emergency services to the various parts of the system.
- g. One copy of all shop drawings and product data, clearly marked for each item furnished using the designation label specified or indicated on the contract documents.
- h. All manufacturers' warranty information.
- i. Normal Maintenance Schedule: Include a listing of work to be performed at various time intervals (e.g., 30, 90, 180 days, yearly).

#### 1.10 COORDINATION DRAWINGS

- A. Prepare coordination drawings in accordance with Division 1 Section "PROJECT COORDINATION" to a scale of  $\frac{1}{4}'' = 1'-0''$  or larger, detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
  - 1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
    - a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
    - b. Exterior wall and foundation penetrations.
    - c. Fire-rated wall and floor penetrations.
    - d. Equipment connections and support details.
    - e. Sizes and location of required concrete pads and bases.
  - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  - 4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

#### 1.11 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT."

- B. Contractor shall keep an up-to-date set of "as-installed," "red-lined" drawings kept current on a daily basis. Such drawings shall be available to Owner, Engineer, or Owner's representative at the job site at all times.
- C. Upon completion of the contract, send to the Architect/Engineer, through the general contractor, one complete set of red-lined drawings showing all deviations.
- D. In addition to the requirements specified in Division 1, indicate on the marked up drawings additional information for:
  - 1. Major raceway systems, size and location, for both exterior and interior.
  - 2. Locations of control devices.
  - 3. Distribution and branch electrical circuits.
  - 4. Switch, fuse, and circuit breaker size and arrangements.
  - 5. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
  - 6. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

#### **1.12 SITE EXAMINATION**

- A. Visit the site prior to submitting bids, examine the premises, and make a thorough survey of the conditions under which the installation is to be made.
- B. The submission of a proposal will be construed as evidence that such an examination has been made, and later claims for labor, equipment, or materials required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

#### **1.13 INTERPRETATION OF THE DOCUMENTS**

- A. Carefully compare the drawings and specifications, checking measurements and conditions under which this installation is to be made.
- B. The interpretations of the intent of the plans shall rest solely with the Architect and the Architect's decision shall be considered final.
- C. If questions arise during the bidding process regarding the meaning of any portion of the contract documents, the prospective bidder shall submit the questions to the Architect/Engineer for clarification. Any definitive interpretation or clarification of the contract documents will be published by addenda, properly issued to each person holding documents, prior to the bid date. Verbal interpretation or explanation, not issued in the form of an addendum, shall not be considered part of the bidding documents. When submitting questions for clarification, adequate time for issuance and delivery of addenda must be allowed.

#### **1.14 ELECTRICAL SERVICE DISRUPTIONS**

- A. No electrical service disruptions may occur without permission of Owner.
- B. Submit a written request for any work electrical outages before taking any operating electrical equipment out of service. Any work involving a task, which requires an electrical service disruption to any part of this facility, shall be closely coordinated with Owner prior to the disruption. All disruptions shall occur at times and of durations acceptable to Owner.

### **1.15 OVERTIME WORK**

- A. Construction work shall be done during regular working hours on regular working days unless specifically noted otherwise on the drawings, and as required by Owner. If overtime work, other than specified, is required on the project, it shall be performed as indicated under the special conditions of these contracts.
- B. Pricing for required overtime work specified shall be included in the Base Bid.
- C. Items requiring overtime work are:
  - 1. Exposing any energized bus.
  - 2. Any work above, below, or adjacent to active, operating equipment that must remain in operation during normal hours.
  - 3. Replacement or modification to electrical service and distribution to the facility.

### **1.16 SAFETY**

- A. The contractor shall take all steps necessary to ensure the safety of the occupants, students, Owner's employees, visitors, project related personnel, or any other authorized personnel, as well as their own forces, by adequately protecting any exposed energized cable, equipment, or devices throughout the course of this work.
- B. Comply with NFPA 241 for safeguarding during construction and alteration operations. In addition, any openings in fire-rated separations between occupied and unoccupied (or operational and non-operational) areas shall be sealed at the end of each work day with an appropriate fire-rated enclosure or sealant. Do not compromise existing security or fire alarm systems serving the occupied or operational areas.

### **1.17 INTERFERENCE WITH OCCUPANCY**

- A. If the existing building is occupied, then the work covered by these documents shall be executed with a minimum of inconvenience to the building occupants.

### **1.18 DAMAGE TO OTHER WORK**

- A. This contractor shall be responsible for damage to other work caused by this installation. Patching and repairing of damaged work done by this Division shall be part of the cost of this Division.

### **1.19 LAYOUT OF WORK**

- A. Layout work to be installed in coordination with other trades engaged on this project whenever their work is likely to affect the electrical installation. Be fully responsible for all dimensions and conflicts between this work and that of other trades, and make the necessary changes in the work without additional cost to Owner if the work does not comply properly with these requirements.
- B. Compare contract documents with those of other trades before proceeding with the installation. Electrical wiring, conduits, or electrical equipment which has been installed without checking for interference and without thorough coordination with other trades shall be moved or relocated without additional expense to Owner.
- C. Equipment shall be installed with ample space allowed for removal, repair, or change to the equipment. Ready accessibility to removable parts or equipment and to the wiring shall be provided without moving other equipment which is installed or which is already in place.

## **1.20 OPERATING TRAINING**

- A. Complete operating training for each system and item of equipment shall be provided to the Owner's designated personnel. The Operation and Maintenance Manuals must be reviewed and accepted by the Architect/Engineer and provided to the Owner prior to operating training. Training sessions shall consist of two 8-hour periods and shall be scheduled at the convenience of Owner. Training shall include instructions on the following:
  - 1. Start-Up and Shutdown Procedures
  - 2. Emergency Operation
  - 3. Periodic Maintenance
  - 4. Safety
- B. In addition to the instructions required above, wherever possible the Contractor shall perform the operation being described in order to fully illustrate system operation.
- C. At the completion of training, the Contractor shall turn over to Owner all required keys and special tools for the installed equipment. Each key or tool shall be labeled with its use.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Unless otherwise specified, all materials and equipment shall be new, unused, and undamaged. Materials and equipment shall be the current and standard designs of manufacturers regularly engaged in their production.

### **2.2 MATERIALS AND EQUIPMENT FURNISHED BY OTHERS**

- A. Where materials and equipment are indicated as furnished by others and installed or connected under this contract, it shall be the Contractor's responsibility to verify installation details prior to proceeding with work.

## **PART 3 - EXECUTION**

### **3.1 ROUGH-IN**

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

### **3.2 ELECTRICAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
  - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
  - 2. Verify all dimensions by field measurements.
  - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
  - 4. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the space.

5. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
6. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
7. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
8. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
9. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

### 3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
  1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
    - a. Uncover Work to provide for installation of ill-timed Work.
    - b. Remove and replace defective Work.
    - c. Remove and replace Work not conforming to requirements of the Contract Documents.
    - d. Remove samples of installed Work as specified for testing.
    - e. Install equipment and materials in existing structures.
    - f. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
  2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
  3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
  4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
  5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
  6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
  7. Patch finished surfaces and building components using new materials specified for the original installation and experienced installers. Installers' qualifications

refer to the materials and methods required for the surface and building components being patched.

### **3.4 TEMPORARY LIGHTING POWER, AND FIRE ALARM**

#### **A. Work Included:**

1. Electrical Contractor shall furnish and install temporary lighting, power, and fire alarm devices for this project as required and remove same at the end of the project.
2. Contractor shall install the above mentioned temporary services in a safe and workmanlike manner.
3. Provide temporary lighting and power as required in areas undergoing work during construction. Furnish and install one OSHA-approved pigtail socket with 150W lamp for every 500 square feet of floor space and a minimum one per room. The temporary lighting shall be left in place until permanent lighting is completely operational.
4. Furnish and install power outlets to a total one for every 2,000 square feet or part thereof of floor area. These shall be 15 amp, single phase receptacles for either 110 or 220V as directed by the General Contractor. Coordinate for additional temporary power requirements with other trades and provide an adequate installation.

#### **B. Contractor to coordinate temporary services with the following:**

1. General Contractor.
2. Mechanical Contractor.
3. Owner/Owner Representative.

END OF SECTION

**SECTION 16050**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, material, equipment and services necessary for electrical work as shown on the drawings and as herein specified.
- B. Section Includes: The work specified in this section includes, but shall not be limited to, providing the following:
  - 1. Motor and Equipment Connections.
  - 2. Electrical Identification.
  - 3. Hangers and Supports.
  - 4. Equipment Bases.
  - 5. Demolition.

**1.2 DEFINITIONS**

- A. Not Applicable

**1.3 CODES AND STANDARDS**

Codes: The electrical system shall comply with the National Fire Protection Association (NFPA), American National Standards Institute (ANSI), Occupational Safety and Health Administration (OSHA), and all other state, local, municipal, and national bureaus and departments which have authority over this project: anything in these contract documents notwithstanding. All systems and components shall be FM approved and listed and labeled by UL. This shall not be construed as waiving compliance with any requirements of the plans and specifications that may be in excess of any requirements of any applicable code.

**1.4 QUALITY ASSURANCE**

- A. Contractor's Quality Assurance Responsibilities: The Contractor shall be solely responsible for quality control of the work.
- B. Manufacturer's Qualifications: Firms shall be engaged in the manufacture of products and materials of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.
- C. Contractor's Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing products and materials similar to that required for this Project.
- D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. Obtain approvals from such authorities.
- E. Installation: Comply with NECA National Electrical Installation standards for electrical construction methods.

**1.5 SUBMITTALS**

- A. General
  - 1. Submittals shall include, but shall not be limited to, equipment specifications sheets, schematic diagrams, wiring diagrams, sizes, mounting details (with

required elevations), technical descriptions of components, and proper calculations to ensure specified performance of the systems.

2. Submittals shall be required for the following products listed in this specification.
3. See Division 16 Section "Basic Electrical Requirements" for additional submittal requirements.

B. Product Data: Submit manufacturer's product information showing material proposed. Submit sufficient information to determine compliance with the drawings and specifications.

C. Shop Drawings: Submit complete shop drawings as required to determine acceptability.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.

B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

#### **1.7 SPARE PARTS**

A. Not Applicable

#### **1.8 WARRANTY**

A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.

B. The contractor shall repair or replace, at no additional cost, to Owner, any item that may become defective within the warranty period.

#### **1.9 MAINTENANCE**

A. Not Applicable

#### **1.10 PROJECT CONDITIONS**

A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.

B. Project Location Environment. Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

#### **1.11 COORDINATION**

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

## **PART 2 - PRODUCTS**

### **2.1 QUALITY**

- A. Electrical equipment, devices and associated materials used on this project shall be UL listed and/or labeled.
- B. Equipment and devices installed under this division and not constructed with enclosure suited for mounting and protecting all live parts shall be installed in approved metal cabinets.

