SECTION 00 01 00 – TECHNICAL SECTIONS - TABLE OF CONTENTS

SECTION 010002 – GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes general rules for the project. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope of Work
      b. Pre-Bid Information
      c. Commencement and Completion
      d. Contacts
      e. Qualifications of Bidder
      f. Work by the City and City Furnished Equipment
      g. Salvage Materials
      h. Provisions for Future Work
      i. Special Site Provisions
      j. Alternates
      k. General
      l. Guarantees
      m. Sustainable Construction Methods and Materials
      n. Schedule of Operations
      o. Documents
      p. Quality Assurance
      q. Codes and Permits
      r. Submittals
      s. Drawings and Specifications
      t. Operation and Maintenance Data
      u. Safeguards - Existing Equipment, Underground Utilities and Artifacts
      v. Access Panels
      w. Sleeves and Openings
      x. Lose and Detachable Parts
      y. Stairs, Scaffolds, Hoists, Elevators or Cranes
   2. PART 2 – PRODUCTS
      a. Specified Items – Substitutes
      b. Approved Testing Laboratories
   3. PART 3 – EXECUTION
      a. Installation
      b. General Installation Methods
      c. Delivery, Handling and Storage of Materials
      d. Demolition
      e. Cutting, Patching and Painting
      f. Excavation, Backfill, and Surface Restoration
      g. Dewatering
      h. Sealing and Firestopping
      i. Cleaning
      j. Continuity of Service and Shutdown
      k. Project Meetings
      l. Temporary Construction
      m. Identification
      n. Lubrication
      o. Punch List
      p. Tests and Final Acceptance
      q. Training and Demonstration

r. Fence
s. Roadway
t. Signs

1.2 SCOPE OF WORK

A. Remodeling of Senior Center at 330 West Mifflin St. in Madison, WI. This includes replacement of walls, ceiling, flooring and casework, along with related Electrical modifications.

1.3 PRE-BID INFORMATION

A. There will be a pre-bid tour of the existing building on November 23, 2010 at 13:00 at 330 West Mifflin Street, Madison, WI, to provide bidders the opportunity to acquaint themselves with the project. A representative from the designer's office will be present to take questions that will be answered by addendum.

1.4 COMMENCEMENT AND COMPLETION

A. Please refer to Section 105.15, 109.7, and 110.5 of the Standard Specifications, which can be found here:
1. http://www.cityofmadison.com/Business/PW/specs.cfm

B. The successful Bidder must agree to commence the work on or before a date to be specified in a written "Start work Letter" and to fully complete all the work within 90 calendar days thereafter.

1.5 CONTACTS

A. The City's designee for architectural and engineering is: Tyler Smith
Company: Destree Design Architects
Address: 222 w Washington Avenue, Suite 310
Phone: 608-268-1499
Email: Tyler@destreearchitects.com

B. The City's designee for project management: Jeanine Zwart
Company: City of Madison
Address: Room 115, 210 Martin Luther King Jr. Blvd.
Phone: 608-267-8749
Email: jzwart@cityofmadison.com

1.6 QUALIFICATIONS OF BIDDER

A. Has completed one or more projects of at least 50% of the size or value of the division of work being bid and the type of work completed is similar to that being bid. If a greater magnitude of experience is deemed necessary, other than size or value of the work, such requirements will be described in the appropriate technical section of these specifications.

B. Has access to all necessary equipment and has organizational capacity and technical competence necessary to do the work properly and expeditiously.

C. Maintains a permanent place of business.

1.7 WORK BY THE CITY AND CITY FURNISHED EQUIPMENT

A. All asbestos removal.

1.8 SALVAGE MATERIALS

A. No materials removed from this project shall be reused except as specifically noted on plans. All materials removed shall become the property of and shall be disposed of by the Contractor.

1.9 PROVISIONS FOR FUTURE WORK

A. Not applicable

1.10 SPECIAL SITE CONDITIONS

A. Unless otherwise noted, construction operations shall be limited to the hours between 7:30 a.m. and 6:00 p.m., Mondays through Fridays, except for holidays. A request must be made to the City forty-eight hours in advance for approval of work days or hours other than those stated above. Compliance is required with the City of Madison Noise Ordinance.

B. In addition the following restrictions apply:
   1. Sequence of Work within Project: Contractor to coordinate construction so as to keep facility in operation at all times.

C. A temporary field office and temporary toilets are not required. The Contractor's labor force may use City facilities upon approval by the City. The Contractor shall maintain the toilets and other spaces provided by the City in clean and sanitary condition at all times.

1.11 GENERAL

A. The City of Madison Standard Publications for Public Works Construction - current Edition, as supplemented from time to time, forms a part of these contract documents as if attached hereto.

B. These Standard Specifications are available upon request from the City Engineer, City Engineering Division, Room 115, City County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53710. An electronic copy is available from the City Website http://www.cityofmadison.com/business/pw/specs.cfm The Contractor shall review these specifications prior to preparation of proposal for the work to be done under this contract. Failure to do so does not relive the Contractor from meeting all requirements.

C. All articles in these General Requirements are applicable to all Divisions and Sections apply to each Division of these Specifications as fully as if repeated within that Division. The Conditions of the Contract, General and supplementary General Conditions, and these General Requirements shall apply to the Contractor and engaged in his work. Items listed under Scope of Work for each Division of the Specifications are not necessarily all inclusive.

D. Portions of these specifications are of the abbreviated, simplified type and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "in conformity with", "shall be", "as noted on the drawings", "in accordance with details", are intentional. Omitted words or phrases shall be supplied by inference in the same manner, as they are when a note occurs on the drawings. Such terms as approved, reviewed, equal, as directed, as required, as permitted, acceptable, satisfactory mean by or to the City Engineer or designee.

E. These specifications and drawings are intended to include everything necessary to perform the entire work properly. Every item necessarily required might not be specifically mentioned or shown. Unless expressly stated, all systems and equipment shall be complete and operable. The words "furnish", "install", and "provide" shall mean the same in a sense that the Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the equipment and systems installation herein specified, except such parts as are specifically exempted herein. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, largest quantity or most closely fits the City's intent. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the City's or designee's inspections, tests and approval from the commencement until the acceptance of the completed work. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy. If items are too large to fit into existing space Contractor shall provide smaller model of same type upon approval by The City at no cost to the City. All sizes as given are minimum except as noted. Prior to bidding bidder must visit site to become familiar and verify existing conditions. Failure to do so does not relieve the bidder from the responsibility to verify existing conditions, to point out errors in drawings or specifications or code violations.

F. Bidders shall bring inadequacies, omissions or conflicts to the City's attention at least ten (10) days before the date set for bid opening. Prompt clarification will be supplied to all bidders of record by addendum. Failure to request clarification or interpretation of the drawings and specifications will not relieve the successful Bidder of responsibility. Signing of the contract will be considered as implicitly denoting that the Contractor has thorough understanding of the scope of work and comprehension of the contract documents. The City is not responsible for verbal instructions.

G. Information pertaining to existing conditions that are described in the specifications or appear on the drawings is based on available records. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing. This information is provided to inform the Contractor of known, existing conditions so that due diligence is taken by the Contractor to avoid damage. Where site observation or documents indicate existing underground utilities/services in close proximity (within four feet horizontally and/or four feet vertically) to necessary new construction work, the Contractor shall be responsible to test, probe or otherwise determine exact locations so as to prevent damage to such utilities/services.

H. It is expected that Contractors have access to their own cell phone for their own use. No additional telephone service will be provided.

I. The City will not furnish Watchpersons. The Contractor shall provide such precautionary measures, to include the furnishing of watch persons if deemed necessary, to protect persons and property from damage or loss where the Contractor's work is involved.

J. Contractors shall cooperate with all the testing consultants and verify system completion to the testing consultants. Demonstrate the starting, interlocking and control features of each system so the testing Contractor can perform its work. Testing and balancing (TAB) Contractor shall be direct subcontractor to the Contractor and shall not be the mechanical Contractor or subcontractor to mechanical Contractor.

K. The Contractor resumes responsibility for all work specified in this contract except for work explicitly noted as be done by the City or a Contractor separately hired by the City. The Contractor shall immediately inform the City of the name of the person(s) designated as Superintendent representing the Contractor at the site. The Contractor shall take complete charge of the work under this contract and coordinate the work of all trades on the project. All Contractors shall work in cooperation with the Contractor and with each other, and fit their work into the structure as job conditions may demand. The City shall make all final decisions as to the right-of-way and run of pipe, ducts, etc., at prearranged

meetings with responsible representatives of the Contractors involved. Contractor(s) shall coordinate the work with adjacent work with other Contractors prior to installation and shall cooperate with all other trades to facilitate the general progress of the work. The Contractor shall coordinate and schedule the work of all its subcontractors, and shall furnish all information required by them for proper scheduling and execution of the work. In the same manner, the Contractor shall coordinate the work with that of the City, and any other Contractor operating in the area, including reasonable adjustments of schedule in order to allow other Contractors or the City to do their work. Coordinate all work with other Contractors prior to installation. Any installed work that is not coordinated and that interferes with other Contractor's work shall be removed or relocated at the installing Contractor's expense.

L. Each trade shall afford all other trades every reasonable opportunity for the installation of their work and for the storage of their material. In no case will the Contractor(s) be permitted to exclude from the premises or work, any other Contractor or employees thereof, or interfere with any other Contractor in the executing or installation of their work. In case it is indicated which trade is responsible for which work, this is meant as a suggestion and it is the Contractor's responsibility in its contracts with subcontractors to clarify who ultimately will do the work. If conflicts arise between the Contractor and subcontractor about who is responsible for which work to be done it is the Contractor's responsibility to make sure the work gets done in time even if the dispute between Contractor and subcontractor gets settled later.

M. The City Engineer shall have the right to make final and binding decisions on disputes between the Contractor and any other subcontractor operating in the area regarding: (a) access to the site with work force, equipment, and/or materials to their work area or (b) their adjacent work areas.

N. The Contractor shall cooperate with other trades and City personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical or piping or ducting work to better fit the general installation, such work shall be done at no extra cost to the City, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

O. The Contractor shall provide and maintain in working order during the entire construction period, a minimum of three (3) fire extinguishers on each floor level, and one (1) in temporary office. Extinguishers shall be nonfreezing type such as A-B-C rated dry chemical, of not less than 10-pound capacity each. In addition, any subcontractor who maintains an enclosed shed on the site shall provide and maintain, in an accessible location, one or more similar nonfreezing type fire extinguisher in each enclosed shed.

P. The area to be set aside for the work under this contract is shown on the drawings, and the Contractor shall confine the construction to the immediate area within the construction limits. The Contractor shall immediately upon entering the site for purpose of beginning work, locate general reference points and take such action as is necessary to prevent their destruction. The Contractor shall layout its work and be responsible for all lines, elevations and measurements of the building and other work executed under its Contract. The Contractor must exercise proper precaution to verify dimensions on the drawings before laying out work and will be held responsible for any error resulting from failure to exercise such precaution. The Contractor shall verify grades, lines, levels, locations, and dimensions as shown on drawings and report any errors or inconsistencies to the City before commencing work. Starting of work by the Contractor shall imply acceptance of existing conditions. Confine all operations, equipment, apparatus and storage of materials, to the immediate area of work to the greatest possible extent. Contractor shall ascertain, observe and comply with all rules and regulations in effect on the project site, including but not limited to parking and traffic regulations, use of walks, security restrictions and hours of allowable ingress and egress. Any special traffic control during construction involving lane closures shall be in accordance with the federal standard, Manual of Uniform Traffic Control Devices.

Q. Using datum, the lot lines and present levels have been established as shown on the drawings. Other grades, lines, levels and benchmarks, shall be established and maintained by the Contractor, who shall be responsible for them. As work progresses, the Contractor shall layout on forms and floor, the locations of all partitions, walls and fix column centerlines as a guide to all trades. The Contractor shall make

provision to preserve property line stakes, benchmarks, or datum point. If any are lost, displaced or disturbed through neglect of any Contractor, Contractor's agents or employees, the Contractor responsible shall pay the cost of restoration.

R. The City's payment and guarantee provisions and when and how the City will accept the work are listed in the Standard Specifications under Sections 105.15 and 110.5.

1.12 GUARANTEES

A. All work, material and equipment is guaranteed by the Contractor to be free of faults for at least one year or longer if specified elsewhere. This year begins from the date of final acceptance from the City, which is stated in the Standard Specifications under Section 105.16. The Contractor agrees to return to the project and commence work as directed upon notification by the City and will furnish at his own expense all necessary labor and material to make proper repairs or corrections made necessary by defective material or inferior workmanship furnished or performed under this contract. If a subcontractor is not complying, the Contractor is held responsible.

B. All corrections and repairs are to be made no more than 30 days after notification of the Contractor for equipment and material that is not critical to the operation of the building. Critical equipment and material, including but not limited to HVAC, roofing, electrical, elevator, shall be repaired or brought into temporary and safe working condition in less than 7 days and temporary alternatives have to be provided by the Contractor. If Contractor fails to do so the City reserves the right to perform the work himself or subcontract a different Contractor and charge the Contractor the full cost of the repair and correction and cost of any material, rental fee, labor and equipment to provide temporary relief and protection to enable safe operation of the building.

1.13 DEFINITIONS AND STATUS OF INDIVIDUALS

A. Owner: synonym for The City of Madison. Other synonyms are “City”, “City of Madison” and “Department”

B. Contractor: Shall mean the person or firm responsible for the execution of this contract, or any portion thereof. This shall include the General or Prime Subcontractor, all Sub Subcontractors and any suppliers. Subcontractor usually refers to the particular contractor concerned with the Section in which the term is found, but this in no way relieves the General contractor of its sole responsibility for completing the entire work of this contract. The contractor shall complete the work in accordance with the contract documents, approved submittals that comply with the contract documents, and any clarifications or instructions issued by the Project Manager. The contractor shall not be relieved of any responsibility to comply with such requirements by the activities of the Architect-Engineer or the Project Manager. The terms contractor and subcontractor may be interchangeable.

C. Architect-Engineer or A/E: is the person or firm designated as the responsible design professional. The A/E shall interpret and clarify the intent of the construction Subcontract Documents, will work with the owner and project manager in determining the acceptability of workmanship, materials and the progress of the work and entitlement to payment. The A/E will review proposed changes, substitutions, shop drawings and schedules submitted by the Subcontractor for approval as required by the Subcontract Documents. The Architect-Engineer shall have access to the work at all times and the authority to recommend that the owner not accept any work or materials deemed not to conform to the requirements of the contract.

D. Project Representative: During the Construction Phase, all submittals and communications with the A/E shall be through the Owner’s “Project Representative.” The Project Representative will administer the technical requirements of the contract and will coordinate the inspection of the work. The A/E and

City/Owner-A/E will determine all professional design responsibility matters. Other synonyms are "Project Manager" and Manager" and City Representative."

1.14 SUSTAINABLE CONSTRUCTION METHODS AND MATERIALS

A. All construction methods and materials shall meet these requirements unless specified differently elsewhere. Contractor is to provide all documentations, certifications and other material necessary to prove compliance to the City and third party certifiers.

B. Construction Activity Pollution Prevention:
   1. Follow Requirements in Storm Water Pollution Prevention Plan (SWPPP) and Erosion and Sedimentation
   2. Control (ESC) Plan.
   3. Stabilize any relocated and moved soil with fast growing grasses and place mulch (hay, woodchips, straw) on it to cover and hold soil.
   4. Divert surface runoff from distributed areas into sediment basin or sediment traps with a mound of stabilized soil Construct posts with filter fabric media to remove sediment from stormwater leaving the site.