### **2.2 MOTORS**

- A. All motors will be furnished and installed under other sections of the specification.
- B. All motors shall be connected under this section.
  - 1. Final connection shall be made with suitable length of liquid-tight flexible metallic conduit.
  - 2. All motors shall be grounded with green grounding conductor as required.
- C. Electrical characteristics of motors shall be as follows:
  - 1. Motors  $\frac{3}{4}$  horsepower and larger shall be rated for operation at 480 volts, 3 phase, 60 Hertz.
  - 2. Efficiency: Furnish Premium Efficient motors, as defined in NEMA MG-1(2006) Table 12-12 for at least 1 to 200 horsepower motors.

### **2.3 ELECTRICAL IDENTIFICATION**

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
  - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
  - 2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is over laminated with a clear, weather- and chemical-resistant coating.
  - 3. Color: Black letters on orange background.
  - 4. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1" wide by 3 mils thick (25 mm wide by 0.08 mm thick).

- D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- E. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16" (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8" (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background for normal systems and white letters on red background for emergency systems.
- F. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- G. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers. Self adhesive backing alone is not allowed.

## 2.4 SUPPORTING DEVICES

- A. Surface Mounted Cabinets: Secure cabinets directly to wall using suitable wall anchors, or provide a suitable frame for mounting and supporting the cabinets using "Unistrut" type supports as required.
- B. Motor Starters and Safety Switches: Provide suitable "Unistrut" racks with sheet steel mounting plates for this equipment.
- C. Hanger Rods:
  1. Provide hanger rods of proper length for electrical items requiring same.
  2. Minimum rod diameter shall be 5/8" for cable trays, and racks supporting more than 8" of total conduit diameter.
  3. Hanger rods shall be zinc plated or galvanized steel.
- D. Cable Supports: Riser cables shall be supported by means of O.Z./Gedney Co, Thomas and Betts, or Joslyn cable supports at each panel and pull box in accordance with Code requirements.
- E. Conduit Supports and Hangers:
  1. Individually suspended conduits shall be supported with galvanized pipe clamps, from threaded steel rods, spaced 5'-0" on centers.
  2. The steel rods shall be affixed to the building structure by means of inserts in concrete slab or beam clamps affixed to the steel structure.
  3. Where multiple conduits are installed adjacent to each other, a trapeze hanger consisting of galvanized P-1000 unistrut suspended from at least two threaded steel rods, shall be used. The conduits shall be affixed to the unistrut with galvanized split pipe clamps, Nos. P-1109 through P-1126, for rigid conduit and Nos. P-1425 through P-1431, for EMT.
  4. Hangers and clamps shall be as manufactured by Unistrut, B-Line or as approved by Engineer.

## 2.5 EQUIPMENT TOUCH-UP PAINT

- A. The Contractor shall provide the types and brands furnished by manufacturers for all components. Furnish a minimum of one (1) gallon of the manufacturer's paint for future touch up painting to the Owner.
- B. Repair damage to factory applied paint finishes with the appropriate touch-up paint.

## PART 3 - EXECUTION

### 3.1 DEMOLITION

#### A. Hazardous Materials Removal

1. The City is responsible for identifying Hazardous Materials in City buildings. The Contractor is responsible for marking the extent of the identified Hazardous Materials that will be disturbed by the Contractor's working and coordinating with a Hazardous Materials abatement contractor under this Contract. The Hazardous Materials abatement contractor will require sole occupancy of the work space during hazardous material abatement work. Contractor shall communicate with the hazardous materials abatement contractor and make adequate allowance for the abatement work in the work schedule. Contractor shall not supply or install any materials that contain any amount of lead paints.
2. See Specification Sections 00935 EXISTING HAZARDOUS MATERIALS INFORMATION and 02081 REMOVAL OF LEAD PAINT CONTAINING MATERIALS for additional requirements.

#### B. Examination

1. The contractor shall visit the site and examine areas under which the work is to be performed and notify the Owner in writing of any conditions detrimental to the proper and timely completion of the work. Contractor shall not proceed with work until satisfactory conditions have been corrected.
2. Verify field measurements and circuiting arrangements for devices shown on drawings.
3. Demolition drawings are based on casual field observation and existing record drawings. Report discrepancies to Owner before disturbing existing installation.
4. Commencement of demolition means acceptance of existing conditions.

#### C. Preparation

1. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
2. Coordinate utility service shut-down with the utility company.
3. Notify the Owner at least 48 hours before disabling any electrical system.
4. Provide temporary wiring and connections to maintain existing systems in service during construction. Experienced personnel shall be used when working on energized equipment or circuits.
5. Existing electrical service: Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

#### D. Demolition and Extension of Existing Electrical Work

1. Remove, relocate, and extend existing electrical work as indicated on the drawings and as noted herein.
2. Remove abandoned wiring back to source of supply.
3. Where source of supply is a panelboard, re-label protective device as "Spare." After demolition is complete, submit revised panelboard schedules indicating "Spares" to Owner and Engineer.
4. Remove exposed abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.

5. Remove and disconnect abandoned outlets and associated devices.
  6. Disconnect and remove abandoned panelboards and distribution equipment.
  7. Disconnect and remove electrical devices and equipment that is no longer in use.
  8. Disconnect and remove abandoned lighting fixtures. Remove brackets, stems, hangers, and other accessories.
  9. Repair adjacent construction and finishes damaged during demolition and extension of work
- E. Cleaning, Repair, and Replacement
1. General: Clean and repair existing materials and equipment that will remain or are to be reused.
  2. Panelboards: Clean exposed surfaces and tighten all electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed schedule showing revised circuiting information.
  3. Lighting fixtures: Remove existing lighting fixtures for cleaning. Use mild detergent to clean exterior and interior surfaces, rinse clean with clean water, and wipe dry. Replace existing lamps and ballasts with new.
- F. Disposal
1. Owner shall have right to retain any equipment or materials that have been demolished prior to disposal or removal from site.
  2. Any equipment or materials not wanted by the Owner shall become the property of the contractor and removed from site.
  3. Contractor shall comply with environmental laws and regulations for disposal of demolished materials and equipment.

### 3.2 MOTOR CONNECTIONS AND INSTALLATIONS

- A. Building utility motors such as fans, etc., and certain starting and controlling equipment for same, as indicated on the drawings, will be furnished under Division 15 of the specifications for the mechanical work and delivered to the building site.
- B. Motors which are delivered to the building site independent of their driven equipment shall be set, aligned and secured under Division 15 of the specifications.
- C. Motors and electrical apparatus which are delivered to the building site factory set, assembled and attached to their driven machinery or apparatus:
1. The machinery or apparatus will be moved into position along with its attached electrical apparatus under the responsible mechanical trade section of the specifications.
  2. The necessary line side electrical connections shall be provided under this section of the specifications. Furnish all labor and material to place all necessary electrical equipment in satisfactory operating condition.
- D. Furnish all branch circuits for motors to the starting equipment and then to the motors, complete with control wiring for automatic and remote control where required. Conduits to motors shall terminate in the conduit fittings on the motors, the final connection being made with short length of flexible conduit. Motors shall be bonded with a green equipment grounding conductor.
- E. Consult the specifications for the various branches of the mechanical work and ascertain the exact requirements of the various systems of automatic control. Install and connect up same to leave in satisfactory operating condition.

- F. Provide all necessary labor and material to completely connect all ventilation equipment including motors, controls, etc., including all alarm and shutdown systems, as specified here and in the mechanical section.

### **3.3 PHASE SEQUENCE, ROTATION AND IDENTIFICATION**

- A. Feeders, panelboards, motor branch circuits, etc., shall be completely phased out for sequence and motor rotation. Phase identification shall be permanently identified in all equipment including conductors by use of all temperature adhesive markers or colored tape similar to Minnesota Mining #35 vinyl tape or as approved.
- B. Phase sequence shall be A-B-C (viewed from front):
  - 1. Left to right.
  - 2. Top to bottom.
  - 3. Front to rear.

### **3.4 SLEEVES AND OPENINGS**

- A. Provide openings and sleeves in walls and floor as required for this work.
- B. Sleeves shall be galvanized steel conduit or schedule 40 black steel pipe, unless otherwise noted. Aluminum conduit shall not be used.
- C. Unless specific sizes are indicated on the drawings, sleeves shall be sized to provide ½" clearance around outside surface of the item for which they are installed.
- D. Annular space between sleeve and surface of item protruding shall be suitably provided with fire stop as hereinafter specified.
- E. Sleeves shall be cut flush with wall surfaces and shall extend 1½" above finished floors unless otherwise indicated.

### **3.5 CORING, CUTTING AND PATCHING**

- A. Necessary coring or cutting in walls, floors, and ceilings shall be neatly and carefully done and repaired in an approved and workmanlike manner.
- B. No cutting into the structural work of the building shall be done without the approval of the Engineer/Architect.

### **3.6 FIRE STOPPING**

- A. Provide fire and cold smoke stopping construction, as specified, for all through-penetrations in rated fire construction (and smoke barriers) in accordance with UL fire resistance directory under categories XHCR and XHEZ. These guides have specific requirements for core and opening sizes based on the size of the penetrating item.
- B. Fire and smoke stopping compounds shall be by 3M, or approved equal.
- C. Conduit penetrations through fire rated gypsum and concrete construction shall be filled with 3M Fire Barrier CP 25WB+ Caulk according to UL and 3M guides.

### **3.7 ELECTRICAL IDENTIFICATION**

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and box covers with color banding or painting as follows:
1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2" (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  2. Conduit Band Locations: At changes in direction, at penetrations of walls and floors, at 20-foot maximum intervals in straight runs, and at 10-foot maximum intervals in congested areas.
  3. Junction boxes and pull boxes: Paint only the outside of boxes and covers, with the identifying color.
  4. Colors as follows:

Krylon Cat. #	Color	Raceway System
2410	Popsicle Orange	Life Safety Emergency
1813	Daisy Yellow	Critical Emergency
1813	Daisy Yellow	Critical Equipment
2201	Bright Copper	480/277 Volts Normal Power
2012	Clover Green	Ground
2116	Scarlet Red	Fire Alarm Systems
2116/1910	Scarlet Red/True Blue (Stripe)	Voice Command Systems
2116/2002	Scarlet Red/Pastel Aqua (Stripe)	Duct Smoke System
2116/2110	Scarlet Red/Hot Pink (Stripe)	Door Holders & Dampers
2116/1501	Scarlet Red/Glossy White (Stripe)	Tamper Valve System
1910	True Blue	Communications/Telephone
3105	Cerise (Fluorescent)	Code Blue Emergency Alarms
2105	Leather Brown	CRT and Computer
1601	Glossy Black	Low Voltage (Lighting Control)
1929	Plum	Security Alarms
2002	Pastel Aqua	HVAC Controls
2110	Hot Pink	Signal Alarms
1501	Glossy White	Pneumatic Tube System
1902	Baby Blue	Nurse Call Systems
1910	True Blue/Orange Stripe	Fiber Optics
2504	Beige	Patient Monitoring

- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Color-code 208/120V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Black
  2. Phase B: Red
  3. Phase C: Blue
  4. Neutral: White
  5. Equipment Ground: Green

- G. Color-code 480/277V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Yellow
  2. Phase B: Brown
  3. Phase C: Orange
  4. Neutral: Gray
  5. Equipment Ground: Green
- H. For conductors not manufactured with integral color, use conductors with black insulation or jacket and then use color coding tape at intervals not exceeding 5 feet, and at all terminations and splices.
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum  $\frac{3}{8}$ " - (9 mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- K. Provide identification and markings for various items furnished and installed under this division of the specifications as follows:
1. White Phenolic nameplate with black cut letters  $\frac{3}{8}$ " high:
    - a. Disconnect switches and individually mounted starters with number or designation of equipment served.
    - b. Panelboards: Identification on the outside of the cabinet door.
  2. Red Phenolic nameplate with white cut letters  $\frac{3}{8}$ " high:
    - a. Fire Alarm Equipment
  3. Dymo Tape labels:
    - a. Light fixtures.
    - b. Light Switches.
    - c. Receptacles.
    - d. Disconnects.
    - e. Where otherwise specifically indicated.
- L. Provide "DANGER - 480 VOLTS" warning signs on all 480 volt equipment.
- M. Voltage characteristics shall be indicated on each piece of equipment, and at each panel.
- N. All panelboards shall be provided with a typed panel board schedule. Include source of power (upstream panel source and breaker or switch).
- O. For special ground systems (such as telecommunication facility grounding) provide engraved brass nameplates for all ground conductors at both terminations.

END OF SECTION

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**SECTION 16060  
GROUNDING AND BONDING**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Scope: The work specified in this section includes providing labor, material, equipment, and services necessary for a complete grounding system as shown on the drawings and as herein specified.
- B. Grounding Section Includes: The work specified in this section includes, but shall not be limited to, providing grounding of the following:
  - 1. Electrical power systems.
  - 2. Electrical metallic raceways.
  - 3. Metal enclosures.
  - 4. Lighting fixtures.
  - 5. Equipment requiring power.
  - 6. Telecommunications systems.
- C. Bonding Section Includes: The work specified in this section includes, but shall not be limited to, providing bonding of elevator equipment.

**1.2 DEFINITIONS**

Not Applicable

**1.3 CODES AND STANDARDS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. If the referenced publications have been revised prior to Contract award, the latest edition/revision shall be submitted for the referenced document.
- C. ASTM International (ASTM)
  - 1. ASTM B 8 – “Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.”
  - 2. ASTM B 33 – (Revised 1985), “Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.”
- D. Institute of Electrical and Electronics Engineers (IEEE)
  - 1. ANSI/IEEE 80 – “Guide for Safety in AC Substation Grounding” (copyrighted by IEEE, ANSI approved).
  - 2. ANSI/IEEE 81 – “Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System” (copyrighted by IEEE, ANSI approved).
  - 3. ANSI/IEEE 142 – “Recommended Practice for Grounded of Industrial and Commercial Power Systems” (copyrighted by IEEE, ANSI approved).
- E. Insulated Cable Engineers Association (ICEA)
  - 1. ICEA 5-68-516 – “Ethylene Propylene Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.”
- F. National Fire Protection Association (NFPA)

1. NFPA 70 – “National Electrical Code (hereinafter referred to as NEC).
  2. NFPA 780 – “Installation of Lighting Systems.”
- G. Underwriters Laboratories, Inc. (UL)
1. UL ECMD – “Electrical Construction Materials Directory.”
  2. UL 467 – “Grounding and Bonding Equipment.”
  3. UL 486A – “Wire Connectors and Soldering Lugs for Use with Copper Conductors, Seventh Edition.”
- H. American National Standards Institute, Electronic Industries Alliance/Telecommunications Industry Alliance (ANSI/EIA/TIA), ANSI/EIA/TIA-607 Grounding and Bonding.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer’s Qualifications: Firms shall be engaged in manufacture of grounding and bonding products, of types, sizes required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes, and bonding jumpers, and whose products have been in satisfactory use in similar service for not less than five years.
- B. Installer’s Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing grounding systems similar to that required for this Project.
- C. Compliance: Comply with applicable local electrical code requirements, NEC, ANSI/IEEE 142, and applicable UL requirements.

#### 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer’s product data showing material proposed. Product data shall include, but shall not be limited to, the following:
1. Conductors.
  2. Cables.
  3. Connectors.
- B. Shop Drawings: Submit complete shop drawings as required to determine acceptability. Shop drawings shall consist of a complete list of materials, including manufacturer’s descriptive and technical literature, catalog cuts, drawings, and installation instruction. Shop drawings shall include, but shall not be limited to, the following:
1. Special fabricated components, which are not a manufactured standard product.
- C. Proof of Compliance: Where materials or equipment are specified to comply with requirements of UL, proof of such compliance shall be submitted.
- D. Test Reports: Submit ground testing test report as specified.
- E. Operation and Maintenance Manuals: Prepare and deliver complete operating and maintenance manuals. Provide information pertinent to the equipment for preventive maintenance and for replacement of expendable components. Manuals shall include the items listed below and other information recommended by the manufacturer:
1. Cables.
  2. Bus bar.
  3. Insulators.
  4. Complete list of parts with reordering numbers.

5. Electrical characteristics of components.
6. Recommended spare parts list.
7. Complete set of shop drawings.

**1.6 DELIVERY, STORAGE, AND HANDLING:**

- A. Materials and components shall be properly packaged, stored, and handled to prevent damage or breakage.

**1.7 SPARE PARTS**

Not Applicable

**1.8 WARRANTY**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The repair of faulty workmanship shall be considered to be included in the contract.

**1.9 MAINTENANCE**

Not Applicable

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work, include, but shall not be limited to, the following:
1. Adalet-PLM Division; Scott Fetzer Co.
  2. Burndy Corporation.
  3. Cadweld Division; Erico Products, Inc.
  4. Crouse-Hinds Division; Cooper Industries.
  5. Joslyn Corporation.
  6. OZ Gedney Division; General Signal Corp.
  7. Thomas and Betts Corp.
  8. Eritech; Erico Products, Inc.

**2.2 CONDUCTORS**

- A. General: Grounding and bonding conductors shall be bare and insulated copper as shown on the drawings or required by other sections of this specification.
- B. Conductivity: Copper conductors shall have a conductivity of not less than 98 percent at 75 degrees C. Conductor resistance values shall be in accordance with the value in ICEA S-68-516.
- C. Cable Sizes: Cable sizes shall be as shown on the drawings or as required by this specification.
- D. Insulation: Insulated grounding and bonding conductors shall have an insulation equal to the current carrying conductors.

## 2.3 CONNECTORS

- A. Ground Bushings: Bushings shall be malleable iron, zinc plated, insulated throat with screw type wire connector.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions under which the work is to be installed, and notify the Architect/Engineer in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

### 3.2 COORDINATION

- A. Coordinate with other work to ensure that installation is not vulnerable to physical damage.

### 3.3 APPLICATION

- A. General: The entire electrical system and building structure shall be grounded. The following items of equipment, appurtenances, and as required by Article 250 of NEC, shall be grounded:
  - 1. Electrical equipment and enclosures.
  - 2. Conduits and raceways.
  - 3. Neutral and ground conductors.
  - 4. Switches and panels.
  - 5. Motor frames, control cabinets, and lighting fixtures.
- B. All metallic conduits, supports, cabinets, and all the other electrical equipment shall be permanently and effectively grounded. All grounded shall be in accordance with the applicable code, and shall meet the approval of the local Inspection Department.
- C. All metallic raceways shall be mechanically and electrically continuous. Where non-conductive raceways are installed, provided separated equipment grounding conductors bonded to pull and/or junction boxes at each end of each conduit run.
- D. Furnish and install a separate equipment grounding wire with each branch circuit conduit, routed with the phase and neutral wires, NEVER in a separate conduit.
- E. Equipment grounding wire to be routed in conduit along the phase and neutral wires (NEVER in separate conduit) per code requirements.
- F. Connectors: Provide mechanical connections for the following:
  - 1. Cable-to-ground bus or as otherwise noted on the drawings
- G. Bonding Jumpers: Bonding jumpers shall be installed where continuity of piping or metal must be maintained or as required by NEC.

### 3.4 INSTALLATION

- A. Install grounding systems as indicated, in accordance with equipment manufacturer's written instructions and with recognized practices. Comply with applicable requirements of UL 467, UL 486A, NFPA 78 ANSI/IEEE 80, and applicable NEMA standards, to ensure that products fulfill requirements.

- B. Connectors
1. Provide mechanical connections as specified.
  2. Remove non-conductive coatings such as paint, lacquer, and enamel on surfaces of equipment to be grounded.
  3. Tighten grounding, bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 468A to assure permanent and effective grounding.
  4. Apply corrosion-resistant finish to field connections, buried metallic grounding and bonding products, and places where factory-applied protective coatings have been destroyed, which are subjected to corrosive action.
  5. No connections below grade shall be covered before inspection by the Architect/Engineer.
- C. Bonding Jumpers: Install where expansion joints or dielectric unions are used.
- D. Ground Bushings: Where a conduit enters a metal enclosure without a ground bus, a ground bushing shall be provided to terminate ground conductor.

END OF SECTION

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**SECTION 16120  
CONDUCTORS AND CABLES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, materials, equipment, and services necessary for the electrical work as shown on the drawings and as herein specified.
- B. Section includes: building wires, cables, and associated connectors, splices, and terminations for wiring systems rated 600V and less.

**1.2 DEFINITION**

- A. THHN: Heat-resistant thermoplastic insulation
- B. THWN: Moisture and heat-resistant thermoplastic insulation
- C. XHHW: Moisture-resistant thermoset

**1.3 CODES AND STANDARDS**

- A. NEMA WC3: Rubber-insulated wire and cable for the transmission and distribution of electrical energy.
- B. NEMA WC5: Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.

**1.4 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

**1.5 SUBMITTALS**

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

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.

- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

**1.7 SPARE PARTS**

Not Applicable

**1.8 WARRANTY**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- D. The repair of faulty workmanship shall be considered to be included in the contract.

**1.9 MAINTENANCE**

Not Applicable

**1.10 PROJECT CONDITIONS**

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings
- B. Project Location Environment: Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

**PART 2 - PRODUCTS**

**2.1 QUALITY**

- A. Electrical equipment, devices and associated materials used on this project shall be UL listed and/or labeled.
- B. Equipment and devices installed under this division and not constructed with enclosure suited for mounting and protecting all live parts, shall be installed in approved metal cabinets.

**2.2 WIRE AND CABLE (600V OR LESS)**

- A. Wire and cable used in this installation shall be copper and shall have 600 volt insulation unless otherwise noted.
- B. The wires used in this installation shall be run in conduits or approved raceways, unless specifically indicated otherwise.
- C. Conductors shall conform to the latest requirements of the Code and meet ICEA Specifications. Submit the name of manufacturer for the Engineer/Architect and Owner's approval, before work is started.
- D. Acceptable Wire and Cable Manufacturers are:
  - 1. General Cable Corporation (BICC).
  - 2. Southwire.
  - 3. Okonite.
  - 4. Rome.