C. Site Development:
   1. Follow requirements in site development plan and don't disturb areas beyond the marked areas

D. Construction Waste Management:
   1. Recycle all recyclable material. This includes any material for which there is a recycling facility in Wisconsin.
   2. Separate all waste material in plastic, metal, paper, acoustical tile, brick, concrete, clean wood, glass, gypsum drywall, carpet and insulation and provide designated on-site collection areas.
   3. Keep track of volume and weight of each material and track if it was recycled or disposed otherwise.
   4. Keep track of volume and weight of donated material and site reused on site
   5. Haul all recyclable material to recycling facility if one is available in the county at no cost to the City.
   6. It is permissible to separate waste off-site by specialized recycling contractor. This contractor needs to provide proof of recycling and needs to be WASTECAP certified as "Accredited Professional in Construction and Demolition Debris Recycling".

E. Indoor Air Quality:
   1. During construction the recommended control measures of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ guidelines for occupied buildings under construction, (1995, chapter 3) must be met or exceeded.
   2. Stored on-site or installed absorptive material must be protected from moisture damage.
   3. In case permanently installed air handlers are used for ventilation, filtration media with a Minimum efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Contractor shall replace all filtration media immediately prior occupancy.
   4. All to be installed ductwork, air handlers and other equipment later connected to the indoor air path are to be protected from dirt and debris.

1.15 SCHEDULE OF OPERATIONS

A. Within 5 calendar days after the effective date of Start Work Letter, the Contractor shall provide a critical path method (CPM) network diagram and a preliminary construction progress schedule covering Contractor operations for the first 60 calendar days. The diagram shall show the order in which the

Contractor proposes to accomplish the work. The CPM shall show interdependence and duration, along with installation man-hours by craft of each activity. Any work element longer than 15 days shall be broken down into component parts. The critical path and float for each activity shall also be shown. The diagram or bar chart shall be neatly lettered and legibly drawn to a time scale. The preliminary progress schedule shall be a bar graph or an arrow diagram showing the times the Contractor intends to commence and complete the various work stages, with operations and contract items planned to start during the first 60 calendar days. This initial network diagram and all consecutive versions shall include preliminary dates throughout the end of the project.

B. Install work in phases to accommodate City's occupancy requirements. During the construction period coordinate electrical schedule and operations with the City.

C. After the initial submittal, the Contractor shall update the schedule monthly by entering actual progress for the period and submit copies as part of the payment request.

1.16 DOCUMENTS

A. All electronic files used or created for this project become property of the City. All files have to be submitted to the City upon request and once each phase (design, construction) is completed. Only Microsoft Office, PDF, and AutoCAD version 2008 and lower documents are acceptable. All documents that once existed in Microsoft or AutoCAD version must be submitted in such. AutoCAD files have to be submitted in original drawing form for further use in future projects. Sheet-set files alone will not be sufficient. All AutoCAD files must be submitted as PDF in addition. The Contractor can use CAD files and other files necessary for this project upon request.

B. The City or designee will provide the Contractor with a suitable set of Contract Documents on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted. During the first week of each month, the Contractor shall present, at the project site, the job copy showing variations and changes to date to the City for review.

D. During first week of each month, the Contractor shall present at the project site all changes to architectural/engineering plans for review. At completion of the project, the Contractor shall submit the marked-up record drawings to the City prior to final payment.

E. Contractor shall provide list with all equipment installed. This list shall contain, but not limited to, type, make and special product key and number. For grant purposes the contractor may have to provide detailed information about equipment installed and labor provided to third party institutions, such as Focus on Energy.

1.17 QUALITY ASSURANCE

A. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the City.

B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the

performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

D. Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

E. Contractor shall assume the responsibility for the protection of all finished construction under the Contract and shall repair and restore any and all damage of finished work to its original state. Wheeling of any loads over any type of floor, either with or without plank protection, will be permitted only in rubber-tired wheelbarrows, buggies, trucks or dollies. Where structural concrete is also the finished surface, care must be taken to avoid marking or damaging those surfaces. All structures and equipment shall be constructed, installed and operated with guards, controls and other devices in place.

F. Contractor shall obtain complete data at the site and inspect surfaces that are to receive the Work before proceeding with fabricating, assembling, fitting or erecting any work under this contract. Contractor shall notify the City in writing in case of discrepancies between existing work and drawings, and of any defects in such surfaces that are to receive the Contractor's work. The City will evaluate the notice and direct what remedial action will be taken.

G. Starting of work implies acceptance of existing work or the work of others. Removal and replacement of work applied to defective surfaces, in order to correct defects, shall be done at the expense of the Contractor who applied work to defective surfaces.

H. The Contractor shall:
1. Provide, erect and maintain all required planking, barricades, guard rails, temporary walkways, etc., of sufficient size and strength necessary for protection of stored material and equipment; paved surfaces, walks, curbs, gutters and drives; streets adjacent to or within project area; adjoining property and all project work to prevent accidents to the public and the workmen at the job site.
2. Notify adjacent property owners if their property interferes with the work so that arrangements for proper protection can be made.
3. Provide and maintain proper shoring and bracing to prevent earth from caving or washing into the building excavation. Provide temporary protection around openings through floors and roofs, including elevator openings, stairwells, and edge of slabs.
4. Provide and maintain proper shoring and bracing for existing underground utilities, sewers, etc., encountered during excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.
5. Provide protection against rain, snow, wind, ice, storms, or heat to maintain all work, materials, apparatus, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged. Remove snow and ice as necessary for safety and proper execution of the work.
6. Protect the building and foundations from damage at all times from rain, ground water and back up from drains or sewers. Provide all equipment and enclosures as necessary to provide this protection.
7. Damaged property shall be repaired or replaced in order to return it to its original condition. Damaged lawns shall be replaced with sod.

8. Protect materials, work and equipment, not normally covered by above protection, until construction proceeds to a point where the general building protection of the area where located, dispenses with the necessity therefore. Protect work outside of the building lines such as trenches and open excavations, as specified above.
9. Take all necessary precautions to protect the City's property as well as adjacent property, including trees, shrubs, buildings, sanitary and storm sewers, water piping, gas piping, electric conduit or cable, etc., from any and all damage which may result due to work on this project.
10. Repair work outside of property line in accordance with the requirements of the authority having jurisdiction.
11. Repair any work, damaged by failure to provide proper and adequate protection, to its original state to the satisfaction of the City or remove and replace with new work at the Contractor's expense.
12. Protect trees indicated on the drawings to remain and trees in locations that would not interfere with new construction, from all damage. Do not injure trunks, branches, or roots of trees that are to remain. Do cutting and trimming only as approved and as directed by the City.
13. The value of trees destroyed or damaged will be charged against the account of the Contractor responsible for the damage in an amount equal to the expense of replacing the trees with those of similar kind and size.

I. The contractor shall be fully responsible for inspecting the work of its suppliers, and subcontractors to assure that the work complies with the standards for materials and workmanship required by the contract documents.

J. The Contractor shall:
1. Monitor quality control over subcontractors, suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of the quality specified in the contract documents.
2. Comply fully with manufacturer's instructions, including each step in sequence.
3. Request clarification from the City before proceeding with work when manufacturers' instructions or reference standards conflict with Subcontract Documents.
4. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or manufactures instructions require more precise workmanship.
5. Ensure that work is performed by persons specializing in the specific trade and class of work required, and qualified to produce workmanship of specified quality.
6. Secure products in place with positive anchorage devices designed and sized to withstand seismic, static and dynamic loading, vibration, physical distortion or disfigurement.

K. If reference standards or manufacturers' instructions contain provisions that would alter or are at variance with relationships between the parties to the contract set forth in the contract Documents, the provisions in the Contract Documents shall take precedence.

L. When required by individual Specification sections, Contractor shall provide the following services from a manufacturer's representative:
1. Review of Specifications and design and concurrence or suggestions for modification.
2. Site observation of conditions of use and substrate.
3. Observation of the installation work in progress and on completion.
4. Start up, testing, and adjustment of equipment.
5. Instruction to the City in operation and maintenance.
6. Provide written signed report by manufacturer's representative documenting services provided and any comments or recommendations.

M. The work will be inspected by City inspectors and/or independent inspection service personnel under coordination of the City. All work is subject to inspection and shall remain accessible and exposed until it has been inspected by the City. Any work covered up or made inaccessible before such inspection shall be uncovered and made accessible without additional expense to the City. The City can request inspection of delivered material to confirm meeting of standards and specifications. An installation under supervision of the City can be requested to check proper installation. Contractor is to grant access to all

material and finished and unfinished work at any time upon request. At least 3 business days notice has to be given to the City prior to arrival of material and equipment to be inspected. This includes concrete, which will be sampled and tested by the City.

N. Inspection or testing performed by the City Engineer or his designee shall not relieve the Contractor from responsibility for performing his own quality control and for complying with the requirements of the contract Documents. The City will not be responsible for the Contractor's failure to carry out work in accordance with the contract Documents.

O. Cooperate and arrange meetings with City or designee (Cx). Fill out and submit all documents required by Cx. Commissioning checklists need to be filled out truthfully at the time indicated. This includes but is not limited to delivery checklist (at time of delivery), installation checklist (at time of installation) and start up checklist (at time of startup).

P. Commissioning involves among other things:
1. Inspection of material arriving at site regarding right type, number and undamaged package and proper storage.
2. Inspection of installation
3. Test of proper function
4. Review of Training and submitted O&M material
5. Test of proper function before end of warranty period

1.18 CODES AND PERMITS

A. Applicable provisions of Public Law, the Constitution and Laws and Statutes of the State of Wisconsin and the codes and regulations of the Department of Energy are hereby referred to and made a part of this contract and all work performed shall be in accordance with such laws, regulations and the latest edition or supplement or amendment thereto in effect at the time of submittal of bid shall be considered to be the issue in effect (unless shown otherwise) of all applicable codes including, but not limited to:
1. Wisconsin Building Code
2. Wisconsin Electrical Code
3. Wisconsin Mechanical Code
4. Wisconsin Plumbing Code
5. Wisconsin Energy Code
6. Wisconsin Fire Code
7. NFPA 70 National Electrical Code
8. General Services Administration 41 CFR Part 101-19
9. Americans with Disabilities Act (ADA)
10. Energy Conservation Performance Standards,
11. Local Codes

B. Contractor is expected to know or to ascertain, in general and in detail, the requirements of all codes and ordinances, and all rulings and interpretations of code requirements being made by all authorities having jurisdiction over the work performed by them, applicable to the construction and operation of systems covered by this contract. Where codes or standard specifications other than those listed in this paragraph are referred to in the different Divisions of these specifications, it is understood that they apply as fully as if cited here. Where differences exist between codes affecting this work, the code affording the greatest protection to the City shall govern. Maintenance clearances shall be maintained around equipment as required by the Codes and Standards, and as recommended by the equipment manufacturers. The maintenance envelope and equipment access shall be kept clear of any obstruction. It is Contractor's responsibility to enforce these requirements with all the Contractors. The Contractor shall be responsible for correcting any infringement on this requirement at no cost to the City. All cost for items and procedures necessary to satisfy requirements of all applicable codes, ordinances and authorities, whether or not these are specifically covered by drawings or specifications. All cases of serious conflict or omission between the drawings, specifications, and codes shall be brought to the City's attention as herein

before specified. The Contractor shall carry out work and complete construction as required by applicable codes and ordinances and in such a manner as to obtain approval of all authorities whose approval is required.

C. Contractor is responsible for obtaining permits at its own cost including expenses for supporting documents. Deliver original permits to the City before work starts. Obtain and pay for all required installation inspections except those provided by the City. Deliver originals of these certificates to the City. Include copies of the certificates in the Operating and Maintenance Instructions. Contractor shall arrange all required inspections and correct all efficiencies at no cost to the City.

D. The Contractor must maintain all licenses required for the work performed and required by authorities. In addition all licenses and certificates required elsewhere have to be maintained. If a Contractor loses a license for whatever reason he must inform the City immediately after learning about that himself. The Contractor must submit proof of holding the license or certificate upon request.

1.19 SUBMITTALS

A. Documents have to be submitted in electronic form (PDF) as described elsewhere in addition to hardcopies no later than 3 business days after start work letter is issued. The City or designee will review, and process shop drawings and other required submittals with reasonable promptness. No delay will be allowed in the progress of the job attributable to Contractor's failure to supply submittals in time.

B. The Contractor shall submit three (3) prints of all shop drawings, submittal data consisting of brochures, catalogs, material lists, wiring diagrams, Material Safety Data Sheets (MSDS), samples, erection drawings, and equipment layouts for review by the City Engineer or his designee. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked. Submittals shall be processed with such promptness as not to cause delay to the work or to that of any other Contractor. Each submittal shall be provided together with a transmittal letter or form. Each original transmittal shall be assigned a transmittal number. The number shall begin with the first initial of the name of the Contractor's firm followed by a serial number. The resubmittals shall indicate the same number with numerical suffix in sequence. Each transmittal shall itemize the enclosures and indicate the distribution of the transmittal and the enclosures. The following information shall be included on all submitted documents: Agency/Location/Address obtained, project number, building name, project name. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

C. Submit all original documents providing information regarding sustainability requirements including but not limited to recycled content, VOC, certified wood, disposal certificates and transportation distance. Contractor is required to prove that material and methods used meet all requirements specified elsewhere.

D. The City or designee will return the marked and stamped drawings together with transmittal letter or form to Contractor. If re-submittal is required, the City Engineer or designee will so note and Contractor shall make another submission for review after correction resolving the review comments on the prior submittals. The above procedure shall be repeated until the City Engineer or designee favorably reviews the submittal. The submittals must be approved before material is ordered and fabrication is authorized.

E. The City Engineer's or designee's favorable review of shop drawings and other submittals shall not relieve the Contractor of responsibility for deviations from drawings or specifications, unless the Contractor has in writing called the City Engineer's or designee's attention to such deviations at the time of submission, and the City Engineer or designee has acknowledged in writing such deviations; nor shall it relieve the Contractor from responsibility for errors of any sort in such drawings. If deviations, discrepancies, or conflicts between shop drawing submittals and the drawings and specifications are discovered either prior to or after the shop drawing submittals are reviewed by the City Engineer or

designee, the drawings and specifications shall control and shall be followed. The Contractor shall be responsible for and shall check the correctness of all documents including those subcontractors prior to submitting them to the City for review.

F. The Contractor shall furnish prints of the favorably reviewed final shop drawings, erection drawings, equipment layouts and vendor data to subcontractors and suppliers for the proper coordination of their work. The Contractor shall keep one (1) complete set of the above documents at the job site for the use of the City.

G. After the completion of the project. and prior to final payment. submit:
1. One (1) copy of the Waste Manifest Records to the The City, if required in accordance with "Safety and
2. Environment" Requirements Article "HAZARDOUS SUBSTANCES".
3. The original and one (1) copy of all guarantee/warranty documents.

1.20 DRAWINGS AND SPECIFICATIONS

A. Drawings indicate approximate locations of the various items. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items on-the-job measurements in conformance with code and cooperation with other trades.

B. Before locating items, confer with the City as to desired location in the various areas. In no case items shall be located by scaling drawings. Contractor must relocate items and bear cost of redoing work or other trades' work necessitated by failure to comply with this requirement.

C. If electrical items are to be relocated within 10 feet of location shown on drawings and Contractor is informed before work is begun on this portion of the job, the relocation shall be at Contractor's expense. Drawings are schematic in nature and are not intended to show exact locations of conduit but rather to indicate distribution, circuitry, and control.

D. Standard Specifications: Standard Specifications such as ANSI, AASHO, AWWA, AISC, Commercial Standards, Federal Specifications, NEMA, UL, and the like incorporated in the requirements by reference shall be those of the latest edition at time of receiving bids, unless otherwise specified. The manufacturers, producers and their agents of required materials shall have such specifications available for reference and are fully familiar with their requirements as pertains to their product or material.

E. Contract Drawings and Specifications on the Job: contract drawings shall be kept on the job by the Contractor shall include at least one copy of Drawings and Specifications, all approved shop and erection drawings and schedules, lists of materials and equipment, as-built drawings, addenda and bulletins, documents relevant to the work. The list of Subcontract drawings is attached to these Specifications.