- E. Wire and cable shall be delivered to the project in complete coils with the manufacturer's name and approval tag attached thereto, indicating wire size and type of insulation, and be labeled and listed.
- F. Unless otherwise noted, conductors for lighting and power circuits shall be #12 AWG minimum size.
- G. Wire for control circuits may be #14 AWG.
- H. All wire shall be stranded.
- I. All conductors shall be rated 90 deg C for dry/wet locations.
- J. AC branch circuit wiring shall be installed with color-coded conductors throughout the installation as specified in the identification sections of this specification.

### 2.3 WIRE CONNECTIONS

- A. All wire connections shall be made by means of solderless connectors.
- B. Clean conductor surfaces before installing lugs and connectors. Apply "no-ox" compound.
- C. Branch circuit joints or splices for wires #10 and smaller shall be made with 3M brand Scotchlok electrical spring connectors. No splices shall be made in a conductor except at outlet boxes, junction boxes, or in splice boxes.
- D. Control wires shall be made by 3M Scotchlok crimp connectors.
- E. Use high press long barrel, cast copper, compression connectors for splices and joints for wires #8 and higher.
- F. Wires and cables that terminate onto a bus bar shall be made by cast copper, two hole, long barrel lug, two crimps of fifteen ton compression, hex lugs. Lug bolts shall have lock washers.
- G. Acceptable manufacturers for compression barrel connectors and lugs:
  - 1. Thomas and Betts
  - 2. Hy-Press Corporation
  - 3. FCI Burndy Products
- H. The phases of all feeders shall be marked at all taps, joints, splices, and near the lugs at each end with permanently colored tapes. Tapes shall be Minnesota Mining #35 vinyl tape or as approved. Tape un-insulated conductors to 150% of insulation rating of conductor.

### 2.4 FISH WIRE

- A. Conduits which are left empty shall contain fish wire of such a gauge required to pull in wire or cable to fill the conduit as determined by Code.
- B. Each length of conduit which is to be used for the telephone system shall contain a #14 gauge nylon fish wire.
- C. Terminations of empty conduits shall be properly tagged.

## **PART 3 - EXECUTION**

### **3.1 CONDUCTOR AND INSULATION APPLICATIONS**

- A. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway.
- B. Feeders Concealed in Concrete, Below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete and Below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- F. Fire Alarm Circuits: Type THHN-THWN, in raceway or power-limited, fire-protective, signaling circuit cable per manufacturer's direction.
- G. Class 1 Control Circuits: Type THHN, in raceway.
- H. Class 2 Control Circuits: Type THHN, in raceway or power-limited cable, concealed in building finishes, or power-limited tray cable, in cable tray per manufacturer's direction.

### **3.2 INSTALLATION**

- A. All wires and cables shall be installed in conduits unless noted otherwise.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Identify and color-code conductors and cables according to Division 26 Section Basic Electrical Materials and Methods, Electrical Identification.

### **3.3 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:
- B. Testing: Perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for proper installation and polarization.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

END OF SECTION

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**SECTION 16130  
RACEWAYS AND BOXES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This Section includes raceways, fittings, pull boxes, outlet boxes, floor fittings, surface and tele/power pole raceways, enclosures, and cabinets for electrical wiring.

**1.2 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. RMC: Rigid metal conduit (heavy wall steel).
- C. FMC: Flexible metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. Fittings: Conduit connection or coupling.
- F. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
- G. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
- H. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and floors.
- I. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.

**1.3 CODES AND STANDARDS**

- A. American National Standards Institute (ANSI)
  - 1. ANSI C80.1 – Rigid Steel Conduit, Zinc-Coated.
  - 2. ANSI C80.3 – Electrical Metallic Tubing, Zinc-Coated and Fittings.
  - 3. ANSI C80.4 – Fittings for Rigid Metal Conduit.
  - 4. ANSI C80.6 – Intermediate Metal Conduit, Zinc-Coated.
  - 5. ANSI/NEMA OS-1 – Sheet Steel Outlet Boxes, Device Box Covers and Bottom Supports.
  - 6. ANSI/NEMA OS-2 – Non-Metallic Outlet Boxes, Device Boxes, and Box Support.
- B. Federal Specifications (FS)
  - 1. WC-586 – Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical Cast Metal.
  - 2. WC-408 – Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall [EMT] Type).
  - 3. WC-1904A – PVC Rigid Non-Metallic Conduit.
  - 4. WC-563A – Electrical Metallic Tubing.
  - 5. WC-566 – Specification for Flexible Metal Conduit.
  - 6. WC-581E – Specification for Galvanized Rigid Conduit.

- C. NECA “Standard of Installation”
- D. National Electrical Manufacturers Association (NEMA)
  - 1. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 2. RN 2 – Packaging of master bundles for Steel Rigid Conduit, Intermediate Metal Conduit, and Electrical Metallic Tubing.
  - 3. TC 2 – Rigid Non-Metallic Conduit, PVC Schedule 40 (EPC-40) and Schedule 80 (EPC-80) PVC.
  - 4. TC 3 – Rigid Non Metallic Conduit and electrical Non-Metallic Tubing Fittings.
  - 5. TC 6 – PVC and ABS Plastics Utilities Duct for Underground Installation.
  - 6. TC-8 – Extra-Strength PVC Plastic Utilities Duct for Underground Installation
  - 7. TC-9 – PVC and ABS Plastic Utilities Duct and Fittings for Underground Installation.
  - 8. TC 10 – PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.
  - 9. TC 13 – Electrical Non-Metallic Tubing.
  - 10. TC 14 – Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.
  - 11. TC 18 – Packaging of Master Bundles for EPC 40 (Polyvinyl Chloride) Conduit.
  - 12. NEMA 250 – Enclosures for Electrical Equipment (1,000 volts maximum).
- E. National Fire Protection Association (NFPA)
  - 1. ANSI/NFPA 70 – National Electrical Code
- F. Underwriters Laboratories (UL): Applicable Listings
  - 1. UL 1 – Flexible Metal Conduit.
  - 2. UL 6 – Rigid Metal Conduit.
  - 3. UL 360 – Liquid Tight Flexible Steel Conduit.
  - 4. UL 514-B – Fittings for Conduit and Outlet Boxes.
  - 5. UL 651-A – Type EB and a PVC Conduit and HDPE Conduit.
  - 6. UL 797 – Electrical Metal Tubing.
  - 7. UL 1242 – Intermediate Metal Conduit.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Contractor’s Quality Assurance Responsibilities: The Contractor shall be solely responsible for quality control of the work.
- D. Manufacturer’s Qualifications: Firms shall be engaged in the manufacture of products and materials of types and sizes required, and whose products have been in satisfactory use in similar service for not less than five years.
- E. Contractor’s Qualifications: Firms shall have at least five years of successful installation experience with projects utilizing products and materials similar to that required for this Project.

- F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. Obtain approvals from such authorities.
- G. Installation: Comply with NECA National Electrical Installation standards for electrical construction methods.

## 1.5 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, enclosures, cabinets, floor boxes, pull boxes, and outlet boxes.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces as listed for the zone of work that construction occurs. Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.”
    - b. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

## **1.7 SPARE PARTS**

Not Applicable

## **1.8 WARRANTY**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- D. The repair of faulty workmanship shall be considered to be included in the contract.

## **1.9 MAINTENANCE**

Not Applicable

## **1.10 PROJECT CONDITIONS**

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment: Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

## **1.11 COORDINATION**

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
  - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

## **PART 2 - PRODUCTS**

### **2.1 METAL CONDUIT AND TUBING**

- A. Rigid Steel Conduit: (Heavy Wall), hot-dipped galvanized with threaded fittings.
- B. EMT: zinc-coated steel, with insulated throat compression fittings (no set screw).
- C. FMC: Zinc-coated steel, with insulated throat squeeze-type connectors.
- D. LFMC: Zinc-coated steel with sunlight-resistant and mineral oil-resistant PVC jacket.
- E. Fittings: compatible with conduit and tubing materials.

### **2.2 METAL WIREWAYS**

- A. Manufacturers:
  - 1. Hoffman.
  - 2. Square D.
  - 3. Approved Equal.

- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA rating as indicated on the electrical drawings.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type, screw-cover type, or flanged-and-gasketed type as indicated on the electrical drawings.
- F. Finish: Manufacturer's standard enamel finish.

### **2.3 BOXES, ENCLOSURES, AND CABINETS**

- A. Available manufacturers:
  1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  2. Appleton Electric Company.
  3. Erickson Electrical Equipment Co.
  4. Hoffman.
  5. Hubbell, Inc.; Killark Electric Manufacturing Co.
  6. O-Z/Gedney; Unit of General Signal.
  7. RACO; Division of Hubbell, Inc.
  8. Spring City Electrical Manufacturing Co.
  9. Thomas & Betts Corporation.
  10. Walker Systems, Inc.; Wiremold Company (The).
  11. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Construction:
  1. Sheet Metal Outlet and Device Boxes: Galvanized Steel.
  2. Cast-Metal Outlet and Device Boxes: Type FD, with gasketed cover.
  3. Small Sheet Metal Pull and Junction Boxes: Screwcover or hinged as shown on the electrical drawing.
  4. Cast-Metal Pull and Junction Boxes: Cast aluminum with gasketed cover.
  5. Cabinets: Galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

### **2.4 PULL BOXES**

- A. Provide pull boxes as shown on the plans and where necessary to meet code and specification requirements for proper installation of associated wiring systems.
- B. Pull boxes shall be sized in accordance with the National Electric Code, NFPA 70.
- C. Boxes indicated on the plans are not intended to be drawn to scale.
- D. Conduit runs of more than 100 feet or with more than the equivalent of three 90 degree bends shall have suitable pull boxes installed in convenient intermediate locations. Such pull boxes shall be shown on the shop drawings and construction record drawings.
- E. Pull boxes over 100 cubic inches shall be supported independently of the conduits.