F. Maintain a complete, precise, accurate dimensioned record of actual locations of the work, including concealed and embedded work, size and type of equipment, and every change or deviation from original contract drawings at the site. Keep this record legible and correct weekly as the job progresses on black or blue-line prints. Keep Record Drawings available for inspection at all times. Drawings will be inspected before approval of requests for payment.

G. It shall be the responsibility of the Contractor to submit to the City within ten (10) days after final inspection, one complete marked-up set of contract drawings fully illustrating all revisions made by all the crafts in the course of the work. This shall include all field changes, adjustments, variances, substitutions and deletions, whether covered by Change Order or not. Underground utility installations must be located precisely as constructed on the marked-up drawings.

H. The Contractor shall not take advantage of any apparent error or omission in the plans or specifications, and the City shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications.

I. In addition to verifying at the site all measurements shown on the Drawings, Contractor shall consult the Drawings and Specifications of related work or existing construction that may in any manner affect the work of this contract. Contractor shall promptly report to the City, in writing, any errors, omissions, violations, or inconsistencies that may be discovered as a result of such verifications; otherwise, it shall be understood that Contractor accepts all such related data and conditions without reservations.

J. Layout of existing piping, conduits, and locations of equipment are shown as exactly as could be determined during design of the facilities; but their accuracy, particularly when such layouts and drawings are schematic, cannot be guaranteed. Contractor shall check all Specifications including the Drawings for possible interference with electrical, mechanical, and structural details, as well as interference with existing building or equipment, and shall notify the City of the interference for resolution of the interference before commencing work. Any completed work that interferes shall be corrected by Contractor at Contractor expense so that the original design can be followed.

1.21 OPERATION AND MAINTENANCE DATA

A. Submit data bound in *8-1/2* x 11 inch (A4) text pages, Use three D side rings if necessary and binders with durable plastic covers. Submit all documents in electronic form as well as in hardcopy. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

B. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 20-pound white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment (including assigned equipment numbers).
      c. A description of recommended replacement parts and materials, which the City should stock.
      d. Parts list for each component.
      e. A summary of equipment vendors, or location where replacement parts can be purchased.
      f. List indicating types and grades of oil and/or grease, packing materials, normal and abnormal tolerances for devices, and method of equipment adjustment.
      g. Copies of all approved submittals.
      h. Operating instructions.
      i. Maintenance instructions for equipment and systems, Preventive maintenance recommendations.
      j. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
      k. Manufacturer's wiring diagrams for electrically powered equipment.
      l. A complete set of record control drawings.
      m. Additional information as indicated in the technical specification sections
   3. Part 3: Project documents and certificates, including the following:
      a. Product data.
      b. Air and water balance reports.
      c. Certificates.

d. Photocopies of warranties.
e. Name, address, and telephone number of the person or office to contact for service during the warranty period.
f. Name, address, and telephone number of the person or service organization to be contacted for service after the warranty period.

C. Submit 1 draft copy of completed volumes 15 [fifteen] days after approval of applicable submittal or receipt of the product. Revise content of all document sets as required prior to final submission. Submit 2 [two] sets of revised final volumes, within 10 [ten] days after final inspection.

1.22 SAFEGUARDS - EXISTING EQUIPMENT, UNDERGROUND UTILITIES AND ARTIFACTS

A. Existing utilities, including those listed as abandoned, shall not be moved or otherwise disturbed without written verification by the City that the utility is abandoned.

B. When altering existing facilities, the Contractor shall take every precaution to preserve and protect existing facilities, both those to be altered and those to remain unaltered that are within the limits of the work.

C. The Contractor shall notify the City of structural members, piping, conduit, or equipment not indicated for removal that may cause interference with the work. Work shall not proceed in the affected area until instructions have been issued. Do not drill or penetrate existing structures without prior permission. The removal of existing work shall be by methods that will not jeopardize the integrity of structures or systems that are to remain.

D. Existing utilities, including but not limited to roof drainage systems, underground cables, ducts, roadways, manholes, building fire alarm, public address or telecommunications wiring shall not be moved or otherwise disturbed, nor electrical circuits or switches operated or taken in or out of service, without prior consent of the City. Contractor shall compensate loss to the City resulting from damage to utilities.

E. If bones or artifacts are encountered during digging, the City requires that the Contractor stop work within a 50-foot radius of the find and immediately notify the City. Work may continue only with approval from the City.

1.23 ACCESS PANELS AND DOORS

A. All serviceable and replaceable devices, including but not limited to valves, boxes, and dampers shall receive an access at a location and in a size that enables proper servicing and repair of the device without removal of other material. The sizes described below are minimum sizes and might be increased if the type and size of device requires it. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the City or designee making sure that access is available for all equipment and specialties. Relocate access panel or door if equipment is not properly accessible to perform all maintenance and repair at no cost to the City.

1.24 LAY-IN CEILINGS:

A. Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration are sufficient; no additional access provisions are required unless specifically indicated.

1.25 PLASTER WALLS AND CEILINGS:

A. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

1.26 SLEEVES AND OPENINGS

A. The Contractor requiring sleeved openings shall furnish and install all sleeves required for their penetrations. Contractors furnishing sleeves to others for installation shall do this in a timely manner so as not to impede the project schedule.

B. Openings that are required and are not shown on the structural and/or architectural drawings shall be the responsibility of the Contractor requiring the openings. The Contractor shall install sleeves for these openings or cut openings as needed (including floor openings within chases).

C. The Contractor shall be responsible for coordinating locations of their sleeves with work of other trades. The Contractor who requires sleeves and/or openings shall submit through the Contractor, to the City for review and approval, layout drawings of all such required sleeves and/or openings. Sleeve and opening layout drawings shall be received by the City a minimum of two weeks prior to installation of the sleeves and openings. Sleeve and opening sizes and locations shall be dimensioned from column lines and floor elevations or from a point of reference approved by the City.

D. Provide galvanized sheet metal sleeves for pipe and conduit penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

E. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 2 inches above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

F. For floor penetrations through existing floors in mechanical, food service areas, parking ramps, sanitary pumping stations, swimming pool equipment rooms, chemical storage and hazardous waste storage rooms and other wet locations or locations that can get wet by accident or failure of a component, core drill opening and provide a sleeve fastened to floor surrounding the penetration or group of penetrations to prevent water from entering the penetration. Top of sleeve shall be 4 inches above the adjacent floor. Provide urethane caulk between angles and floor and fasten angles to floor a minimum of 8" on center. Seal corners water tight with urethane caulk. Or, core drill sleeve openings large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement. Size sleeve to allow insulated pipe to pass through sleeve and paint the sleeve.

G. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.

1.27 LOOSE AND DETACHABLE PARTS

A. Contractor shall retain all loose and small detachable parts of apparatus and equipment furnished under this Contract, until completion of the work and shall turn them over to the City to receive them.

B. Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts".

1.28 STAIRS, SCAFFOLDS, HOISTS, ELEVATORS OR CRANES

A. The Contractor shall furnish and maintain equipment such as temporary stairs, fixed ladders, ramps, chutes, runways and the like as required for proper execution of work by all trades, and shall remove them on completion of the work. The Contractor shall erect permanent stair framing as soon as possible. Provide stairs with temporary treads, handrails, and shaft protection. Contractors requiring scaffolds shall make arrangements with the Contractor, or shall provide their own and remove them on completion of the work. The Contractor shall underlay its interior scaffolds with planking to prevent uprights from resting directly on the floor construction.

B. Contractor shall provide and pay for its own hoist/crane or other apparatus necessary for unloading/setting or moving their equipment and materials. Installation and removal of equipment for this activity must be accounted for in the Project Schedule. Equipment and operations for this activity shall comply with applicable Department of Commerce and OSHA requirements. No material hoist may be used to transport personnel unless it meets Department of Commerce and OSHA requirements for that purpose.

C. Existing elevators may be used on a limited basis with the City's permission and agreement. The Contractor will pay costs of warranty extensions and additional service work required. Appropriate protection must be provided by the using Contractor and that Contractor shall be responsible for any structural, mechanical or finish damage to the elevator and its parts and to adjoining building finishes and components.

PART 2 - PRODUCTS

2.1 SPECIFIED ITEMS – SUBSTITUTES

A. Wherever catalog numbers and specific or trade names are used in conjunction with a designated material, product, thing, or service mentioned in these Specifications, they are used to establish the standards of quality, utility, and appearance required. Substitutions, which are equal in quality, utility, and appearance to those specified, will be approved, subject to the following provisions:

B. All Substitutions must be accepted by the City Engineer or designee in writing. The City Engineer or designee will accept, in writing, such proposed Substitutions as are in his or her opinion, equal in quality, utility, and appearance to the items or materials specified. Such acceptance shall not relieve the Contractor from complying with the requirements of the drawings and specifications, and the Contractor shall be responsible at Contractor's own expense for any changes resulting from Contractor proposed substitutions which affect the other parts of Contractor's own work or the work of others.

C. The manufacturer shall be a company specializing in the manufacture of the specified equipment and accessories with minimum five years documented experience.

D. Failure of the Contractor to submit proposed substitutions for approval in the manner described above and within the time prescribed shall be sufficient cause for disapproval by the City Engineer or designee of any substitutions otherwise proposed.

2.2 APPROVED TESTING LABORATORIES

A. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
   1. Underwriters Laboratories Inc.
   2. Electrical Testing Laboratories, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and all code requirements. Provide the City or designee with copy of manufacturer's instructions prior to installation. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment to provide access space for servicing all components. Install in accordance with recognized industry practices. The manufacturer's latest recommendations at the time of bidding shall be used.

B. Startup and test equipment and adjust operating and safety controls for proper operation.

C. Contractor shall coordinate work with existing equipment so that all systems, equipment and other components will fit the available space, and will allow proper service and repair. Each location needs to be approved by the City or designee. This also applies to existing equipment if newly installed equipment interferes with its accessibility. Location of equipment has to fit into existing panels, decoration or finish. The City can request minor position changes of equipment before the work has begun.

D. The Contractor shall cooperate in reducing objectionable noise or vibration. If noise or vibration is a result of improper material or installation, these conditions shall be corrected at no cost to the City. Abnormal buzzing in equipment is not acceptable.

E. Carpentry, Cutting, Patching, and Core Drilling:
   1. Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in the scope of work. Do not cut, core, or drill structural members without consent of the City.

F. Waterproof Construction:
   1. Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashings at exterior roof penetrations. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes. Provide waterproof NEMA 3R enclosures for all equipment or devices mounted outside or otherwise exposed to the weather.

G. Workmanship:
   1. Install using procedures defined in NECA Standard of Installation and shall be conform with all codes and regulations. Materials and equipment of the types for which there are National Board of Fire Underwriters' Laboratories (UL) listing and label service shall be so labeled and shall be used by Contractor.

H. Modifications to existing construction and Alterations:
   1. Alter, extend and reconnect existing conduit as necessary. Reconnect existing conduits, which were reused, cut or exposed because of construction as quickly as possible. Where wiring is involved, new wires shall be "pulled in" between the nearest available accessible reused outlets to the extent allowed by the governing code. Furnish and install new conduits for wires if they cannot

be "pulled in" to existing conduits. All new conduits, wiring, and electrical items shall be connected to the existing systems so as to function as a complete unit. Where existing electrical equipment, devices, fixtures, electrically operated items, etc., interfere with any remodeling work, they shall be removed and reinstalled in another location to avoid such interferences. All existing and relocated equipment shall be left in good operating condition. Include in bid removal from service of existing electrical material and equipment as specified hereinafter, as noted on the drawings, or as needed by field conditions.

I. Painting of Equipment and Hardware:
   1. Provide moisture resistant paint for all exterior painting. Colors shall be as shown on the drawings unless specified.
   2. Refer to individual Sections and construction drawings for painting requirements. All exposed conduits, raceways and gutters inside and outside the building shall be painted to match the wall color.

3.2 DELIVERY, STORAGE AND HANDLING OF MATERIALS

A. Contractor or the Contractor's authorized representative must be present to accept delivery of all equipment and material shipments. The City will not knowingly accept, unload or store anything delivered to the site for the Contractor's use. Inadvertent acceptance of delivered items by any or employee of the City shall not constitute acceptance or responsibility for any of the materials or equipment. It is the Contractor's responsibility to assume liability for equipment or material delivered to the job site.

B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays. Materials and equipment shall be delivered to the site in adequate time to ensure uninterrupted progress of the work and inspection of material by the City. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Care shall be taken to prevent damage to materials and equipment during loading, transporting and unloading. Packaged materials and equipment shall be delivered to the site in original, undamaged containers bearing manufacturer's name, with seals unbroken. Packaged units shall be delivered in their original crates. Store in a clean and dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic. Promptly inspect shipments to insure that the material is undamaged and complies with specifications. Materials or equipment, which do not conform to the Specifications or are damaged shall not be incorporated in the work and shall be immediately removed from the site.

C. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

D. Contractor shall confine equipment, apparatus, storage of materials and operations to limits indicated on the drawings or by specific direction of the City. The storage of materials on the grounds and within the building shall be in strict accordance with the instructions of the City. Storage of materials within the building shall at no time exceed the design carrying capacity of the structural system. The City assumes no responsibility for materials stored in building or on the site. The Contractor assumes full responsibility for damage due to the storage of materials. Repairing of areas used for placing of sheds, offices, and for storage of materials shall be done by the Contractor.

E. Material shall be stored according to manufacturer's recommendations as a minimum. Provide and maintain watertight storage sheds on the premises where directed, for storage of materials that might be damaged by weather. Sheds shall have wood floors raised at least 6" above the ground. Materials, construction sheds, and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing lines. Should it be necessary at any time to move material sheds or storage platforms, the Contractor shall move it at the Contractor's expense, when directed by the City. All

materials affected by moisture shall be stored on platforms and protected from the weather. In addition, material must be stored in a location protected from vandalism and weather. If material is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If necessary, material will be stored off site at the Contractor's expense. Offsite storage agreements will not relieve the Contractor from using proper storage techniques. Storage and protection methods must allow inspection to verify products.

F. All materials shall be stored in a manner that prevents release of hazardous material to the environment. All hazardous materials, including motor fuels, shall be properly handled and contained to prevent spills or other releases. The Contractor shall develop and maintain a contingency plan to provide emergency response, containment, and cleanup of spills of hazardous materials resulting from contract activities. All spills and releases shall be reported to the City as soon as possible. Please note that the Standard Specifications Section 107 A(f) must be followed and overrides any provision in these specifications.

G. Cover pipes and ducts to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, duct, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

H. Store windows and doors in upright position, off ground, under cover and protected from sunlight, weather and construction activities.

3.3 DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. Demolition Drawings are based on casual field observation and/or existing record documents. Verify field measurements and circuiting arrangements as shown on Drawings, verify that abandoned wiring, piping, ducting and equipment serve only abandoned facilities. Report discrepancies to the City before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

B. Before demolition of any load bearing concrete, a ground-penetrating radar or concrete X-ray scan needs to be performed to detect any rebar. This work shall be performed at least a week before demolition starts to give *A/E* the opportunity to resolve any issues by rebar or other obstacles in unexpected locations. Drawings with existing subsurface obstacles may not be correct and shall not be relied on.

C. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the City to minimize disruption to the existing building occupants.

D. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the City. Verify whether or not PCB ballasts exist in light fixtures, which will be disposed of. If PCB light fixture ballasts exist, then follow requirements in other sections related to electrical work.

E. Patch holes and openings caused by removal of material and equipment, or formerly covered by such, with like material and texture of surrounding surface. Painting is not necessary unless noted otherwise.

F. Approval of all legal institutions shall be obtained prior to disposal of any equipment and materials. All disposal has to be in compliance with all local, county, state and nationwide regulations. All disconnected wiring shall be removed from all raceway systems, panels, enclosures pull boxes, junction boxes etc.

irrespective of whether the removal is specified in the construction documents or not. The empty raceway systems shall be tagged spare on both ends of each termination. .

G. Don't demolition equipment and material that is to stay in place. Replace and repair any equipment and installations that get damaged during demolition.