F. Pull boxes shall be accessible after completion of installation.

## 2.5 OUTLET BOXES

- A. Boxes for Suspended or Bracket Mounted Lighting Fixtures: Ceiling outlets and bracket outlets which are to support lighting fixtures shall be equipped with a 3/8" malleable iron fixture stud securely fastened into the outlet box.
- B. Flush Mounted Boxes (in plaster, drywall, poured concrete, smooth tile):
1. Outlet boxes for duplex receptacles, single and two-gang toggle switches, shall be a minimum of 4" square by 1 1/2" deep.
  2. Outlet boxes for other devices installed under similar conditions shall be a minimum of 4" square 1 1/2" deep.
  3. Where more than two conduits enter an outlet box, a 2 1/8" deep box shall be used, except in columns.
  4. Where three or more gangs of devices are required, solid gang boxes a minimum of 4 1/2" high by 1 5/8" deep shall be used.
  5. Provide suitable plaster rings as required.
  6. Provide minimum of 1/2" deep tile covers as required.
- C. Capped Outlet Boxes: Outlet boxes which are indicated as capped outlet boxes shall employ flat metal cover plates, fastened to the outlet box with screws.
- D. Surface Mounted Outlet Boxes: Where outlet boxes are to be installed exposed on ceiling or wall surfaces, the boxes shall be specifically designed for such a type of installation and shall be square or rectangular as required. Device plates shall match the contour of the boxes and shall be of the type manufactured for these particular type boxes. In finished areas, all boxes shall be flush mounted unless specifically noted otherwise.
- E. Suspended Ceiling Outlet Boxes:
1. Where outlet boxes are installed in suspended ceiling cavities for the purpose of splicing fixture wire, branch circuit conductors and for connecting flexible metallic conduit between this box and the lighting fixtures, such boxes shall be of the size required by code requirements pertaining to the number of conductors entering and leaving the box. Minimum box size shall be 4" square by 1 1/2" deep.
  2. Each box shall be secured to the ceiling channel irons or building structure and shall have its opening facing the nearest recessed lighting fixture.
  3. All boxes shall have covers or device plates as required.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors:
1. Exposed: Rigid steel.
  2. Connection to Vibrating Equipment (including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  3. Boxes and Enclosures: NEMA 250, Type 4.
- B. Indoors:
1. Exposed Dry Locations: EMT.
  2. Concealed in Interior Partition: EMT.

3. Connection to Vibrating Equipment (including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  4. Damp or Wet Locations: RMC.
  5. Concealed in Concrete or Block Walls: RMC.
  6. Mechanical Rooms and Penthouses: RMC.
  7. Imbedded in Concrete Slabs: RMC.
  8. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size:  $\frac{3}{4}$ " trade size (DN 21).
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

### 3.2 INSTALLATION

- A. Keep raceways at least 6" (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary caps to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
  1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  1. Run parallel or banked raceways together on common supports.
  2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
- J. Terminations:
  1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase

nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength.
- L. Telephone and Signal System Raceways, 2" Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by NFPA 70.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6" (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Flexible Connections: Use maximum of 72" (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- Q. Bushings
  - 1. Provide bushings wherever RMC, or EMT conduit is terminated, including stub-outs, and locations not provided with connection fittings or boxes.
  - 2. Insulated Bushings
    - a. Provide insulated bushings or connections for RMC, or EMT conduit terminations.
    - b. Insulated bushings shall be OZ/Gedney Co., Type PBP for rigid conduit or Type "SBT" for EMT, or approved equal.
  - 3. Grounded Type Insulated Bushings
    - a. Provide grounded type insulated bushings for all electric service and distribution feeder conduits, including stub-outs.
    - b. Bushings shall be properly grounded and/or bonded.
    - c. Ground type insulated bushings shall be OZ/Gedney Co. Type "BLG" or approved equal.
  - 4. Insulating Bushings
    - a. Provide insulating bushings where cables pass through walls of metal enclosures. Bushings shall be OZ/Gedney Co. Type "BBL" or "ABB" or approved equal.

- b. Insulated bushings shall be used at ends of threaded rigid conduits and threaded fittings. Provide double locknuts when terminated in enclosure.
  - c. Bushings shall be OZ/Gedney Co. Type "A" or approved equal.
- R. Rigid Conduit Fittings and Couplings
  - 1. Running threads shall not be used on conduit for connection at couplings.
  - 2. RMC conduits shall be joined by approved threaded couplings.
    - a. Threadless couplings and connectors are not acceptable.
    - b. Set screw couplings are not acceptable.
    - c. Split couplings are not acceptable.
  - 3. Joints in conduit which are installed under or in the floor slab, or in exterior walls shall be made watertight by using T&B Kopr-shield thread compound on each joint.
- S. Electric Metallic Tubing (EMT) Conduit Fittings and Couplings
  - 1. Only insulated throat type compression fittings shall be used.
  - 2. Only compression-type fittings shall be used, set screw fittings and couplings are not acceptable.
- T. Couplings and unions shall be mechanically strong and shall be so installed to make a continuous bond between the conduits connected.

### **3.3 PULLING COMPOUND**

- A. If it is desired to use a pulling compound on wire and cable, first obtain the approval of the Engineer/Architect before employing such compounds. Compound shall be UL listed and compatible with conductor insulation covering.
- B. Conduits shall be swabbed until moisture and dirt are removed and before wires are pulled or cables are installed.

### **3.4 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### **3.5 CLEANING**

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

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**SECTION 16140  
WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. Scope: The work specified in this section includes, but shall not be limited to, providing labor, materials, equipment, and services necessary for the electrical work shown on the drawings and as herein specified.
- B. Section includes: receptacles, toggle switches, and finish plates.

**1.2 DEFINITIONS**

- A. GFI: Ground-fault circuit interrupter.

**1.3 CODES AND STANDARDS**

- A. FS W-C-596 – Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
- B. FS W-S-896 – Switch, Toggle.
- C. NEMA WD 1 – General Color Requirements for Wiring Devices.
- D. NEMA WD 6 – Wiring Devices – Dimensional Requirements.
- E. UL 943 – Standard for Ground Fault Circuit Interrupters.
- F. UL 498 – Standard for Attachment Plugs and Receptacles.
- G. UL 20 – Standard for General Use Snap Switches.
- H. DSCC W-C-896F – General Specification for Electrical Power Connector.

**1.4 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.

**1.5 SUBMITTALS**

- A. Product Data: For each product specified.
- B. Shop Drawings: Legends for receptacles and switch plates.
- C. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products and materials properly packaged in factory fabricated containers and mounted on shipping skids.
- B. Store products and materials in clean, dry, heated space. Protect from dirt, fumes, water, construction debris, and traffic. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle products and materials carefully to prevent internal damage, breakage, denting, and scoring enclosure finish. Do not install damaged products or materials. Replace and return damaged products or materials to manufacturer.

**1.7 SPARE PARTS**

Not Applicable

## **1.8 WARRANTY**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.
- C. Any manufacturer's warranties concerning any item installed shall be to the benefit of Owner.
- D. The contractor agrees not to void or impair or to allow any sub-contractor to void or impair any warranties regarding products or items installed as part of this project.
- E. The repair of faulty workmanship shall be considered to be included in the contract.

## **1.9 MAINTENANCE**

Not Applicable

## **1.10 PROJECT CONDITIONS**

- A. Field Measurements: Verify that field measurements are as indicated on the shop drawings and as shown on the drawings.
- B. Project Location Environment. Furnish and install materials suitable for the altitude, weather, and seismic requirements of the project location.

## **1.11 COORDINATION**

- A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- B. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- C. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

## **PART 2 - PRODUCTS**

### **2.1 SWITCHES AND RECEPTACLES**

- A. Provide the various switches and receptacles shown on the plans.
- B. In general, the color of all devices shall be brown or ivory. UPS protected receptacles shall have an orange nylon face, emergency system receptacles shall have a red nylon face, and surge suppression shall have a blue nylon face.
- C. All devices shall be Underwriters' Laboratories listed, Federal specification listed, heavy-duty type. Receptacles shall be grounding type.
- D. Devices shall be manufactured by the following:
  - 1. Duplex receptacles, 20 Ampere, 125 Volt
    - a. Ground Fault Circuit Interrupter (GFI) [Brown or Ivory = Normal; Red = Emergency]
      - (1) P&S/Legrand #1591 (Specification Grade # 2091-SG)

- (2) Hubbell #GF5362 (Specification Grade # SFG 8300)
  - (3) Leviton #6899-HG (Specification Grade #6898-HG)
  - (4) Cooper #GF20 (Hospital Grade #HGF20)
2. Toggle switches 20A, 120-277V [ Brown or Ivory = Normal; Red = Emergency]
- a. Single Pole
    - (1) Hubbell 1221
    - (2) P&S/Legrand #20AC1
    - (3) Leviton #1221
    - (4) Cooper #2221

## 2.2 DEVICE PLATES

- A. Device plates shall be of same manufacture as device, and shall be flat surface type.
- B. Device plates in mechanical and electrical equipment rooms and unfinished areas shall be metallic cast box with matching cover plate suitable for wet locations.
- C. Device plates in finished areas shall be stainless steel Type 302. [Nylon, brown or ivory, to match device; or red emergency system.]
- D. All multi-gang plates shall be one piece.
- E. Plates for outlet boxes shall contain a label for identifying circuit number and panel source.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
- C. Do not share neutral conductor on load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Protect devices and assemblies during painting.

### 3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods."
  - 1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
  - 2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

### 3.3 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

- C. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.4 FIELD QUALITY CONTROL**

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Check TVSS receptacle indicating lights for normal indication.
- C. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- D. Replace damaged or defective components.

### **3.5 CLEANING**

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

**SECTION 16142**  
**SUPPORTING DEVICES**

**1. PART 1 GENERAL**

**1.1. SCOPE**

- A. Conduit and equipment supports, straps, clamps, steel channel, etc, and fastening hardware for supporting electrical work. Included are the following:

**1.2. SECTION INCLUDES**

PART 1 - GENERAL

- Scope
- Section Includes
- Quality Assurance

PART 2 - PRODUCTS

- Material

PART 3 - EXECUTION

- Installation

**1.3. QUALITY ASSURANCE**

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

**2. PART 2 PRODUCTS**

**2.1. MATERIAL**

- A. Support Channel: Galvanized.
- B. Hardware: Corrosion resistant.
- C. Conduit clamps, straps, supports, etc., shall be steel or malleable iron. One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when conduit is installed on the interior surface of any exterior building wall.

### 3. PART 3 EXECUTION

#### 3.1. INSTALLATION

- A. Fasten hanger rods, conduit clamps, outlet, junction and pull boxes to building structure using beam clamps or expansion anchors.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors 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.
- C. Do not use powder-actuated or plastic anchors.
- D. File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.
- E. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.
- F. Do not drill structural steel members.
- G. Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch (25 mm) off wall.
- I. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure.

END OF SECTION

**SECTION 16410**  
**SAFETY AND DISCONNECT SWITCHES/ENCLOSED CIRCUIT BREAKERS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This Section includes the following:
  - 1. Equipment disconnects.
  - 2. Motor-circuit disconnects.
  - 3. Molded case circuit breaker in an individual enclosure.

**1.2 DEFINITIONS**

Not Applicable

**1.3 CODES AND STANDARDS**

- A. NEMA KS-1 – Enclosed Switches
- B. NFPA 70 (NEC)

**1.4 QUALITY ASSURANCE**

- A. Comply with codes for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.
- C. Single-Source Responsibility: All enclosed switches and circuit breakers shall be the product of a single manufacturer.

**1.5 SUBMITTALS**

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for switches and accessories specified in this Section.
- C. Descriptive data and time-current curves for protective devices and let-through current curves for those devices with current-limiting characteristics. Include coordination charts and tables, and related data.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing and shall be inspected for damage prior to acceptance.
- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer’s ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components; replace with new.
- E. Equipment furnished by others. The contractor shall be responsible for receiving, uncrating, inspecting, storing, and installing of Division 16 equipment listed as furnished by others.

**1.7 SPARE PARTS**

Not Applicable

**1.8 WARRANTY**

- A. Motor and circuit disconnects and breakers shall be warranted for a minimum period of one year after project completion, or longer if manufacturer's warranty allows.

**1.9 MAINTENANCE**

Not Applicable

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide enclosed switches and circuit breakers by one of the following:
  - 1. Safety Switches:
    - a. General Electric
    - b. Square D
    - c. Cutler-Hammer
  - 2. Circuit Breakers:
    - a. General Electric
    - b. Square D
    - c. Cutler-Hammer

**2.2 GENERAL**

- A. Disconnect and Safety Disconnect Switches:
  - 1. General: Provide heavy duty surface-mounted safety switches for motors and equipment unless otherwise indicated, of types, sizes, and electrical characteristics as indicated on the electrical drawings and equipment schedules.
  - 2. Switch Interiors: Switches shall have switch blades which shall be fully visible in the off position when the enclosure door is open. Current carrying parts shall be plated copper and switch contacts shall be silver-tungsten. Lugs shall be removable and shall be UL-listed for 75 degrees C, copper wire.
  - 3. Switch Operator: Switches shall be quick-made, quick-break type. The operating handle shall be an integral part of the enclosure base and shall be padlockable in the off position. The handle position shall indicate whether the switch is in the on or off position.
  - 4. Interlock Contacts: Provide two Form C auxiliary, 10 ampere, 300V rated contacts. The contacts shall provide for two normally open and two normally closed contacts for switch open or closed position.

- B. Circuit Breakers:
1. All circuit breakers shall comply with NEMA ABI and FSW-C-375.
  2. Circuit breakers shall be securely bolted to the enclosure and be flush with the box assembly.
  3. Circuit breakers shall have over center toggle mechanism with quick-make, quick break action, common trip for all pole positions, and a handle position indicator with breaker rating imprinted in a location easily verified without removing the box cover.
  4. Circuit breakers for all motor loads shall be HCAR rated.
  5. Circuit breaker size(s) shall be listed on the electrical plan drawings or equipment schedule.

### **2.3 ENCLOSURES**

- A. NEMA 4: Provide NEMA 4 general purpose enclosures for indoor installation unless otherwise indicated on the drawings. Enclosure covers shall be attached with pin type hinges. Enclosures shall have a gray baked enamel finish, electrodeposited on clean, phosphatized steel.

### **2.4 RATINGS**

- A. General: Provide heavy duty safety switches and circuit breakers with ampere rating as shown on the drawings.
- B. Horsepower-Rated: Safety switches shall be horsepower-rated for 250, 480, and 600V, AC and DC, and shall be rated for the motor driven loads supplied by the switch.
- C. Short Circuit Rating: Safety switches with Class RK1 or Class L fuses shall have a UL short circuit rating of 100,000 amperes RMS symmetrical minimum.

### **2.5 FUSIBLE SWITCHES**

- A. Provide fusible disconnect switches as shown on the drawings.
- B. Fusible disconnects rated 30 through 600 amperes shall have Class RK1 fuse clips. Refer to Division 16, Section 16491 for acceptable fuse manufacturers.

### **2.6 IDENTIFICATION**

- A. Each disconnect switch, circuit breaker, and control panel shall have an engraved, laminated bakelite nameplate attached to the outside of the enclosure. The nameplate shall include the switch or breaker designation and the equipment it serves. Attach the nameplate by screws or rivets. See Division 16, Section 16130.

### **2.7 ELECTRICAL INTERLOCKS**

- A. Provide electrical interlock switches on disconnects as specified herein. The interlock switches shall open prior the opening of the power switch and close only after the power switch has been enclosed. Provide two sets normally open (NO) and normally closed (NC) switches for each disconnect.
- B. Provide the necessary control wiring to the interlock switch to disconnect the control circuit from the motor controller.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install enclosed switches, breakers, and control panels in locations as indicated, according to manufacturer's written instructions. Comply with all applicable requirements of electrical installations and for the seismic zone of this project.
- B. Install enclosures level and plumb.
- C. Install wiring between enclosed switches and control/indication devices as required.
- D. Connect switches, breakers, panels, enclosures, and components to wiring system and to equipment ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including; screws and bolts, according to equipment manufacturers published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- E. Mounting: Mount enclosures on building structures adjacent to equipment unless otherwise noted. Enclosures shall not be mounted on equipment served, unless it is a part of a preassembled control panel. If building structure is not adjacent to the equipment, provide a separate unistrut rack with supports, clear of equipment, for mounting of switch and breaker enclosure. Conduits shall not be used for the support means.
- F. Location:
  - 1. Disconnects and breaker enclosures shall be readily accessible and shall not interfere with removal of equipment parts or with standard maintenance. Disconnects and breaker enclosures shall be installed with their top at 5½ feet above the floor unless otherwise noted on the drawings.

### **3.2 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will employ and pay an independent testing agency to perform specified field quality-control testing.

### **3.3 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

### **3.4 DEMONSTRATION**

- A. Train Owner's maintenance personnel on procedures and schedules for start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
- B. Review data in the "Operating and Maintenance Manual." Refer to Division 1 Section "Project Closeout."
- C. Schedule training with Owner through the Architect with at least 7 days' advance notice.

END OF SECTION

**SECTION 16491**  
**FUSES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This Section includes the following:
  - 1. Cartridge fuses, rated 600V and less, for use in switches, panelboards, switchboards, controllers, and motor control centers; and spare fuse cabinets.
  - 2. Cable limiters for use on service entrance applications where multiple cables per phase are installed.

**1.2 DEFINITIONS**

- A. Fuse: A safety device that protects an electric circuit from excessive current, consisting of or containing a metal element that melts when current exceeds a specific amperage, thereby opening the circuit.

**1.3 CODES AND STANDARDS**

- A. UL 198C: High-Interrupting Capacity Fuses; Current Limiting Types.
- B. UL 198E: Class R Fuses.
- C. FS W-F-870: Fuseholders (For Plug and Enclosed Cartridge Fuses).
- D. NEMA FU 1: Low Voltage Cartridge Fuses.
- E. NFPA 70: National Electrical Code.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Provide fuses and cable limiters from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 1. Comply with NEMA FU 1.
  - 2. Comply with NFPA 70.

**1.5 SUBMITTALS**

- A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.

**1.6 DELIVERY AND STORAGE**

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing and shall be inspected for damage prior to acceptance.
- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer's ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components: replace with new.

#### **1.7 SPARE PARTS**

- A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
  - 1. Fuses: Quantity equal to 10% of each fuse type and size, but not fewer than three of each type and size.
  - 2. Provide two (2) fuse pullers to Owner.

#### **1.8 WARRANTY**

- A. The contractor shall warrant all materials, workmanship, and equipment against defects for a period of one year after the date of substantial completion. Certain equipment shall be warranted at the time of final acceptance, or for longer periods of time as specified in those sections of the project manual.
- B. The contractor shall repair or replace, at no additional cost to Owner, any item that may become defective within the warranty period.

#### **1.9 MAINTENANCE**

- A. Replace failed fuses during period of construction. Replacement of blown fuses after substantial completion will be the responsibility of this contractor, thru the warranty period, using the Owner's spare fuses.

#### **1.10 COORDINATION**

- A. Coordinate fuse ratings with HVAC, refrigeration equipment, and motor nameplate ratings for maximum fuse size.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Fuses, 30 through 600 amperes:
    - a. Bussman #LPS-RK-SP
    - b. Ferraz Shawmut #AMP TRAP 2000 RK1
    - c. Little Fuse Power Gard #LLSRK-1D Series

#### **2.2 CARTRIDGE FUSES**

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

**3.2 INSTALLATION**

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install cable limiter devices on both ends (at load side of service transformer and at line side of main switch) of incoming electrical service cables where multiple-cables-per-phase systems are installed.

**3.3 IDENTIFICATION**

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

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**SECTION 16515**  
**INTERIOR LIGHTING FIXTURES**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, exit signs, lighting fixtures, and accessories.

**1.2 DEFINITIONS**

- A. Lighting Fixture: A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.
- B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.

**1.3 CODES AND STANDARDS**

- A. ANSI C82.1: American National Standard for Fluorescent Lamp Ballast – Line Frequency Fluorescent Lamp Ballast.
- B. ANSI C82.11: High Frequency Fluorescent Lamp Ballasts.
- C. ANSI C82.4: High-Intensity Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
- D. ANSI C82.6: Ballasts for HID Lamps – Method Measurement
- E. NEMA LE 2: H-I-D Lighting System Noise Criterion (LS-NC).
- F. NFPA 70: National Electricity Code (NEC)
- G. UL 935: Standard for Fluorescent Lamp Ballasts.

**1.4 QUALITY ASSURANCE**

- A. Electrical Component Standard: Provide components that comply with National Electrical Code - NFPA-70 and that are listed and labeled by Underwriters Laboratory where available.
- B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
- C. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed incombustible construction that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
  - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

## 1.5 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, submit each item in this Article according to the conditions of the contract and Division 1 specification section. Arrange in order of fixture designation. Include data on features, accessories, and the following:
  - 1. Dimensions of fixtures.
  - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
  - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
  - 4. Emergency lighting unit battery and charger.
  - 5. Fluorescent and high-intensity-discharge ballasts.
  - 6. Types of lamps.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
  - 1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.
- C. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.
- D. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle lighting fixtures to avoid damage to housing, components, and finishes.

## 1.7 SPARE PARTS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Battery and Charger For emergency lighting units: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
  - 4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

## 1.8 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and

shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for last nine years.
- C. Special Warranties for Fluorescent Ballasts: Written warranty, executed by manufacturer agreeing to replace fluorescent ballasts that fail in materials or workmanship within specified warranty period.
  - 1. Special Warranty Period for Electronic Ballasts: Five years from date of manufacture, but not less than four years from date of Substantial Completion.
  - 2. Special Warranty Period for Electromagnetic Ballasts: Manufacturer's standard warranty, but not less than two years from date of manufacture.

## **1.9 MAINTENANCE**

- A. Lamp Seasoning
  - 1. Operate all fluorescent lamps for 100 hours prior to requesting final observation. Season fluorescent lamps at 3 hour on, 20 minute off cycle.
- B. Relamping
  - 1. Replace failed lamps at completion of work. Replacement of incandescent and other lamps burnouts after the warranty period starts shall be the responsibility of the Owner.
- C. Adjusting and Cleaning
  - 1. Align luminaries and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaries.
  - 2. Touch up lighting fixture finish at completion of work.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated on the Electrical Drawings.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation on the Lighting Fixture Schedule.