3.4 CUTTING, PATCHING AND PAINTING

A. Cutting and patching required to access work in existing walls, in chases, above inaccessible ceilings, below floors, etc., shall be by the Contractor who requires the access, unless shown on the bid documents otherwise or noted otherwise.

B. The Contractor shall do all cutting, or fitting of the work as required to make its several parts fit together, or to receive the work of others, as shown or reasonably implied by the drawings or specifications, or as may be directed by the City. Holes cut in exterior walls and/or roofs shall be waterproofed.

C. The Contractor who cuts shall also be responsible for patching. Where cutting and patching is required, the Contractor shall hire individuals skilled in such work to do cutting and patching. The Contractor who removes or relocates building components which leaves a remaining opening shall be responsible for patching the opening.

D. Patching includes repairing openings to match adjacent construction and painting the surface to match existing surface including texture.

E. Painting means covering the entire wall where patching is to be done to nearest break point or corner unless indicated to be done by other trades. All paining will require patching. This includes all painting included in other sections.

F. Contractor shall not endanger any work by cutting, digging or otherwise and shall not cut or alter the work of others without their consent.

G. Do not pierce beams or columns without permission of the City and then only as directed in writing. If any ductwork, piping, conduit, etc. is required through walls or floors where no sleeve has been provided, use a core drill or saw cut to prevent damage and structural weakening.

H. Wherever any material, finish, or equipment, is damaged, the skilled trade shall accomplish the repair or replacement, in that particular work and the cost shall be charged to the party responsible for the damage. The City reserves the right to disallow any means *and/or* methods that, in the opinion of the City, are harmful to and/or not in the best interest of preserving the improvements receiving the work.

3.5 CONCRETE WORK

A. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support or installation of electrical, mechanical, plumbing piping, fixtures, specialties and equipment. This includes but is not limited to piping thrust restraints, pipe supports, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with other trades.

B. Unless noted otherwise provide cast in place concrete for equipment pads, manhole bases and thrust blocks. Concrete to be 3,000 psi at 28 days, *3/4* inch aggregate, five bags cement, three inch slump, air entraining admixture. The ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete shall constitute the execution requirements.

3.6 EXCAVATION, BACKFILL, AND SURFACE RESTORATION

A. The Contractor shall take all measures necessary to become acquainted with the location of underground service, utilities, structures, etc., which may be encountered or be affected by the Contractor's work, and shall be responsible for damage caused by neglect to provide proper precautions or protection. As a minimum to become acquainted with such underground appurtenances, the Contractor shall: 1) Observe existing conditions visible at the site immediately prior to commencement of work; 2) Review available site plans incorporated in the contract documents *and/or* provided by the City; 3) Final check with the City for additions to or changes from conditions indicated on site plans for the facility.

B. Before excavation in areas with utilities nearby, a ground-penetrating radar or ground radar scan needs to be performed to detect any subsurface obstacles. This work shall be performed at least a week before demolition starts to give A/E the opportunity to resolve any issues by utilities or other obstacles in unexpected locations. Drawings with existing utilities may not be correct and shall not be relied on.

C. Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap. Existing pipes, electrical work, and all other utilities encountered, which may interfere with new work, shall be re-routed, capped, cut off, or replaced by the Contractor.

D. Perform all excavation and backfill work necessary to accomplish indicated systems installation. Excavate to below bottom of pipe and structure bedding (4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil). Finish bottoms of excavations to true, level surface. Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure there is no disturbance of bearing soil. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

E. Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the City Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of ½ cubic yard or more in volume. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping. Bedding up to a point 12" inches above the top of a pipe or conduit shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand

Sieve Size	% Passing (by Wt)
1 inch	100
No. 16	45-80
No. 200	2-10

Gradation for Crushed Stone Chip Bedding

Sieve Size	% Passing (by Wt)
½ inch	100
No. 4	75-100
No. 100	10-25

F. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the City Engineer, maintained in place until other permanent support approved by the City Engineer is provided.

G. Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed by the work and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.

H. Strip topsoil from area to be excavated, free from subsoil and debris, and store separately for later re-spreading. No topsoil shall be removed from site and all topsoil is property of the City. Remove surplus excavated non-topsoil materials from site and dispose properly.

I. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

J. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

K. Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.

L. Three days before backfilling, the City shall be notified so that the City Surveyor can obtain the three-dimensional coordinates of all buried utilities. Buried utilities including the pipeline and any other utilities exposed during construction shall not be covered with backfill without the prior approval of the City. Coordination of this survey requirement is the responsibility of the Contractor. Surveyors will be provided by the when scheduled. The cost for delay or dig-up related to the Contractor's failure to schedule the utility survey shall be paid by the Contractor. Alternately, the Contractor shall install reference points consisting of nail and hub/flagging at all changes in grade or alignment of the new pipeline and for all other utilities exposed by the excavation. The Contractor shall keep a separate written record referenced to each point with the following information:
   1. Offset and depth to top and centerline of utility, accurate to 0.1 feet
   2. Type of utility (i.e. gas, water, etc.)
   3. Size of utility (i.e. 2", 4", 16" wide duct, etc.)
   4. Type of material of utility (i.e. cast iron, PVC, etc.)
   5. Identification tape shall be installed 12': above the buried utility crown. The identification tape shall be continuous for the entire length of utility. Before backfilling for buried utilities over identification tape, the City construction inspector will verify that identification tape has been installed.

M. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM 0-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

N. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.

O. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

P. Completely restore the surface of all disturbed areas as described below to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment. Topsoil shall be spread upon order from the City, typically right before any planting to avoid disturbance of topsoil by construction activities.

Q. Lawns: Topsoil with 4" of clean, friable, fertile topsoil conforming to D.O.T. Section 625, free from debris, lumps, rocks, roots, plants and seeds. Grade surfaces to match adjacent elevations. Rake smooth, free of lumps and debris. Sod with good quality nursery sod conforming to D.O.T. Section 631, be uniform, dense, free from weeds and consist of approximately 60% Kentucky blue grass and the balance perennial rye, fescue and white clover. Place sod with joints staggered and abutting. Maintain lawn areas for one month after installation. Department will be responsible for necessary watering and mowing. Contractor needs to inform Department about watering needs. Do necessary weeding, repair, reseeding or resodding until uniform catch is obtained.

R. Curb and Gutter: Concrete curb and gutter conforming to the City requirements and D.O.T. Section 601, Type 0 or L.

S. Sidewalk and Walkways: Non-reinforced concrete conforming to D.O.T. Section 602, thickness to match existing, cross slope of one-fourth inch per foot, scored into squares approximately equal to width.

T. Bituminous Concrete Pavements: 4" thick crushed stone base course conforming to D.O.T. Section 304 (excluding 304.2.4) and two pass bituminous concrete pavement conforming to D.O.T. Section 407, first course 1-1/2" binder, second course 1-1/2" surface.

3.7 DEWATERING

A. Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

B. Temporary pumps required for pumping water from building excavation or from building proper shall be provided by the Contractor, including temporary connections. Permanent sump pumps shall not be installed until building is substantially complete and when approved by the City. The Contractor shall remove temporary pumps and connections when approved by the City.

3.8 SEALING AND FIRESTOPPING

A. The Contractor penetrating a waliffloor/ceiling is responsible for sealing this opening to the same rating as the wall/floor/ceiling is rated. All walls, floors and ceilings are considered to have a 1 hour rating at minimum unless a higher rating is determined. This also applies to walls, floor and ceilings that are not rated.

B. Sealing and firestopping of sleeves/openings between conduits, cable trays, wire ways, troughs, cable-bus, bus-duct, pipes, ducts etc. and the structural or partition opening shall be the responsibility of the Contractor whose work penetrates the opening. The Contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

3.9 FIRE AND/OR SMOKE RATED PENETRATIONS:

A. Install approved product in accordance with the manufacturer's instructions where an installation penetrates a fire/smoke rated surface. When pipe is insulated, use a product, which maintains the integrity of the insulation and vapor barrier.

B. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support substantial weight.

C. Whenever possible, avoid penetrations of fire and smoke rated partitions. When they cannot be avoided, verify that sufficient space is available for the penetration to be effectively fire and smoke stopped. All firestopping systems shall be by the same manufacturer. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce. The Contractor will be responsible for selecting the appropriate UL tested fire stop system for each application required on the project and will submit this to the City or designee for review. Each firestop manufacturer has specific details for different applications they have tested.

D. Manufacturers: 3M, STIISpecSeal, Tremco, Hilti or approved equal.

E. Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

F. Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

3.10 NON-RATED PENETRATIONS:

A. Conduit Penetrations Through Below Grade Walls:
   1. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.

B. Conduit and Cable Tray Penetrations:
   1. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core-drilled opening.

C. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.

D. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

3.11 CLEANING

A. The Contractor shall clean up and remove from the premises, on a daily basis accumulation of surplus materials, rubbish, debris and scrap and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

B. All installed items shall be cleaned at time of installation, and all lens exteriors shall be cleaned just prior to final inspection. Equipment shall be thoroughly cleaned of all stains, paint, spots, dirt and dust. All temporary labels not used for instruction or operation shall be removed. Dust, dirt and other foreign matter shall be removed completely from all internal surfaces of all mechanical and electrical units, cabinets, ducts, pipes, etc. Dirt, soil, fingerprints, stains and the like, shall be completely removed from all exposed finished surfaces.

C. Contractor shall wash all glass immediately prior to the occupancy of this project. Work shall include the removal of labels, paint splattering, glazing compound and sealant. Surfaces shall include mirrors and both sides of all glass in windows, borrowed lights, partitions, doors and sidelights. In addition to the above, the Contractor shall be responsible for the general "broom" cleaning of the premises and for expediting all of the cleaning, washing, waxing and polishing required within the technical sections of the specifications governing work under this Contract.

D. The Contractor shall also perform "final" cleaning of all exposed surfaces to remove all foreign matter, spots, soil, construction dust, etc., so as to put the project in a complete and finished condition ready for acceptance and use intended.

E. If rubbish and debris is not removed, or if surfaces are not cleaned as specified above, the City reserves the right to have said work done by others and the related cost(s) will be deducted from monies due the Contractor.

3.12 CONTINUITY OF SERVICE AND SHUTDOWN

A. Contractor shall provide and maintain continuous service (power, controls, alarms, communication, elevators, HVAC, roads etc.) during the entire construction period. No outages shall be permitted on existing systems except at the time and during the interval specified by the City. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines and might be scheduled during after-hours if regular business hours are not acceptable to the City. No extra costs will be paid to the Contractor for such outages, which must occur outside of regular weekly working hours. Cost to the utility is paid by Contractor. The Contractor shall provide temporary utility services and bypasses for any disruptions not completed within this period. The Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

B. If the building is occupied and continues operation during construction, retrofit or demolition, Contractor must maintain ventilation and air conditioning for as large parts of the building as technically feasible. Spreading of dirt, dust and other construction related material must be kept to a minimum. Occupied and work areas must be separated by seals. All work affecting air conditioning and ventilation must be coordinated with the daily work in the building and approved by the supervisor or department head at the building. If air conditioning, heating and ventilation has to be taken out of service for longer periods of time in parts of the building and work would be affected negatively, the Contractor shall provide temporary sufficient air conditioning, heating and ventilation in coordination with the department. All such taking out of service has to be coordinated and approved by the supervisor or department head at the building.

C. If the shutdown involves the interface with, or modification of, existing building energy system(s), the Contractor shall be required to show the reviewed submittal and shop drawings of the proposed modifications. Shutdown schedules shall have been reviewed and approved by the City at least 72 hours

prior to date of shutdown. Postponement by the City of scheduled shutdowns shall not constitute a basis for additional charges to the City.

D. Prior to the shutdown of any building energy system(s) the Contractor shall provide the following:
   1. Proof of receipt of all materials required for the shutdown or a written commitment from the responsible suppliers that the required materials will be available at the time of the shutdown.
   2. A list of the qualified Contractor personnel assigned to perform the work.
   3. Analysis of any affect on the utility or building energy system(s) and the estimated duration of the shutdown.
   4. Work plan for the shutdown
   5. A twenty-four-hour emergency callback phone number to be used by the City in the event of any problems or concerns with the modifications made to the building system(s) after the Contractor has left the site.

E. The startup of electrical and mechanical utility systems constructed by Contractor shall be performed by Contractor in coordination with the City.

3.13 PROJECT MEETINGS

A. Project meetings will be held at the time designated by the City. If the principal of the firm does not attend meetings, a responsible representative of the Contractor who can bind the Contractor to a decision at the meetings shall attend.

B. During construction, weekly project meetings may be held at the discretion of the City. The minutes of these meetings will be prepared by the Contractor and one copy issued as expeditiously as possible to the each party involved in the project. The Contractor will submit, in writing, questions and/or answers (previously obtained verbally) to be confirmed at each meeting.

3.14 TEMPORARY CONSTRUCTION

A. Temporary construction shall conform to all requirements and laws of state and local authorities, which pertain to operation, safety, and fire hazards. Contractor shall furnish and install all items necessary for conformance with such requirements, whether called for under separate sections of these Specifications or not. Contractor shall provide, maintain, and remove upon completion of his work:
   1. Temporary crossovers and bypass to utilities, electrical connections, traffic and footbridges, and walkways used to maintain services or communications, which cannot be interrupted or curtailed.
   2. Temporary rigging, scaffolding, shoring, hoisting equipment, and all other temporary work as required for this project.
   3. Temporary barricades around openings and excavations for this project.

B. Temporary lighting, if necessary during the period of construction, shall be supplied and maintained by the Contractor at Contractor expense so that construction work can be safely performed. The temporary lighting system shall be sufficient to enable all trades to safely complete their work and to enable the City to check all work as it is being done. Illumination shall be 5 foot-candles minimum in all areas and, in addition, shall meet or exceed the requirements of 29 CFR 1926.56 Illumination (OSHA regulations). In accordance with the latest issue of the National Electrical Code, all temporary electrical circuits for construction purposes shall be equipped with combination ground fault interrupter and circuit breakers meeting the requirements of UL for Class A, Group 1 devices. The ground fault interrupter portion shall be solid-state type, insulated and isolated from the breaker mechanism. A test button shall be provided for checking the device. The breaker mechanism shall provide overload and short circuit protection and shall be operated by a toggle switch with over center switching mechanism so that contact cannot be held closed.

3.15 TEMPORARY HEAT

A. All heating required after enclosure of the building shall be classified as TEMPORARY HEAT and be provided by the Contractor. It shall be the responsibility of the Contractor to see that every precaution is used to prevent unnecessary escape of heat. The Contractor shall provide and pay for temporary heat. A minimum temperature of 45 degrees and a maximum temperature of 65 degrees for the building shall be maintained, except for a period of at least ten days prior to the placing of interior woodwork and throughout the placing of this and other finish, varnishing, painting, tiling etc., and until substantial completion to provide sufficient heat to insure a temperature in the spaces involved of not less than 70 degrees nor more than 80 degrees. Temperatures must be checked during nighttime and on weekends. Restitution shall be made by Contractor responsible for damage to building and contents caused by overheating, freezing, fumes, soot or residue given off by temporary heating or lack of thereof.

B. Permanent heating system may be used for temporary heating. Warranty period may not be affected by use of permanent heating. If permanent system is used, the Heating Trade shall install in their permanent location heating coils or connectors as approved by the City, with controls to maintain temperatures required. Temporary filters shall be used in the permanent system. Provide bases, shields, etc., around heating elements to prevent too rapid drying of adjacent concrete, masonry or plaster. Relocation of some of the permanent heating system equipment may be required during construction to prevent interference with new construction. Temporary units may be installed in such areas during the time permanent equipment is not operating due to relocation. The temporary heating system shall be removed after the permanent heating system has been installed and is operating. Surfaces and structure shall be patched as required. Temporary heating equipment shall be relocated by the Heating Trade as required during construction to prevent interference with new construction.