### **2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL**

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools.

Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

- D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85%.
  - 2. Specular Surfaces: 83%.
  - 3. Diffusing Specular Surfaces: 75%.
  - 4. Laminated Silver Metallized Film: 90%.
- E. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
  - 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
  - 2. Lens Thickness: 0.125" (3 mm) minimum, unless greater thickness is indicated.
- F. Electromagnetic Interference Filters: Integral to fixture assembly. Provide one filter for each ballast. Suppress conducted electromagnetic interference filters as required by MIL-STD-461.

### 2.3 FLUORESCENT LAMP BALLASTS

- A. General Requirements: Unless otherwise indicated, features include the following:
  - 1. Designed for type and quantity of lamps indicated at full light output.
  - 2. Sound Rating: A, except as otherwise indicated.
  - 3. Type: Class P, High Power Factor, except as otherwise indicated.
- B. Electronic Ballasts: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
  - 1. Certified Ballast Manufacturer Certification: Indicated by label. (ETL and CBM)
  - 2. Encapsulation: Without voids in potting compound.
  - 3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
  - 4. Total Harmonic Distortion & Voltage: Less than or equal to 10% THD. Instant start with dual voltage (120/277v).
- C. Ballasts for Lamps in Nonrecessed Fixtures: Unless otherwise indicated, additional features include the following:
  - 1. Power Factor: 95%, minimum.
  - 2. Ballast Coil Temperature: 65 deg C, maximum.
  - 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  - 4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.
- D. Acceptable Manufacturers: Advance; Osram/Sylvania; Lutron; Motorola or approved equal.

### 2.4 EXIT SIGNS

- A. General Requirements: Comply with UL 924 and the following:
  - 1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
- B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Incandescent, two for each fixture, 50,000 hours rated lamp life.
  2. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours rated lamp life.
  3. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
  4. Additional Lamps for DC Operation: Two minimum, bayonet-base type, for connection to external DC source.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
  2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80% of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

## 2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:
1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
  2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80% of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
  4. Wire Guard: Where indicated, heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
  5. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

## 2.6 LAMPS

- A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.
- B. Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.
- C. Acceptable Manufacturers: General Electric, Phillips or Sylvania.

## 2.7 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: ½" (12-mm) steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

- C. Twin-Stem Hangers: Two, ½" (12-mm) steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- D. Rod Hangers: ⅜" (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

## 2.8 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
  - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
  - 2. Metallic Finish: Corrosion resistant.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture. Support fixtures according to requirements of Division 26 Basic Electrical Materials and Methods.
- B. Suspended Fixture Support: As follows:
  - 1. Pendant and Rods: Where longer than 48" (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.
- C. Lighting fixture Attachment: Fasten to indicated structural supports.
- D. Lighting fixture Attachment with Adjustable Features or Aiming: Attach lighting fixtures and supports to allow aiming for indicated light distribution.
- E. Lamp lighting fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

### 3.2 CONNECTIONS

- A. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.

- D. Tests and Observations: Verify normal operation of lighting units after installing lighting fixtures by energizing circuits with normal power source, and performing the following:
  - 1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
  - 2. Check intensity and uniformity of illumination.
  - 3. Check excessively noisy ballasts.
  - 4. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify transfer to emergency/battery source and retransfer to normal.
- E. Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.
- F. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

### **3.4 CLEANING AND ADJUSTING**

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

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**SECTION 16721N  
NEW FIRE ALARM SYSTEMS**

**PART 1 - GENERAL**

**1.1 SCOPE OF WORK**

- A. This Section includes, but is not limited to, providing a new addressable multiplexed fire alarm system, including smoke detectors, visible and audible notification devices, and fire protection controls, and other devices.

**1.2 DEFINITIONS**

- A. FACP: Fire Alarm Control Panel
- B. FAAP: Fire Alarm Graphic Annunciation Panel
- C. RAP: Remote Annunciation and Voice Panel
- D. BMS: Building Management (DDC) System
- E. ADA: Americans with Disabilities Act

**1.3 CODES AND STANDARDS**

- A. NFPA 72 – National Fire Alarm Code, 2002 Edition
- B. UL – Underwriters Laboratories, Inc, latest edition
- C. ISO 9001
- D. NFPA 70 – National Electrical code (NEC)
- E. NFPA 92A – Smoke Control Systems
- F. NFPA 101 – Life Safety Code
- G. International Fire Code, 2002 Edition

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced factory-authorized Installer to perform work of this Section.
- B. Fire alarm designer: Shop drawings shall be produced by, or under the direct supervision of, a NICET Certified Level IV fire alarm engineering technician or licensed fire protection engineer (P.E.).
- C. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.
- D. Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authorities having jurisdiction.
- E. Comply with NFPA 70.
- F. Comply with NFPA 72.
- G. Listing and Labeling: Provide fire alarm systems and components specified in this Section that are listed and labeled by Factory Mutual.
- H. Listing and Labeling: Provide systems and equipment specified in this Section that are listed and labeled.
  - 1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

## **1.5 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of system component specified including dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and Nationally Recognized Testing Laboratory (NRTL) listing data.
- C. Letter from and NCIET Level IV designer or licensed fire protection engineer indicating that the fire alarm system design has been reviewed and is in compliance with codes and manufacture instructions.
- D. Wiring diagrams from manufacturer differentiating clearly between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Make all diagrams specific to this Project and distinguish between field and factory wiring.
- E. Floor Plans: Indicate final outlet locations and routings of raceway connections.
- F. Device Address List: Coordinate with final system programming.
- G. System operation description covering this specific Project, including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are unacceptable.
- H. Operating instructions for mounting at the FACP, and all accessories.
- I. Product certificates signed by manufacturers of fire alarm system components certifying that their products comply with specified requirements.
- J. Maintenance data for fire alarm systems to include in the operation and maintenance manual specified in Division 1. Include data for each type of product, including all features and operating sequences, both automatic and manual. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.
- K. Submission to Authorities Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Upon receipt of comments from the authorities having jurisdiction, submit them for review. Resubmit if required to make clarifications or revisions to obtain approval.
- L. Record of field tests of system.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Where recommended by the equipment supplier, deliver equipment in fully enclosed vans after specified environmental conditions have been permanently established in

spaces where equipment is to be placed. The products accepted on the site shall be wrapped in factory packing, and shall be inspected for damage prior to acceptance.

- C. Store equipment in clean, dry with non-condensing environments that are controlled within manufacturer=s ambient tolerances for non-operating equipment. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Handle equipment carefully to prevent damage, breaking, and scoring. The contractor shall not install damaged units or components; replace with new.
- E. Equipment furnished by others. The contractor shall be responsible for receiving, uncrating, inspecting, storing, and installing of Division 26 equipment listed as furnished by others.

#### **1.7 SPARE PARTS**

- A. Provide within the FACP spare capacity (cards & controllers) the ability to expand the quantity of initiating and notification devices by 25% over those indicated and required by the contract documents and specified herein.
- B. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Tamper Covers and Wire Guards: Quantity equal to 15% of the number of units installed; minimum of six.
  - 2. Lamps for Remote Indicating Lamp Units: Quantity equal to 10% of the number of units installed, but not less than one.
  - 3. Lamps for Strobe Units: Quantity equal to 10% of the number of units installed, but not less than one.
  - 4. Smoke Detectors: Quantity equal to 10% of the number of units of each type installed, but not less than one of each type.
  - 5. Detector Bases: Quantity equal to 10% of the number of units of each type installed, but not less than one of each type.
  - 6. Printer Consumables: Four cartridges or ribbons.

#### **1.8 WARRANTY**

- A. Equipment and systems shall be warranted by the manufacturer and the Contractor for a period of one year following final acceptance. The warranty shall include, but not be limited to, parts, labor, 24 hour service, pick-up, and delivery.

#### **1.9 MAINTENANCE**

- A. Maintenance Service: The equipment manufacturer shall include a maintenance contract for the entire campus-wide system to provide a minimum of two inspections and tests per year for two years in compliance with NFPA 72 guidelines.

### **PART 2 - PRODUCTS**

#### **2.1 SYSTEM DESCRIPTION**

- A. General: Provide a new zoned, multiplexed, networked, addressable, microprocessor-based fire-detection and alarm system, including automatic alarm initiation, analog intelligent addressable detectors, smoke detectors, elevator recall, automatic alarm verification, as indicated.

- B. Signal Transmission: Hard wired, using separate individual circuits for each zone of alarm initiation and alarm device operation.
- C. Audible Alarm Indication: By sounding of speakers capable of reproducing various tones and voices.
- D. Visual Alarm Indication: By xenon strobe-type units.
- E. Supervision of circuits based on Class A wiring as follows:
  - 1. Style D for initiating devices circuits
  - 2. Style Z for notification appliance circuits
  - 3. Style 7 for signaling line circuits
- F. Smoke Control: The new FACP shall be listed and labeled for control of elevator Phase I or II Emergency Recall Operation to control elevator(s).
- G. At the completion of the project, each newly installed control panel, addressable wiring loop, equipment addresses and emergency battery supply shall have a minimum of 25% spare capacity for future additions.

## 2.2 MANUFACTURERS

- A. Manufacturers and Products: Subject to compliance with requirements, manufacturers offering fire alarm systems based on the following fire alarm control panels (FACPs):
  - 1. Notifier AM2020 system
  - 2. Simplex 4120 system
  - 3. Siemens Cerberus Pyrotonics MXL system
  - 4. Edward Systems Technologies EST-3 System

## 2.3 FIRE ALARM CONTROL PANELS (FACPS)

- A. General: The fire alarm control panel (FACP) shall provide power, annunciation, supervision, detection, alarm, and control for smoke management.
- B. Fire alarm panels shall be addressable, multiplexed, and capable of being networked in a pier-to-pier connection.
- C. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels and field wiring. Identify each enclosure by an engraved, red, laminated, phenolic-resin nameplate. Lettering on the enclosure's nameplate shall not be less than 1" high. Identify individual components and modules within the cabinets with permanent labels.
- D. Systems: Alarm and supervisory systems are separate and independent in the FACP. The alarm-initiating zone boards in the FACP consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.
- E. Control Modules: Provide new modules of types and capacities required to perform all functions of the fire alarm systems. Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm shall have a unique tone/sound.
- F. Zones: Provide new circuitry for all alarm and supervisory zones indicated.

- G. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm or trouble condition still exists.
- H. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator at the FACP and addressable system components, including annunciation, supervision, and control. A display with a minimum of 32 characters shows alarm, supervisory, and component status messages and indicates control commands to be entered into the system for control of smoke detector sensitivity and other parameters. Arrange keypad for use in entering and executing control commands.
- I. Instructions: Printed or typewritten instruction card mounted behind a lexan plastic or glass cover in a stainless-steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.4 FUNCTIONAL DESCRIPTION AND SEQUENCE OF OPERATION

- A. Include the following system functions and operating features plus those additional functions and features required by the authorities having jurisdiction and by Owner:
  1. Priority of Signals: Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest priority is an alarm signal. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.
  2. Non-interfering: Zone, power, wire, and supervise the system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. Systems that require batteries or battery back-up for the programming function are unacceptable.
  3. Fire Alarm Control Panel (FACP) Response: The manual or automatic operation of an alarm-initiating or supervisory-operating device causes the FACP to transmit an appropriate signal including the following:
    - a. General alarm
    - b. "Alarm Verification" sequence
    - c. Smoke or heat detector alarm
    - d. System trouble
    - e. Elevator recall
  4. Silencing at the FACP: Switches provide capability for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent zone alarms cause the audible signal to sound again until silenced by switch operation. Restoring alarm, supervisory, and trouble conditions to normal extinguishes the associated LED and causes the audible signal to sound again until restoration is acknowledged by switch operation.
  5. Loss of primary power sounds a trouble signal at the FACP. The FACP indicates when the fire alarm system is operating on an alternate power supply.

6. Loss of primary power at the FACP sounds a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on an alternate power supply.
  7. Annunciation: Manual and automatic operation of alarm- and supervisory-initiating devices is annunciated both on the FACP and on the annunciator, indicating location and type of device.
  8. FACP Alphanumeric Display: Displays plain-English language descriptions and addresses of initiating devices, alarms, trouble signals, supervisory signals, monitoring actions, system and component status, and system commands.
  9. General Alarm: A system general alarm includes the following:
    - a. Indicating the general alarm condition at the FACP.
    - b. Identifying the device that is the source of the alarm (or its zone) at the FACP.
    - c. Initiating audible and visible alarm signals throughout the building.
    - d. Stopping supply and return fans serving zone where alarm is initiated.
    - e. Closing smoke dampers on system serving zone where alarm is initiated.
    - f. Recall of elevators in the zone where the alarm is initiated.
    - g. Unlocking designated doors.
    - h. Recording the event on the system printer.
    - i. Initiating transmission of alarm signal to remote central station and municipal fire alarm system
    - j. Initiating transmission to "Fire Detected" alarm signal to the facility BMS.
  10. Manual Station Alarm Operation:
    - a. Indicating the general alarm condition at the FACP.
  11. Fire Detection from Heat Detection Devices Causes:
    - a. General alarm initiation.
  12. System Trouble including circuit break in the fire alarm system wiring, ground in the fire alarm system wiring, or maintenance switch operation causes or initiates the following:
    - a. A supervisory, audible, and visible signal indication at the FACP.
  13. Maintenance Switch causes or initiates the following:
    - a. A supervisory, audible, and visible signal indication at the FACP.
  14. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. The same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity adjustment schedule changes are recorded by the system printer.
- B. Recording of Events: Record on PC computer and print a record all alarm, supervisory, and trouble events. Printouts are by zone, device, and function. When the FACP receives a signal, the alarm, supervisory, and trouble conditions are printed. The printout includes the type of signal (alarm, supervisory, or trouble) the zone identification, date, and the time of the occurrence. The printout differentiates alarm signals from all other printed indications. When the system is reset, this event is also

printed, including the same information for device, location, date, and time. A command initiates the printout of a list of existing alarm, supervisory, and trouble conditions in the system.

1. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire-detection system alarm-initiating device and its indication at the FACP is 2 seconds.
2. Independent System Monitoring: Supervise each independent smoke- or heat-detection system, duct detector, and elevator smoke-detection system for both normal operation and trouble.
3. Circuit Supervision: Indicate circuit faults by both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and LED-indicating light. The maximum permissible elapsed time between the occurrence of the trouble condition and its indication at the FACP is 10 seconds.

## **2.5 ADDRESSABLE DEVICES**

- A. Alarm-Initiating Devices: Classified as addressable devices according to NFPA 72.
  1. Communication Transmitter and Receiver: Integral to device. Provides each device with a unique identification and capability for status reporting to the FACP.
  2. External Addressable Interface Unit: May be used where specified devices are not manufactured and labeled with integral multiplex transmitter and receiver. Arrange to monitor status of each device individually.

## **2.6 FIRE DETECTORS**

- A. Fire Detectors shall be intelligent analog addressable units combining heat detection (fixed and rate of rise), photoelectric and ionization smoke sensing technology in one unit. Units shall comply with UL 268 and include the following features:
  1. Sensitivity Adjustment from FACP.
  2. Automatic Environmental correction.
  3. Programmable to be in "single mode detection" such as fixed heat, rate of rise heat, photoelectric smoke, or ionization smoke as required on drawings.
  4. Operating Voltage: 24VDC, nominal.
  5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  6. Plug-in Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring.
  7. Integral Visual Indicating Light: Connect to indicate detector has operated.
  8. Remote Controllability: Individually monitor detectors at the FACP for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACP.
- B. Smoke Detectors: Unless noted otherwise, where smoke detectors are shown on drawings they shall be provided as photoelectric type detection.

## **2.7 ALARM-INDICATING (NOTIFICATION) DEVICES**

- A. General: Equip alarm-indicating devices for mounting.

- B. Wire Guards: Provide wire guards (WG) for alarm devices where indicated on plans.
- C. Weather Proof: Where indicated on plans to be weather proof (WP) alarm devices shall be suitable for outdoor and wet locations and include wire guards.
- D. Visual Only Alarm Devices: Xenon strobe lights with clear or nominal white polycarbonate lens. Mount lenses on an aluminum faceplate. The word "FIRE" is engraved in minimum 1" high letters on the lens.
  - 1. Devices have a minimum light output as required by the latest edition of the ADA.
  - 2. UL 1971 compliant with minimum.
  - 3. Strobe Leads: Factory connected to screw terminals.
  - 4. Wiring separate from audible devices.
  - 5. Provide with synchronizing flash rate module.
- E. Audible/Visual Alarm Devices: Combination speaker/strobe units Xenon strobe lights with clear or nominal white polycarbonate lens. Mount lenses on an aluminum faceplate. The word "FIRE" is engraved in minimum 1" high letters on the lens.
  - 1. Visual device shall comply with specifications for Visual Only units.
  - 2. Speakers shall be capable of producing a range of programmable tones and voice up to a maximum of 90dBA at 10 feet. Speakers shall include adjustable taps to increase or decrease sound levels (generally tapped at ½ watt).
  - 3. Combination unit shall be four-wire, with separate wires for speaker and strobe unit.
  - 4. Combination devices consist of factory-combined, audible and visual alarm units in a single mounting assembly.
- F. Remote Alarm Indicator: LED type, mounted flush in a single gang wall plate.
  - 1. Connected to indicate the alarm operation of a single detector or other device.
  - 2. Legend: "Alarm."

## 2.8 EMERGENCY POWER SUPPLY

- A. General: All FACP's shall be provided with batteries.
- B. General: Components include nickel-cadmium-type battery, charger, and an automatic transfer switch. Battery nominal life expectancy is 10 years minimum.
- C. Battery capacity is adequate to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode, for a period of 15 minutes.
- D. Battery Charger: Solid-state, fully automatic, variable charging rate type. Provide capacity for 150% of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges them completely within 4 hours. Charger output is supervised as part of system power supply supervision.
- E. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

## 2.9 WIRE

- A. Wire: Solid-copper conductors with 300V rated, 75C, color-coded insulation per NEC 760 FPLP or FPLR type cable minimum 18 AWG.

- B. All fire alarm wiring shall be installed in conduit. See Section 16130 for conduit types and applications.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Install system according to NFPA standards referenced in Parts 1 and 2 of this Section.
- B. Fire Alarm Power Supply Disconnect: Paint red and label "FIRE ALARM." Provide with lockable handle or cover.

#### **3.2 DRAWINGS SUPPLIED**

- A. The drawings supplied by the engineer are diagrammatic in nature and show the general scope of work to be performed in conjunction with these specifications. The drawings are to be used as a guideline by the contractor for the equipment required, and for the approximate location and coverage of the fire detection and alarm systems specified.
- B. The contractor shall retain the services of a qualified NICET Level IV fire alarm designer or licensed fire protection engineer who is authorized by the manufacture to provide exact quantities and locations for devices, performance requirements, and installation details to coincide with all physical restraints of the area due to the building layout and mechanical equipment, while maintaining conformity with all applicable codes.

#### **3.3 EQUIPMENT INSTALLATION**

- A. Smoke Detectors: Install ceiling-mounted detectors not less than 4" from a side wall to the near edge. Install detectors located on the wall at least 4", but not more than 12", below the ceiling. For exposed solid-joint construction, mount detectors on the bottom of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 60" from air registers.
- B. Visual Alarm-Indicating Devices and Combination Audible/Visual Devices: Install adjacent to or in combination with each alarm bell or alarm horn and not more than 80" above the finished floor and at least 6" below the ceiling, per ADA requirements.
- C. Device Location-Indicating Lights: Locate in public space near the device they monitor. Wall mount lights at 80" above finished floor.
- D. FACP: Surface-mounted with tops of cabinets not more than 72" above the finished floor.

#### **3.4 WIRING INSTALLATION**

- A. Wiring Method: Install wiring in metal raceway according to Section 26 0505 -Basic Electrical Materials and Methods. Conceal raceway except in unfinished spaces and as indicated.
- B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

- D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.

### 3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Section 16050 - Basic Electrical Materials and Methods.

### 3.6 GROUNDING

- A. Ground cable shields and equipment according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

### 3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Pre-testing: After installation, align, adjust, and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- C. Report of Pre-Testing: After pre-testing is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.
- D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72. Minimum required tests are as follows:
  - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
  - 2. Test all conductors for short circuits using an insulation-testing device.
  - 3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
  - 4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
  - 5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10% of the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.

6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
  7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
  8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.
- H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

### **3.8 CLEANING AND ADJUSTING**

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

### **3.9 DEMONSTRATION**

- A. Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.
1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of 8 hours of training.
  2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
  3. Schedule training with Owner with at least 7 days' advance notice.

### **3.10 ON-SITE ASSISTANCE**

- A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested adjustment visits to the site for this purpose.

### **3.11 TRAINING**

- A. System vendor shall provide up to two (2) two-hour sessions of on-site orientation of Owner personnel in the operation, programming and maintenance of the FACP and all system devices.

- B. Training shall be conducted at the convenience of Owner after the system is accepted by Owner as complete.
- C. Provide instruction as required for operating the system. "Hands-on" demonstrations for the operation of all system components and the entire system including program changes and functions shall be provided.
- D. The contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" to Owner.

#### **PART 4 - MANUFACTURER'S REPRESENTATIVE**

##### **4.1 MANUFACTURERS**

- A. Contractor shall include in their bid, the cost for equipment and services provided by the following manufacturer's representative.
  - 1. Notifier
  - 2. Simplex
  - 3. Siemens Cerberus Pyrotonics

END OF SECTION