C. The use of temporary units whose product of combustion will damage fresh concrete, mortar or other building materials, will not be allowed. Use of coke or oil salamanders is prohibited. All portable temporary heating units shall be properly ventilated to prevent combustion gases from remaining in the heating area. If electrical power is required for oil or gas portable heating units, it may be taken from the available temporary power source and paid for by the Contractor. Heating units and the area surrounding the units shall be kept in a clean and safe condition.

3.16 TEMPORARY ELECTRICAL SERVICE

A. The Contractor shall make all arrangements with the local utility company for metered electrical service, pay for the installation of all temporary service to utility point of termination shown on drawings, and upon completion of project, pay for removal of temporary service. The Contractor shall patch surfaces and structure after services have been removed. The Contractor shall pay for all electrical energy consumed for construction purposes for all trades including temporary offices, for operation of ventilating equipment, for heating of building, and for testing and operating of all equipment. The Contractor shall continue to pay for energy used until substantial completion even though equipment has been connected to the permanent wiring.

B. Contractor shall provide and maintain 200 ampere electrical services in single phase or multi phase as required by equipment to be used. Provide at multiple services to ensure service to run at less than 75% of its capacity at all times and to enable short cable runs of less than 300 ft to equipment to be used.

C. The Contractor shall provide meter base and wiring to point of utility termination, provide main fused service switch, and fused or breaker distribution panel(s). The Contractor shall also provide, at no cost to others, all lamps, wiring, switches, sockets and similar equipment required for temporary system until substantial completion. Upon completion of the project, the Contractor shall remove the temporary system.

D. After Substantial Completion of the permanent electrical system and building wiring, permanent receptacles may be used during finishing work. Permanent wiring for lighting fixtures, switches and receptacles shall be installed only after all masonry and plastering has been completed, but this wiring shall not be used for motors larger than fractional HP or for welding equipment. Circuits for larger motors and welding equipment may be provided with special circuits to mains of electrical panels at the expense of those trades requiring them, provided that special permission is obtained from the City and the installation is made by skilled electricians.

E. All temporary wiring and electrical installations shall be in accordance with applicable codes. Any power outage occasioned by tying into the existing electrical system for temporary or permanent use shall be coordinated with the City. The City does not guarantee the quantities or quality of power or water available for Contractor's use, nor will it be responsible in any manner for interruptions in service or for the effects of interruptions.

F. All Trades shall furnish their extension cords and lamps other than those furnished for general lighting. All Trades and other separate Contractors shall be allowed to use the service provided for general lighting and fractional horsepower hand tools at no cost.

G. If a Contractor contemplates the use of equipment that requires a different voltage or greater capacity than that specified, then that Contractor must arrange with Utility for this additional service and pay for installation of the service and the necessary additional switches and wiring required. The meter shall be taken out in the Contractor's name.

3.17 TEMPORARY WATER, SEWER AND PUMPS

A. The Contractor shall supply all water required for construction and other purposes until the permanent water supply system is accepted and in operation. As soon as possible Contractor shall install and pay for permanent water mains into new building, provide temporary gate valve and freezing protection, extend piping and provide a 'X" hose bib for use by all Contractors. Permanent lines maybe used.

B. Waste of water shall be avoided and valves, connections, pumps pipes and hoses shall be provided by Contractor kept in perfect condition.

C. Sewer work shall be started and finished as soon as possible. Including backfill.

D. Water supply used by workmen shall be kept clean and sanitary at all times.

3.18 TOILETS

A. The Contractor shall provide and maintain sanitary temporary toilets, located where directed by the City, in sufficient number required for the force employed. The toilets shall comply with International Building Code Chapter 29 on Plumbing Systems. Toilets shall be self-contained chemical type.

B. As soon as conditions will allow, the Plumbing Trade shall provide temporary toilets within the building, where directed, and equip the room with at least two temporary water closets and one temporary lavatory, each with connections to cold water and sanitary sewer. The Contractor shall provide a temporary wood enclosure with doors; remove when directed. After directed by the City, the Plumber shall remove the temporary fixtures and replace them with permanent fixtures. After temporary toilet accommodations are provided within the building, the Contractor shall remove the temporary outside toilets.

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

3.19 FIELD OFFICES

A. The Contractor shall provide, maintain and remove upon completion a temporary watertight office where directed for use by the Contractor and Trades. The office shall be equipped with a plan rack, a suitable table for examination of plans and shall have adequate equipment for document files and space for job meetings. Exterior of offices shall be of neat appearance, and if deemed necessary by the City, shall be painted to achieve such appearance; heat offices during cold weather; provide each office with at least one glazed movable window and one door with a cylinder lock and latch set. Provide and maintain artificial light, minimum of 40 foot-candles, and two duplex outlets where directed. When directed, move the office into a suitable area in the building.

3.20 IDENTIFICATION

A. Identify all equipment by stenciling (not less than 1 inch high letters/numbers) with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Where stenciling is not appropriate for equipment identification, engraved name plates may be used (White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady)

B. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Label all pipes with name of loop and arrows for flow direction with permanent label. Label all gauges. Use one coat of black enamel against a light background or white enamel against a dark background.

C. Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

D. Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

E. Provide all buried utilities, conduit and pipes with detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape.
   1. Manufacturers: Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton.

F. All underground non-metallic sewers/mains and water services/mains shall be provided with tracer wire installations. Tracer wire installations shall conform with Section 182.0715(2r) of Wisconsin Statutes and prevailing Department of Commerce Chapter 84 requirements. Tracer wire shall be continuous solid copper or steel plastic coated with split bolt or compression-type connectors.

G. SNAP-AROUND PIPE MARKERS:

1. One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, %" min. size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

H. VALVE TAGS:

1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem, available from EM ED Co., Seton Name Plate Company, or W. H. Brady.

3.21 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the City. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.22 PUNCH LIST

A. Contractor's supervisor at site shall acknowledge receipt of punch list.

B. Multiple punch lists can be submitted.

C. If Contractor fails to perform required corrective work in less than 30 days upon receipt of punch list by Contractor, the City can perform corrections himself and charge the Contractor.

D. Contractor shall advice the City or designee that the necessary work has been performed. If the City or designee verify if punch list items were not resolved and the work was not performed in less than 30 days upon receipt of punch list by Contractor, the Contractor shall be required to compensate the designee for additional site visits at a rate of $100/hour plus mileage with the amount paid to the City or designee prior to processing the final payment.

3.23 CLOSEOUT PROCEDURES

A. Substantial Completion:

1. Proceed as follows when Contractor considers the Work to be Substantially Complete:
    a. Submit written notice to the A/E with list of items to be completed or corrected.
    b. Within a reasonable time, the A/E and owner will inspect to determine status of completion.
    c. Should *A/E* determine that Work is not substantially complete, he will promptly notify Contractor in writing, giving the reasons therefore.
    d. Contractor shall remedy deficiencies, and send a second written notice of substantial completion, and *A/E* and Owner will reinspect the Work.
    e. When *A/E* determines that Work is substantially complete, he will prepare a Certificate of Substantial Completion in accordance with the General Conditions.

B. Final Completion:

1. *A/E* will consider Closeout Submittals within 10 days after date of Substantial Completion of the whole Work.
2. When Contractor considers Work is complete, he shall submit written certification that:
3. Contract Documents have been reviewed.
4. Work has been inspected for compliance with Contract Documents.

5. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificates of Substantial Completion have been corrected.
6. Equipment and systems have been tested in presence of Owner's representative and are operational.
7. Work is complete and ready for final inspection.

C. Closeout Submittals:
1. Comply with the Proposal, Contract, Bond, and Specification documents, prepared by The City of Madison and the following Closeout procedures.
2. Evidence of compliance with requirements of governing authorities:
   a. Certificates of Inspection.
   b. Affidavit of Compliance With Prevailing Wage Rate Determination, if applicable (See Section 01235).
3. Project Record Documents: In accordance with 01782 - Project Record Documents.
4. Operation and Maintenance Data, Instructions to Owner's Personnel: In accordance with 01784 - Operating and Maintenance Data.
5. Warranties and Bonds: In accordance with 01786 - Warranties and Bonds.
6. Evidence of Payment of Debts and Claims and Release of Liens: Utilize AIA Documents G706 and G706A.
7. Consent of Surety to Final Payment: Utilize AIA Document G707.
8. Certificates of Insurance for Products and Completed Operations:
9. The Application for Final Payment:
   a. In accordance with the Proposal, Contract, Bond, and Specification documents, prepared by The City of Madison.

3.24 PROJECT RECORD DOCUMENTS

A. Maintain at the site for the Owner, one record copy of:
1. Drawings, Project Manual, and Addenda.
2. Required State approved Documents.
3. Construction schedule.
4. Change Orders and other modifications to the Contract.
5. *A/E* field orders or written instructions.
6. Approved Shop Drawings, product data and samples.
7. Field test records.

B. Maintain documents in a clean, dry, legible condition, and in good order. Do not use record documents for construction purposes.

C. Label record documents "PROJECT RECORD" in neat, large printed letters.

D. Record information concurrently with construction progress.

E. Do not conceal any work until required information is recorded.

F. Drawings; Legibly mark to record actual construction:
1. Field changes of dimension and detail.
2. Changes made by Field Order or Change Order.
3. Details not on original Contract Drawings.

G. Specifications and Addenda; Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

H. At Contract Closeout, deliver Record Documents to A/E for the Owner.

3.25 TESTS AND FINAL ACCEPTANCE

A. The complete installation consisting of the several parts and systems and all equipment installed according to the requirements of the Contract Documents, shall be ready in all respects for use by the City and shall be subjected to a test at full operating conditions and pressures for normal conditions of use.

B. Proper notice has to be given to enable the City or designee to attend all tests. Failure to give proper notice can result in repeated tests to be paid for by the Contractor. Tests are acceptable on properly working equipment only and have to be repeated as often as required by the City at no cost to the City. If tests have to be repeated by an City-hired Contractor due to equipment not installed or working properly, the Contractor shall reimburse the City for additional testing expenses.

C. Contractor shall make all necessary adjustments and replacements affecting the work, which is necessary to fulfill the City's requirements and to comply with the directions and recommendations of the manufacturer of the several pieces of equipment, and to comply with all codes and regulations, which may apply to the entire installation. Contractor shall also make all required adjustments to comply with all provisions of the drawings and specifications.

D. Prior to acceptance, all elements of operating equipment, including those of mechanical nature and those that slide, swing, turn, or are intended to move in any way and those of an electrical nature, shall be given an operating test to assure to the satisfaction of the City that such equipment operates as required. Contractor shall make all adjustments, replacements, and such other modifications as needed. If it is necessary to run equipment in order to complete the work, for periods that exceed the manufacturer's recommended maintenance interval, the Contractor will provide such required maintenance at no additional cost to the City.

E. Notice that the work is ready for final inspection and acceptance shall consist of a written notice issued to the City by the Contractor stating that the Contractor has carefully inspected all portions of the work, has reviewed in detail the drawings and specifications, and that to the best of the Contractor's knowledge all conditions of the contract documents have been fulfilled. Upon receipt of this notice, the City and the Contractor shall make a joint inspection of the work. After deficiencies, if any, have been corrected or accounted for, and after all work is satisfactorily complete, the City will accept the work; and Notice of Completion will be filed by the City.

F. Prior to final acceptance, filing of the Notice of Completion or processing of final payment, the following shall be done and submitted reviewed and accepted by the City:
1. Certificates of compliance and guarantees required under various Sections
2. Operating and maintenance manuals
3. Instruction to City personnel, as required
4. Test reports (TAB, fire alarm, elevator etc.)
5. Certifications and registrations (boiler etc.)
6. All keys
7. Replacement material as required in specifications
8. All required operations tests
9. All documents required by commissioning and other project related documents
10. Satisfy all commissioning requirements
11. As -built documents
12. All punch list items resolved
13. All training provided (except deferred seasonal training)
14. All warranty issues brought to Contractor's attention so far resolved
15. Warranty documents signed by representative of manufacturer, guarantee documents, roofing agreement and other warranty related documents

G. No official closeout and final payment will be made before all requirements are met.

3.26 TRAINING AND DEMONSTRATION

A. The City's facility staff (and occupants and service Contractors as needed), shall receive orientation and training on features, systems and equipment in this facility requisite with the complexity and criticality of the system and the City's needs.

B. Additional training requirements may be found in specific equipment sections. The City may videotape all training sessions.

C. Only training on equipment that works as designed is acceptable.

D. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed on all equipment per the Specifications. Unless otherwise required or approved, the training shall be given during regular business hours during a regular work week.

E. The City or designee will be responsible for coordinating and approving the content and adequacy of the training of the City personnel for commissioned equipment. The City or designee will develop an overall training plan after meeting with the City and appropriate facility staff to determine needs and areas of emphasis for this project. The City or designee will develop criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The City or designee recommends approval of the training to the City.

F. Training shall consist of, as needed and at the discretion of the City or designee, the installing technician, installing Contractor and the appropriate trade or manufacturer's representative on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment as installed in this project is required. More than one party will be required to execute the training on primary equipment. The Contractor shall attend and present at sessions in addition to the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

G. Follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Training Shall Include the Following:
   1. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
   2. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, and special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover, as applicable, and any emergency procedures.
   3. Discussion of relevant health and safety issues and concerns.
   4. Discussion of warranties and guarantees.
   5. Common troubleshooting and maintenance issues, problems and solutions.
   6. Explanatory information included in the O&M manuals and the location of all related plans and manuals in the facility.
   7. Discussion of any peculiarities of equipment installation or operation.
   8. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1 is recommended, as applicable.
   9. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
   10. Training shall occur after functional testing and piping and equipment labeling are complete unless approved otherwise by the City.

H. Testing Adjusting and Balancing: The Contractor shall have the following special training responsibilities relative to the testing, adjusting and balancing (TAB) work:
   1. The TAB technician shall meet with facility staff after completion of TAB and instruct them on the following:
      a. Go over the final TAB report, explaining the layout and meanings of each data type.
      b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
      c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
      d. Discuss any temporary settings and steps to finalize them for any City-furnished, City-installed equipment.
      e. Other salient information that may be useful for facility operations, relative to TAB.

3.27 ROADWAY

A. The Contractor may build a temporary roadway for delivery of materials at the Contractor's own expense and maintain it until completion of construction or until service drives are installed. Where possible, build temporary roadway within the confines of the new roadway and allow others to use it at no cost. Any gravel topping used for temporary roadway shall be at least 6" below finished elevation of permanent drives. If temporary roadway is not intended to be converted to a permanent road, all road materials shall be removed upon termination of access need, and the confines of the temporary roadway shall be repaired to match adjacent area.

3.28 FENCE

A. The Contractor shall provide a neat appearing protective fence where indicated on the drawing, constructed of standard studded T-Posts of sufficient length for line posts and spaced not to exceed 8'-0" apart. Corner posts and gate posts are to be galvanized steel pipe of not less than 2 *1/2"* o.d. and shall be properly braced. A 4-foot high wooden snow fence shall be securely fastened to the supports. Plastic fencing is not acceptable. The snow fence shall project 4" above the fence posts. Provide gates, properly constructed and braced, complete with hinges, hasps, and padlocks in number and location required for proper control, delivery and distribution of material and equipment. Gateposts shall be adequately back tied and anchored to insure a rigid installation. All protective fencing shall be maintained in an upright, orderly fashion throughout the construction schedule. In areas where existing trees are to be protected, the area inside the protective fencing shall not be used for any purpose related to construction activities, such as material storage, vehicle parking, portable toilets, or other disruptive activities that would result in damage of any kind to the site inside the fence.

3.29 SIGNS

A. Contractor shall furnish and install signs, located as directed by the City. The signs shall be readily legible to the general public, subcontractors, material men, and truck drivers approaching the site and shall include the following information:
   1. Project.
   2. Subcontract No.
   3. Subcontractor Name.
   4. Access to Buildings: Contractor shall keep access to existing buildings clear at all times.

B. The Contractor shall order, paint and erect the sign. The sign shall be placed on the property where directed and shall be maintained for the duration of the construction period.

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

End of Section 010002

SECTION 01 00 03 – SAFETY AND ENVIRONMENT

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes general rules for the project. Included are the following topics:
   1. PART 1- GENERAL
      a. Scope
      b. General Requirements
      c. Activity Hazard Analysis and Hazard Abetment Plan
      d. Work Site Safety Orientation
      e. Fire Protection and Prevention
      f. Special Permits
      g. Hazardous Substances
   2. PART 2 – PRODUCTS
      a. Procurement of Hazardous Materials
   3. PART 3 – EXECUTION
      a. Accidents
      b. Spills
      c. Waste Management
      d. Erosion Control and Storm Water Management

1.2 GENERAL REQUIREMENTS

A. Contractor shall provide in the performance of the work under this subcontract all labor, materials, equipment, services and supervision required to maintain work sites that meet the environment, safety and health (ES&H) requirements of all applicable federal, state, and local regulations and protect the environment and the safety and health of its employees, the employees of its lower tier subcontractors, CITY employees and the general public.

B. Contractors shall comply with the requirements of the following:
   1. Occupational Safety and Health Act (OSHA)
   2. Occupational Safety and Health Standards, Department of Labor
   3. Safety and Health Regulations for Construction, Department of Labor
   4. Wisconsin Fire Code
   5. National Electrical Safety Code, ANSI C2
   6. Environmental Protection Agency
   7. Clean Air Act
   8. Clean Water Act
   9. Resource Conservation and Recovery Act
   10. Toxic substances Control Act
   11. Wisconsin Department of Health and Family Services
   12. State and Regional Water Quality Control Boards

C. In case of conflict or overlap of the above references, the most stringent provision shall apply.

D. The contractor shall provide a qualified onsite Health and Safety Representative with the authority to enforce all of the safety requirements of this subcontract and implement the contractor's Injury and Illness Prevention Program and Hazard Abatement Plan. This may be a contractor supervisor, foreperson or project manager. The contractor shall remove and replace its Health and Safety Representative at the

request of the Project Representative, if the Safety Representative is unsuccessful in enforcing the safety requirements of this subcontract and maintaining hazard free worksites. The contractor's onsite health and safety representative shall conduct safety inspections of the project operations, materials, and equipment frequently throughout the day to ensure that all safety deficiencies are identified and corrected. The city reserves the right to enforce measures if it feels the contractor's onsite health and safety representative does not enforce all requirements. Inspection findings and corrective actions taken shall be documented, and the record shall be kept on the construction work site and be made available to the Project Manager upon request.

E. The contractor shall prepare a written comprehensive injury and illness prevention program for its employees and all lower tier Subcontractor employees as required by this contract's specified EH&S standards, and regulations and submit it to the Project Representative for review. Field activities shall not start on this project until the project representative has favorably reviewed the program. Subsequent revisions shall be submitted to the Project Representative for review prior to commencement of affected work.

F. The required comprehensive program shall include but not be limited to:
1. Confined Space Entry
2. Site specific Emergency Response, First Aid, & Medical Services. Identify employees with CPR/First Aid certification available at the work site.
3. Fire Protection and Prevention
4. Hazard Communications
5. Hazardous Waste Operations
6. Hazardous Work Permits
7. Toxic and Hazardous substances
8. Inspection, Maintenance, and Certification of Heavy Equipment, Cranes, and Motor Vehicles
9. Lock Out/Tag Out (LOTO) Subcontractors are required to include LOTO
10. Personal Protective and Life Saving Equipment
11. Radiation Protection
12. Construction Safety Training
13. Control of silica dust released during demolition or drilling of concrete or released from work with other materials that contain silica.
14. Energized electrical work within panels and equipment is not allowed.
15. Workers shall be qualified to perform electrical tasks in accordance with OSHA 29 CFR 1910 and 1926 requirements.
16. Work practices must be compliant with NFPA 70E, 2004 - Standard for Electrical Safety in the Workplace.

G. Rubbish, debris and scrap shall not be thrown through any window or other opening, or dropped from any great height; it shall be conducted to the ground, to waiting truck(s) or removable container(s) by means of approved chutes or other means of controlled conveyance.

H. Form and scrap lumber shall have all nails withdrawn or bent over; shall be neatly stacked, placed in trash bins, or removed from the premises.

I. Spillages of oil, grease or other liquids, which could cause a slippery or otherwise hazardous situation or stain a finished surface, shall be cleaned up immediately.

J. The City Engineer and/or assigned delegates will periodically monitor the contractor's compliance with the EH&S requirements of this subcontract. If safety deficiencies are found, the Project Representative will issue a Safety Deficiency Notice to the contractor.

K. Upon receipt of a written Safety Deficiency Notice from the OWNER, the contractor shall take appropriate action to correct the deficiency and discontinue the hazardous activity until the hazard is abated. Failure to correct or eliminate violation(s) within the period specified might result in the CITY stop all or any part of the work.

L. The contractor shall submit to the Project Representative a written response to the Safety Deficiency Notice describing what corrective action it has taken, the date such corrective action was completed and actions that it will take to prevent future recurrence of the same incident.

M. All material classified by authorities to be a material that needs special treatment must be recycled, reused or disposed of by a special contractor that holds a valid license to work with such material.

1.3 ACTIVITY HAZARD ANALYSIS AND HAZARD ABATEMENT PLAN

A. In addition to the Injury and Illness Prevention Program the Subcontractor shall prepare and submit for review by the Project Representative a written Activity Hazard Analysis for each phase of construction in this contract.

B. The Activity hazard Analysis shall provide the following information:
1. Description of work phase or activity
2. Identification of potential hazards associated with the activity
3. A list of the contractor's planned controls to mitigate the identified hazards
4. Name of the contractor's employee responsible for inspecting the activity and ensuring that all proposed safety measures are followed
5. Construction activities for which an Activity Hazard Analysis and Hazard Abatement Plan may be required include, but are not limited to:
   a. Roofing
   b. Hoisting and handling of materials
   c. Excavations
   d. Trenching and drilling
   e. Concrete placement and false work
   f. Welding
   g. Steel erection
   h. Work performed six feet or higher above ground
   i. Electrical work
   j. Demolition
   k. Work in confined spaces
   l. Work that causes the release of silica such as demolition or drilling of concrete or work with materials that contain silica.
   m. Work with epoxy coatings
   n. Work with or around hazardous materials
   o. Work on hilly terrain
   p. Use and handling of flammable materials
   q. Control of Crystalline Silica Dust: The subcontractor shall provide all necessary control measures at the work site to keep worker exposure to crystalline silica dust within the OSHA Established Permissible Exposure Limits (PEL's). Dust control measures may require spraying of water or engineering controls at the dust generating points. It also may include the use of respirators, industrial grade HEPA vacuums, and HEPA filtered locally exhausted tools.
   r. Construction operations known to cause the release of silica dusts include, but are not limited to:
      1) Chipping, sawing, grinding, hammering, and drilling of concrete, rock, or brick.
      2) Work with cementitiou5 materials such as grout, mortar, stucco, gunnite, etc.
      3) Dry sweeping of dust originating from concrete or rock
6. The City Project Representative must favorably review the Activity Hazard analysis and Hazard Abatement Plan before work can start on that activity.

C. Each employee scheduled to work in the activities identified above shall receive safety training in those activities prior to working on them. The Subcontractor shall maintain proof of employee training at the work site and make it available to the Project Representative upon request. The favorably reviewed

project Hazard Abatement Plan shall be maintained on the work site and shall be made available, upon request, to work site employees and the Project Representative.

1.4 WORK SITE SAFETY ORIENTATION

A. Each employee shall receive initial EH&S orientation prior to performing any work on the project. The contractor shall maintain on the work site a detailed outline of the orientation and a signed and dated roster of all employees who have completed the project EHS indoctrination. Make documentation available to Project Representative on request.

B. The orientation shall, at a minimum, cover the following points:
   1. Employee rights and responsibilities.
   2. Construction contractor responsibilities.
   3. Alcohol and drug abuse policy
   4. Contractor's disciplinary procedures.
   5. First aid and medical facilities.
   6. Site and project specific hazards.
   7. Hazard recognition and procedures for reporting or correcting unsafe conditions or practices.
   8. Procedures for reporting accidents and incidents.
   9. Fire fighting and other emergency procedures to include local warning and evacuation systems.
   10. Hazard Communication Program.
   11. Access to employee exposure monitoring data and medical records.
   12. Protection of the environment, including air, water, and storm drains from construction pollutants.
   13. Location of and access to reviewed project Illness and Injury Prevention Program, Hazard Analysis and Hazard Abatement Plan
   14. Location and contents of required postings

1.5 FIRE PROTECTION AND PREVENTION

A. The contractor shall develop and maintain an effective fire protection and prevention program at the job site through all phases of demolition, alteration, repair, and construction work. Contractor shall ensure the accessibility and availability of fire protection and suppression equipment.

B. Smoking shall be prohibited at or in the vicinity of operations, which constitute a fire hazard. Such areas shall be conspicuously posted with "NO SMOKING OR OPEN FLAME" signs.

C. Smoking is not permitted in any CITY buildings. No burning of rubbish or debris will be allowed at the site. Combustible waste shall be removed immediately or stored in fire resistive containers until disposed of in an approved manner.

1.6 SPECIAL PERMITS

A. Permit to Penetrate Ground or Existing Surfaces of City Property:
   1. Prior to any penetration of the ground or existing concrete surfaces (including the use of stakes or poles) in excess of 1.5", the Subcontractor shall obtain from the Project Representative a Permit to penetrate or Excavate Existing Surface of city Property and shall adhere to the conditions of the permit during such work. The Permit and all conditions in it shall be considered part of these specifications and shall be included in the contractor's bid amount.
   2. In areas where a Permit to penetrate or excavate existing surfaces of city property is not required, contractors shall verify by safe means, prior to drilling, that no utilities or services are enclosed within the area to be drilled.

B. Fire Safety Permit:
   1. All operations with open flames or that cause sparks or is near gas lines or near combustible storage containers require a daily Fire Safety Permit issued by the Project Representative. Contractor shall not commence such work until the permit is issued. Activities requiring a Permit include, but are not limited to, electric arc and gas welding and flame cutting, other open flame operations, tar kettles, powder activated tools and excavations. Fire watch personnel shall be provided the contractor in sufficient number to continuously monitor all locations where work is conducting requiring a fire permit. The fire watch personnel shall remain on the job at least thirty minutes after such operations are completed. Fire safety personnel may be installers or welders.

C. Noncombustible shields or covers shall be provided by the contractor on tables, floors, walls, around the workstation, and over equipment to protect building structures, equipment and personnel from sparks and fragments of hot metal. Contractor shall also take these precautions to protect against sparks and hot metallic oxides generated by grinding, drilling or sawing operations.

D. Permit to Conduct Electrical Work:
   1. Energized electrical work is not allowed, except for verification and testing.

E. Air Emissions Permits and Notifications:
   1. For all projects that involve demolition of a structure, the contractor shall complete the asbestos demolition forms and notify all related authorities at least 10 working days in advance of the activity, regardless of the presence of asbestos.

F. For all projects that involve removal of regulated asbestos containing materials, the contractor shall complete the required asbestos removal forms and notify the authorities at least 10 working days in advance of the activity.

G. For any operations required to obtain an Authority to Construct or Permit to Operate from the authorities, the contractor shall provide in advance to the Project Manager the information needed for the application. Authorities may take more than 40 working days to process the application and issue the Authority to Construct or Permit to Operate; the contractor shall include this time in his Schedule of Operations; OWNER will grant no extra cost under this contract for this wait period.

1.7 HAZARDOUS SUBSTANCES

A. The contractor assumes responsibility for proper removal, collection and storage of hazardous substances on site and disposal of those if hazardous substances were known to be present and pointed out in these specifications or on the plans. If hazardous substances are not known to be present and are found, the city assumes responsibility for additional cost due to removal, collection and storage on site. All hazardous substances are to be disposed in accordance with all federal, state and local laws, codes and regulations. It is the contractor's responsibility to recognize typical hazardous substances not known to be present. This includes all substances that were used in buildings of that type in the period since original construction.

B. Contractor will assume that all electronic components, machinery, refrigeration devices and other common devices contain hazardous substances and include disposal of such in bid price, even if those substances are not mentioned separately. If special tests are necessary the city assumes responsibility for such.

C. ASBESTOS
   1. Contractor's attention is directed to WAC NR 447, WAC HSS 159 and the Occupational Safety and Health Act (OSHA) in general, part 1926.1101--ASBESTOS in particular. Contractor is responsible for compliance with all applicable regulations when the work includes fastening to or coring through Asbestos Containing Materials (ACM) and disturbance of asbestos containing caulking and mastics. Unless otherwise indicated, all caulking, sealants, glazing compounds,

gaskets, asphalt roofing materials and miscellaneous adhesives are assumed to contain asbestos and are considered to be Category I non-friable ACM as defined in NR 447. Waste material containing Category I non-friable ACM, is regulated as Construction and Demolition (C&D) waste and may be disposed of at a Department of Natural Resources (DNR) approved C&D waste landfill. If Contractor's work methods cause non-friable ACM to become friable, the Contractor is responsible for the disposal of the friable asbestos waste at a landfill specifically approved by DNR to accept friable asbestos. A copy of the signed waste manifest for the disposal of all friable asbestos waste shall be provided to CITY prior to request for final payment.

2. The regulations referenced above require removal of friable ACM and Category" non-friable ACM prior to demolition of a building. Category I non-friable ACM does not need to be removed from a building prior to demolition if the waste generated from the demolition is taken to a DNR approved C & D waste landfill. If the contractor chooses to recycle building materials from a building to be demolished, the contractor is responsible for removal and disposal of all Category I non-friable ACM in accordance with applicable regulations prior to demolition. If the contractor's demolition methods will cause non-friable ACM to become friable, the contractor is responsible for removal and disposal of all Category I non-friable ACM in accordance with applicable regulations prior to demolition.
3. The asbestos abatement contractor will require sole occupancy of the workspace during asbestos abatement work. Contractor shall communicate with the asbestos abatement contractor and make adequate allowance for the asbestos abatement work in the work schedule

D. Lead Based Paint

1. Conform with OSHA and EPA recommended worker safety requirements when removing lead based paint or material bearing lead based paint or material contaminated with lead by the demolition process. Contractor's attention is directed to the Occupational Safety and Health Act (OSHA) in general and particularly to 29 CFR 1910 (LEAD STANDARD) and to CFR 1926 (LEAD EXPOSURE IN THE CONSTRUCTION INDUSTRY). For OSHA compliance and regulation interpretations, contractors may contact the area OSHA office for this project. [Milwaukee, telephone (414) 297-3315; Appleton, telephone (414) 734-4521; Eau Claire, telephone (715) 832-9019]. Dispose of refuse containing lead based paint or contaminated with lead by the demolition process in conformance with State of Wisconsin Hazardous Waste Regulations set forth by the Department of Natural Resources and in conformance with OSHA and EPA recommended worker safety requirements.

E. PCB’s

1. Contractor's attention is directed to Wisconsin Administrative Code, Chapter NR 157 relative to PCB's. Refer to Division 26, Electrical within these specifications for work involving PCB's. Used lighting ballasts are accumulated separately as either PCB-containing or non-PCB containing and disposed of by the contractor.

F. Mercury-Containing Devices

1. Mercury containing devices are accumulated in our facilities for eventual recycling through a contracted vendor. These devices include certain building controls and switches, thermometers, and lamps. Lamps are stored in accordance with Environmental Protection Agency universal waste regulation 40 CFR part 273 including storing them in containers with labels describing the contents and the start date of accumulation.

G. Paint and related products

1. The oil-based paints are disposed of as hazardous waste

H. Used Appliances and Building Equipment

1. Used appliances include microwaves, refrigerators, and ice machines. Smaller pieces of building equipment include items such as water heaters and variable-drive motors. All of these items are recycled by a contracted vendor at the contractor's expense.

PART 2 - PRODUCTS

2.1 PROCUREMENT OF HAZARDOUS MATERIALS

A. The Subcontractor shall submit to the Project Representative, for review by the EH&S Division, any proposed procurement, stocking, installing, or other use of materials containing asbestos, cadmium, chromates, or lead.

B. All materials and applications shall comply with requirements of any and all Districts Regulations, including, but not limited to architectural coatings, general solvent and surface coatings, solvent cleaning operations, adhesive and sealants, visible emissions, and asbestos.

C. Contractor shall keep and maintain proof of compliance with the above-referenced regulations, including any recordkeeping obligations, for a period of two years after completion of the project. Contractor shall make such documents or evidence available if so requested by CITY.

D. No materials outlawed in any of the 50 US states are to be used. Only equipment and material legal in alL 50 states is to be used. All Federal, state, county and local codes and ordinances regarding are to be considered deciding if a piece of equipment or material is to be used.

PART 3 - EXECUTION

3.1 ACCIDENTS

A. The contractor's representative shall immediately notify the Project Representative of any accidents, injuries or occupational illnesses that occur on the project, regardless of the employer of the involved personnel or the owner of the involved materials or equipment. For OSHA recordable injuries, the subcontractor shall also furnish a copy of the OSHA Form 301(or equivalent) to the Project Representative within five days of the injury.

B. In the event a job site accident occurs, the contractor shall immediately implement controls and restrictions on the accident site to ensure the site remains undisturbed until released in writing by the OWNER to resume work. The contractor shall provide accident investigation follow-up and shall support Owner's accident Investigation and reporting protocol.

3.2 SPILLS

A. The contractor shall promptly report to the Project Representative any spill, deposit, leak, drainage, debris, residue, spoil, residual, and/or by-product, whether its presence at the jobsite is occasioned by accident, inadvertence, intent, discarding, or abandonment by the Subcontractor or its lower tier subcontractors. This reporting requirement applies to petroleum products, oil, lubricants, chemical substances, waste materials, and waste substances, which are in such quantities as to constitute a hazardous substance or hazardous waste. All such occurrences of any quantity involving paints, solvents, thinners, degreasers, PCBs, halogenated hydrocarbons, volatile organic compounds, and/or asbestos shall be deemed a reportable event. These identification and reporting requirements shall be the responsibility of the contractor for both its own work forces as well as for any sub tier contractor, material man or supplier performing work on site for the contractor. Reporting shall be made to the Owner's Project Representative. In no event shall the Owner's Project Representative remove any spill(s) identified as a hazardous substance or hazardous waste from the OWNER without prior direction. All removal, cleanup, and associated costs, which result from contractor or lower tier subcontractor, material man, or supplier

presence at the jobsite, shall be at the Subcontractor's sole expense. Either OWNER personnel or the contractor under the supervision of authorized CITY representative shall effect removal, cleanup and associated remedial measures at the exclusive option of the OWNER.

3.3 WASTE MANAGEMENT

A. In accordance with the City's management practice, all contractors shall reduce, reuse, salvage, and/or recycle construction waste to the extent that is feasible.

B. Waste materials removed from the site shall be managed by the contractor and disposed of in accordance with all applicable laws, regulations, codes, rules, and standards. The Contractor shall prepare all hazardous wastes for transport and disposal. Arrangements for disposal shall be coordinated through City's Project Representative. Charges for transport and disposal of hazardous waste by the City's hazardous waste service contractor will be paid directly by the City. Other materials such as soil, debris, sludge, water, etc. generated by project activities which may contain constituents exceeding federal, state, or local environmental cleanup standards must not be removed from the site, or treated and disposed on site without prior written approval of City. City mayor may not provide a list of acceptable offsite disposal or treatment facilities for disposal by Contractor.

C. Prior to demolition or construction activities, the General Contractor, with input of all contractors and their subcontractors, shall develop and submit a Waste Management Plan to City. Priority is given to reuse, followed by recycling followed by disposal including proper land filling or incineration. This has to be done in exactly that order. Disposal only will be acceptable if other methods are not commercially available. The Waste Management Plan includes but is not limited to the following:

1. A list of each material proposed to be salvaged, reused, or recycled, Materials to be included, at a minimum, are the following:
    a. Concrete: Clean concrete, concrete with rebar, asphalt concrete.
    b. Metals: Steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass or bronze, including banding, ductwork, framing, roofing and siding, flashing, piping and rebar.
    c. Clean Fill: Earth, rocks, and gravel.
    d. Wood: Clean dimensional wood, wood pallets, engineered wood products including plywood, particleboard,
    e. I joist.
    f. Biodegradable landscaping materials.
    g. Cardboard, paper, packaging.
    h. Masonry: Brick, ceramic tile, CMU.
    i. Roofing: Clay or concrete tiles, asphalt shingles.
    j. Gypsum board.
    k. Acoustic ceiling panels.
    l. Carpet and pad.
    m. Paint.
    n. Insulation.
    o. Plastics: ABS, PVC
    p. Beverage containers
    q. Cardboard.
    r. Concrete
    s. Brick and concrete masonry units (CMU).
    t. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
    u. Gypsum wallboard.
    v. Clean dimensional wood
    w. Wood doors
    x. Acoustical ceiling tiles/panels
    y. Glass

2. Separation and Materials Handling Procedures: How waste materials (as identified above), will be separated, cleaned (if necessary) and protected from contamination.
3. Waste Material Estimating Sheet (Appendix A at the end of this Section)
4. Proposed Alternatives to Land filling: List each material planned to be salvaged or recycled, quantities, and proposed destination.

D. The General Contractor shall be responsible for coordination of separation, handling, recycling, salvage, reuse, and return methods to be used by all contractors and for reporting the results of the Waste Management Plan. The contractor shall provide separation, bins for temporary onsite storage, handling, transportation, recycling, salvage, and land filling for all demolition and waste materials and keep recycling and waste bins areas neat, clean and clearly marked in order to avoid contamination or mixing materials and maintain logs onsite for each load of materials removed from site.

E. During the progress of the work, the General Contractor shall report to City, the quantity of each material recycled, reused, or salvaged, and the receiving party. All contractors shall maintain a record of weight tickets, manifests, receipts, and invoices for review by City on request.

F. At the completion of the project the General Contractor shall submit a final summary of the progress reports, including the percentage of recycled waste (weight or volume) to the quantity of waste that would have been otherwise land filled.

G. Contractor is to provide the following documents upon request for payment:
1. Waste Materials Estimating Sheet (Appendix A at the end of this Section)
2. Landfill Log (Appendix B at the end of this Section)
3. Waste Diversion Log (Appendix C at the end of this Section)
4. Legible copies of manifests, weight tickets, and receipts. Manifests shall be from recycling and/or disposal site operators that can legally accept the materials for the purpose of reuse, recycling or disposal. These documents shall include the contract number and the job site name.

H. Examples of documents include, but are not limited to:
1. Cover sheet for hazardous materials recycling contract
2. Vendor "Pickup Request"
3. Vendor "Certificate of Recycling and/or Disposal"
4. Vendor invoice

I. Maintain at the Project site Landfill Logs and Waste Diversion Logs for each load of materials removed from site. Discuss Waste management plans and implementation at the following meetings:
1. Pre-bid meeting.
2. Pre-construction meeting.
3. Regular job-site meetings.

J. Immediately Inform the City Engineer if hazardous materials are encountered or suspected, and stop work in the suspect area. Do not proceed with work in the suspect area until approved by the City Engineer.

K. The following resources are provided for information only, to aid the Contractor in managing the construction waste:
1. The Wisconsin DNR, Bureau of Waste Management http:/www.dnr.state.wLus/org/aw/wm/
2. The UW-Extension's Solid and Hazardous Waste Education Center http://www1.uwex.edu/ces/shwec/, email shwec@uwm.edu or telephone: 608-262-0385.
3. WasteCap Wisconsin, Inc. http://www.wastecapwLorg or telephone: 414-961-1100 or 608-245-1100

L. The contractor shall provide summaries of type and amount of material recycled, reused or disposed off. Those summaries shall include enough information and detail to satisfy requirements by external auditors. At a minimum the documentation needs to meet the current LEED requirements and

requirements set by the EPA and federal government for federally funded projects. These requirements mayor may not be mentioned specifically in this contract and the contractor is required to learn about specifics and to add documentation as required by such third party auditors.

3.4 EROSION CONTROL AND STORM WATER MANAGEMENT

A. In accordance with state law, where applicable, the General Contractor shall be governed by the following:

B. The General Contractor hereby covenants to maintain all project grounds, public streets and associated areas, including fill areas in a manner consistent with state laws and the general policy to conserve soil and soil resources, and to control and prevent soil erosion and to control and prevent siltation into waters of the state. This clause is to be liberally construed to further the above stated objectives. The following shall include, but not limit areas in which control is to be executed:

C. Erosion Control Plan: Implement the erosion control plan developed for the project and maintain erosion control practices throughout the construction period. Modifications to the erosion control plan, addressing phases of construction shall be the responsibility of the General Contractor. Erosion control practices that are compromised as the result of construction activity shall be returned to their functioning state by the end of the current workday. Where applicable, erosion control practices shall comply with Chapters NR 151 and 216, Wis. Adm. Code.

D. Minimum Stripping: Limit stripping of sod and vegetation and limit land disturbance to an area and a time period that will expose bare soil to least possibility of erosion that construction requirements will allow. Stockpiling: Materials, including soil, shall be stored and protected in a manner that will prevent runoff of material from the stockpiles into streets, drainage facilities, storm sewer systems, or waters of the state in the event of rain.

E. Soil Erosion and erodible Materials: Take positive measures to prevent soil erosion from the construction area and areas disturbed by construction activities by employing such means as seed and mulch, mulches, intercepting embankments and berms, sedimentation basins, ditch checks, riprap, erosion mats, silt fence, approved polyacrylamides, inlet protection, or other temporary erosion control devices or methods.

F. Record Keeping: Maintain a copy of the current erosion control plan on site. Maintain maintenance records and inspection logs on-site for erosion control and storm water management practices. Contractor shall provide project representative with a weekly maintenance and inspection report.

G. Street Maintenance: Control the tracking of soil onto street and paved surfaces to a minimum. Any such tracking shall be removed no less than on a daily basis.

H. Storm Water Management: Practices installed for post-construction storm water management shall be protected during construction activity, and in the event that their intended function becomes compromised during construction activity, shall be restored and/or repaired according to Chapters NR 151 and 216, Wis. Adm. Code, for post-construction storm water management. Erosion control and storm water management practices shall be installed and maintained in accordance with the WDNR approved technical standards available at the following website: http://dnr.wi.gov/org/water/wm/nps/stormwater/techstds.htm Responsibility and authority for inspections are vested in the City. Responsibility and authority for maintaining records for NR 216 is the responsibility of the General Contractor.

I. The contractor's storm drain protective actions shall include but not be limited to:
   1. Identification of storm drain inlets that may be affected by this subcontract work and installation of needed protective filters and structures
   2. Regular inspection and maintenance of drain inlet protective assemblies

3. Soils erosion and sediment control
4. Proper storage and containment of soil and other material stockpiles to prevent them from running off into storm catch basins
5. Effective management of vehicular and equipment site ingress and egress to avoid mud tracking
6. Collection and proper disposal of waste material and slurry from concrete, mortar, or saw cutting work
7. Collection and proper disposal of waste water resulting from washing or hydro blasting of equipment, vehicles or buildings
8. Contingency plans for containing and disposing spills from sewer lines
9. Training of personnel in housekeeping practices aimed at protecting storm drains during construction.

END OF SECTION 010003

SECTION 024000 – SELECTIVE DEMOLITION, ALTERATION, AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

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

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

1.5 PROTECTION

A. Do not interfere with use and operation of existing adjacent work areas. Maintain free and safe passage to and from.

B. Cease operations and notify Owner and A/E immediately if safety of adjacent work areas appears to be endangered. Do not resume operations until safety is restored.

C. Protect existing work not indicated or scheduled to be altered. Promptly repair damages at no cost to the Owner.

D. Provide, erect and maintain safety devices as required to protect general public, workers, and adjoining work area employees.

PART 2 - PRODUCTS

2.1 MATERIALS

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

2.2 SALVAGED MATERIALS

A. Conform to requirements specified in Division One – General Requirements, Alteration Project Procedures.

2.3 PRODUCTS FOR PATCHING

A. Provide as required to match adjacent surfaces or as indicated.

PART 3 - EXECUTION

3.1 DEMOLITION

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

B. Perform demolition in accordance with applicable authorities having jurisdiction.

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

D. Remove demolished materials, tools and equipment from site upon completion of work. Leave site in a condition acceptable to A/E.

3.2 SALVAGE

A. Carefully remove, salvage, and reuse or turn over to Owner items designated on the Drawings to be salvaged.

3.3 PATCHING

A. Comply with installation requirements specified elsewhere for products used.

B. Patch all damaged surfaces with products to match existing

END OF SECTION 024000

SECTION 060110 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wood furring and grounds.
2. Plywood backing panels.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FIRE-RETARDANT-TREATED MATERIALS

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

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

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

C. Application: Treat all rough carpentry, unless otherwise indicated.
1. Plywood backing panels.

2.2 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Furring.
2. Grounds.

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

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

2.3 PLYWOOD BACKING PANELS

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

2.4 FASTENERS

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

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

C. Wood Screws: ASME B18.6.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 WOOD BLOCKING INSTALLATION

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

3.3 WOOD FURRING INSTALLATION

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

END OF SECTION 060110

SECTION 060120 – FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Standing and Running trim.

B. Related Sections include the following:
   1. Section 060110: Rough Carpentry

1.3 SUBMITTALS

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

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

C. Samples:
   1. 6” length of each type, profile, and surface finish.

D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Indicate materials, component profiles, fastening, jointing details, and accessories.

E. Quality Assurance: Perform finish carpentry work in accordance with recommendations of the Millwork Standards of the Architectural Woodwork Institute.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

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

2.2 FABRICATION

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

PART 3 - EXECUTION

3.1 PREPARATION

A. Field Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain measurements and verify dimensions to assure accurate fit.

B. Preparation of Surfaces: Deliver materials and fabrications to Section 09912 contractor for back priming and/or pre-finishing prior to installation. Back prime wood materials for painted finish exposed to moisture and high relative humidity.

C. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.

3.2 INSTALLATION

A. Quality Standard: Install standing and running trim, interior frames and jambs, and other finish carpentry work to comply with AWI section 1700 for the same grade specified in Part 2 of this section for type of finish carpentry work involved.

B. Apply all nails, spikes, screws, lag screws, steel angles, hangers, bolts, nuts, washers, anchors, and other items of hardware required for the assembling and securing of this work. Use best suitable type of nails and anchors for various types of carpentry. Use annular nails and other special nails where required. Correct and defective work caused by inadequate nailing, holding power or nails used and the use of nails which result in the staining of other materials. All finish work shall have nails set for puttying. Recess all screws and bolt heads and provide flush hardwood plugs where exposed.

C. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

D. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8 feet for plumb and level countertops; and with 1/16 inch maximum offset in flush adjoining surfaces and 1/8 inch maximum offsets in revealed adjoining surfaces.

E. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints. Use construction adhesives of type recommended by manufacturer for use intended. Sort trim to achieve close match of graining for each assembly, especially if splicing is required.

G. Countertops: Cut, fit, scribe and secure in place.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork at no cost to Owner. Adjust joinery for uniform appearance.

B. Cleaning: Clean all work of this Section prior to acceptance by Owner, including installed work furnished by others.

C. Adjustment: Adjust all hardware for proper operation.

D. Protection: Protect all work of this Section until acceptance by Owner. Advise GC of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

3.4 END OF SECTION 060120

SECTION 060410 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Plastic-laminate countertops.
   2. Wood shelving and wall panels.
   3. Wood trim at framed Tac-Wall material.

B. Related Sections include the following:

   1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 SUBMITTALS

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

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

C. Samples:
   1. For each Wood product, 8x8 for each type, species, and finish.
   2. For each type of Plastic Laminate, 8x8 for each type, color, and surface finish.

D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

E. Quality Submittals:
   1. Product Data: For installation adhesives, including printed statement of VOC content.
   2. Product Data:
      a. Composite wood manufacturer's product data for each composite wood product used indicating that the bonding agent contains no urea formaldehyde.
      b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
      c. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content
   3. Quality Certification: Submit woodwork fabricator’s certification, stating that fabricated woodwork complies with quality grades and other requirements indicated.

4. Certificates: Chain-of-custody certificates certifying that products specified to be made from certified wood from a certified managed forest. Include evidence that mill is certified for chain of custody by a third party-accredited certification body.

F. Product Certificates: For each type of product, signed by product manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

A. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
1. Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated.

B. Optimum moisture content: kin-dry architectural woodwork to an average moisture content of 8 percent or as otherwise recommended by applicable Quality Standards for the regional climatic conditions involved.

C. Softwood Plywood: APA A-B EXT-Group 1

D. Fiberboard: Medium density complying with ANSI A208.2

E. Fasteners and Anchorages: Provide all nails, screws, bolts, nuts, washers, and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

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

G. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard:
a. 100% recovered and preconsumer recycled wood fiber.

2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
   a. SierraPine (Medex, Medite II. and Medite-FR) Medium-density Fiberboard.

H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

2.2 CABINET HARDWARE AND ACCESSORIES

A. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

2.3 MISCELLANEOUS MATERIALS

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

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

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

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

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

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

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

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).

D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.5 WOOD PANELS

A. Wood Species and Cut for Exposed Surfaces: Red oak, plain sawn or sliced.

1. Grain Direction: Vertically
2. Matching of Veneer Leaves: Random match.

2.6 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

D. Transparent Finish:

1. AWI Finish System: Catalyzed polyurethane.
2. Staining: Match approved sample for color.
3. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.

    a. Apply wash-coat sealer after staining and before filling.

6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

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

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

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

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

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

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

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Calk space between countertop and wall with sealant specified in Division 7 Section "Joint Sealants."

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

3.3 ADJUSTING AND CLEANING

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

B. Clean, lubricate, and adjust hardware.

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

END OF SECTION 06402

SECTION 072100 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket sound control insulation.

1.3 SUBMITTALS

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

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

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

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET SOUND CONTROL INSULATION

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

1. CertainTeed Corporation.
2. Johns Manville.
3. Owens Corning.

B. UnFaced, Glass-Fiber Blanket Insulation: ASTM C 665

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

D. Products:

1. CertainTeed Corp:
   a. Batts. 30% recycled content, some from curbside recycling. Batts with polypropylene wrap to contain any particulates. Available in standard unfaced or faced. Insulsafe contain no toxic binders.
2. Johns Manville:
   a. Fiberglass blankets, batts. Formaldehyde-free, low-emission Grid-SHIELD Rx batts and rolls. Perforated polyethylene wrapped. 20% to 30% recycled glass. SCS Certified and Environmental Choice Program. R-1 1 to R-25 batts.
3. Owens-Corning:
   a. Non-offgassing, less toxic fiberglass in rolls rated R-13 and R-25. Rolls and batts. 30% recycled glass, some from curbside pickup. SCS certified.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

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

END OF SECTION 072100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Elastomeric joint sealants.
2. Latex joint sealants.
3. Acoustical joint sealants.

B. Related Sections:
1. Division 9 Section "Gypsum Board" for sealing perimeter joints.
2. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealants.

1.3 SUBMITTALS

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

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

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

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

D. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

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

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

1.5 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.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

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

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

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

1.8 PROJECT/SITE CONDITIONS

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

PART 2 - PRODUCTS

2.1 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 joint-sealant manufacturer, based on testing and field experience.

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

1. Architectural Sealants: 250 g/L.

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

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

D. Stain-Test-Response Characteristics: Where 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.

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

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

2.2 ELASTOMERIC JOINT SEALANTS

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

2.3 LATEX JOINT SEALANTS

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

1. Products: Subject to compliance with requirements, provide the following:

a. Bostik, Inc.; Chem-Calk 600.
b. Pecora Corporation; AC-20+.
c. Tremco Incorporated; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

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

1. Products: Subject to compliance with requirements, provide the following:

a. Pecora Corporation; AC-20 FTR.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material 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. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

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. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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

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.
    a. Clean porous joint substrate surfaces by brushing, grinding, 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.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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 kind 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 bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. 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.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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.

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

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.

3.6 JOINT-SEALANT SCHEDULE

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

1. Joint Locations:

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

2. Joint Sealant: Latex.

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

1. Joint Sealant Location:

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

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

1. Joint Location:

a. Acoustical joints where indicated.

2. Joint Sealant: Acoustical.

END OF SECTION 079200

SECTION 081400 - WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Sections:
1. Division 8 Section “Metal Frames” for hollow metal frames.

1.3 SUBMITTALS

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

1. Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

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

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

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

C. Samples for Verification:

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

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

D. Forest Certification: Provide doors made with cores not less than 70 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

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

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Algoma Hardwoods, Inc.:

2. Marshfield Door Systems, Inc.
3. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade: Standard Duty.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors :

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

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

C. Openings: Cut and trim openings through doors in factory as indicated or scheduled.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section "Glazing."

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish: Match existing doors.

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: Match existing.
4. Effect: Match existing.
5. Sheen: Match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081400

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Other doors to the extent indicated.

B. Related Sections include the following:
1. Section 08110: Steel Frames
2. Section 08210: Wood Doors

1.3 SUBMITTALS

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

B. Warranty: Special warranty specified in this Section.

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

D. Keying Schedule: Submit a separate keying schedule

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

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

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

1.4 QUALITY ASSURANCE

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

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

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

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

1.5 COORDINATION

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

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

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

1.7 OWNERS INSTRUCTIONS

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

1.8 WARRANTY

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

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

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

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

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

1.9 EXTRA STOCK/SPARE PARTS

A. Furnish and deliver the following items of hardware to the Owner upon Substantial Completion.
1. Cylinders (cylinder cores): Two master key set; verify keying with Owner.
2. Locking Devices: Five for each different function.
3. Closers: One right-hand, one left-hand.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

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

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

2.2 HINGES, GENERAL

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

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

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Weight: Unless otherwise indicated, provide the following:
1. General:
   a. BB1279 standard weight, 2 ball bearing, brass, with brass pin ANSI A2133.
2. Entrance Doors: Heavy-weight hinges.
3. Doors with Closers: Antifriction-bearing hinges.
4. Interior Doors: Standard-weight hinges.

D. Hinge Options: Where indicated in door hardware sets or on Drawings:
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.

E. Fasteners: Comply with the following:

1. Wood Screws: For wood doors and frames.
2. Screws: Phillips flat-head; wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

A. General:
1. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
   a. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
2. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
3. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
   a. Strikes for Bored Locks and Latches: BHMA A156.2.
   b. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

B. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
1. Bored Locks: BHMA A156.2.
2. Basis of Design:
   a. Manufacturer: Best Access
   b. Series: 9k, with 16 lever and K rose
3. Certifications: ANSI A156.2, 1996, Series 4000, Grade 2. UL Listed for all functions up to 3-hour doors.
4. Keying: 7-pin tumbler, removable core, with two nickel silver keys per lock.
5. Backset: 2-3/4 inches (70 mm). Verify to match existing.
6. Strikes: Equivalent to ASA ANSI A115.2 with box.

C. Miscellaneous Locks and Cylinders:
1. Provide miscellaneous lock devises as scheduled.
2. Furnish locksets with construction cores, or construction keying.

2.4 EXIT DEVICES

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

2.5 CLOSERS

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

B. Surface Closers: BHMA A156.4 , Grade 1 unless Grade 2 is indicated. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
1. Acceptable Manufacturer: LCN or approved equal
   a. Product: 1460 Standard Cover with Parallel Arm/Hold Open “Cush-n-Stop”
      1) Provide Closers with arms, brackets, drop plates, and other closer accessories to suit the door and frame conditions.

2.6 KEYING

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

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

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

C. Keys: Nickel silver.

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

a. Notation: "DO NOT DUPLICATE."

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

2.7 STOPS AND HOLDERS

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

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

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

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

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

2.8 ASTRAGAL

A. Basis of Design: Hager 835S

2.9 FLUSH BOLT

A. Basis of Design: Hager 283D

2.10 FABRICATION

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

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

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

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

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the

door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.11 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Finish: Satin Chrome 626.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

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

3.2 INSTALLATION

A. Deliver hardware scheduled or required to be built-in to metal frames to contractors for that work.

B. Deliver all electronically operated products requiring electrician installation to Division 16 contractor for installation.

C. General:
1. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking, or excessive clearance.

D. Mounting Heights: Mount door hardware units at heights to match existing unless required to comply with governing regulations.

1. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

E. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in

another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
3. Electric Strikes: Install power supplies in ceiling above.
4. Door Closers: Install surface mounted closers on doors without thru-bolting. Refer to door specifications for door construction. Install for maximum degree of 180 degrees whenever possible, or to adjoining wall. Indicate degree of openings on final hardware schedules.

3.3 ADJUSTING AND CLEANING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

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

3.5 DOOR HARDWARE SCHEDULE

A. DOOR 1005A
1. Floor Stops

B. DOOR 2012A
1. Storage Lock
2. Astragal
3. Flush Bolts
4. Floor Stops

END OF SECTION 087100

SECTION 088720 – ARCHITECTURAL WINDOW FILM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Decorative Window Film.

B. Related Sections:
   1. Section 08800 - Glazing: General Glazing applications to receive architectural window film.

1.3 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals, 1997 Edition.

B. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.

C. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

D. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

E. ASTM G 26 - Standard Practice for Performing Accelerated Outdoor Weatherizing for Non-metallic Materials Using Concentrated Natural Sunlight.

1.4 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's standard available colors and patterns.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
   2. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Owner to provide image of logo.

B. Field Measurements: Verify actual dimensions of glazing area by field measurements before fabrication.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer’s standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: 3M Window Films
   1. Equal Products by alternate manufactures to be submitted for approval.

2.2 SINGLE PATTERNED FILM

A. 3M Fasara Decorative Glazing film
   1. Color/Style to be selected from Manufacturers standard options.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.

C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

D. Apply film to glass and lightly spray film with slip solution.

E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.

F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 088720

SECTION 092116 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Steel Framing and Furring:
      a. Dietrich Industries, Inc.
      b. National Gypsum Company.
      c. Unimast, Inc.
   2. Gypsum Board and Related Products:
      a. G-P Gypsum Corp.
      b. Certainteed ProRoc.
      c. United States Gypsum Co.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Hanger Attachments to Concrete: As follows:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.
      a. Type: Cast-in-place anchor, designed for attachment to concrete forms.

D. Hangers:
   1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

E. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.
   1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base Metal Thickness: 0.0312 inch.
   2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
      a. Configuration: Hat shaped, with face attached to two flanges by slotted or expanded metal legs.

2.3 STEEL PARTITION FRAMING

A. Components, General: As follows:
   1. Comply with ASTM C 754 for conditions indicated.
   2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

B. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.027 inch (22 gauge).
   2. Deflection Limit: L/240, unless otherwise indicated.
   3. Depth and Spacing: As indicated.

C. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.
   1. Depth: 1-1/2 inches, unless otherwise indicated.
   2. Clip Angle: 1-1/2 by 1-1/2 inch , 0.068-inch- thick, galvanized steel.

D. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36, 100 percent post-industrial recycled content (synthetic) gypsum shall be used to manufacture the board materials. The synthetic gypsum shall be a byproduct of the flue gas desulfurization (FGD) process, which removes sulfur dioxide from the emissions of coal-burning electrical power plants. One local source of the gypsum board materials may be obtained from the USG Gypsum Plant in East Chicago, IN or GP Gypsum, Wheatfield, IN.
   1. Regular Type:
      a. Thickness: 5/8 inch, unless otherwise indicated.
      b. Long Edges: Tapered.
      c. Location: As indicated.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead: Use at outside corners, unless otherwise indicated.
      b. L-Bead: L-shaped; exposed long leg receives joint compound.
      c. Expansion (Control) Joints.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by manufacturer.

2.7 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following. Refer to Division 7 Section "Joint Sealants" for applicable general requirements.
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealantcomplying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
   3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
   4. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   5. Do not attach hangers to steel deck tabs.
   6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.

C. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

D. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
   1. Hangers: 48 inches o.c.
   2. Furring Channels (Furring Members): 16 inches o.c.

3.5 INSTALLING STEEL PARTITION

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt-felt isolation strip between studs and wall.

B. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
1. Cut studs 1/2 inch short of full height to provide perimeter relief.

C. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

D. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install two studs at each jamb, unless otherwise indicated.
2. Extend jamb studs through suspended ceilings and attach to underside of top plate.

E. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed

by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

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

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of board.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

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

B. Prefill open joints and damaged surface areas.

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

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
   1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
   2. Level 3 is suitable for surfaces receiving medium- or heavy-textured finishes before painting or heavy wallcoverings where lighting conditions are not critical.
      a. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges.
   3. Level 4 is suitable for surfaces receiving light-textured finish wallcoverings and flat paints. It is generally the standard exposed finish.
      a. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
   4. Level 5 is suitable for surfaces receiving gloss and semigloss enamels and surfaces subject to severe lighting. It is considered a high-quality gypsum board finish.
      a. Level 5 (For large uninterrupted surfaces where the Architect determines that Level 4 finish is unacceptable): Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface at extensive uninterrupted wall or ceiling surfaces including but not limited to curved walls and soffits.

E. Texture Finish: By Section 099123 contractor.

END OF SECTION 092116

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
   1. Level Surfaces: Minimum 1/8" per foot

1.2 SUMMARY

A. This Section includes the following:
   1. Floor/Wall Tile

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

B. Samples:
   1. For of each type and composition of tile and for each color and texture required, at least 12 inches (300 mm) square, mounted on braced cementitious backer units, and with grouted joints.
   2. For of each type and finish of transition materials

C. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Product to have Recycled Content
   2. See Finish Schedule located in drawings
      a. Tile Products:
         1) Rex Ceamiche Artistiche
         2) Ergon Engineered Stone
      b. Tile-Setting and -Grouting Materials:
         1) Bonsal: W.R. Bonsal Company.
         2) Bostik.

3) C-Cure Corporation.
4) Custom Building Products.
5) Dal-Tile Corporation.
6) DAP, Inc.
7) Laticrete International, Inc.
8) Mapei Corporation.
9) Summitville Tiles, Inc.
10) TEC Incorporated.

2.2 ANSI CERAMIC TILE STANDARD

A. Provide tile that complies with Standard Grade requirements of ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

2.3 ANSI STANDARD FOR TILE INSTALLATION MATERIALS

A. Provide materials complying with referenced ANSI standards.

B. Comply with recommendations and installation guidelines of the TCA's "Handbook for Ceramic Tile Installation".

C. Comply with the State of Wisconsin Enrolled Commercial Building Code.

D. For tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, comply with the following requirements:
1. Match colors, textures, and patterns indicated by referencing manufacturer's standard designations for these characteristics.
2. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
3. See Finish Schedule located in Construction Drawings

2.4 FACTORY BLENDING

A. For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

B. All base materials in toilet room areas to extend upward onto walls a minimum of 6 inches (152 mm).

2.5 GLAZED PORCELAIN STONEWARE TILE

A. Indicated as Tile-1 on Finish schedule in drawings
1. Provide flat tile complying with the following requirements:
a. Manufacturer: Rex, Ceramiche Artistiche
b. Composition: Porcelain.
c. Module Size: 12 by 12 inch
d. Color: See Finish Schedule located in Construction Drawings

2.6 CERAMIC TILE

A. Indicated as Tile-2 on Finish schedule in drawings
   1. Provide flat tile complying with the following requirements:
      a. Manufacturer: Ergon Engineered Stone
      b. Composition: Ceramic.
      c. Module Size: 12 by 24 inch (cut to 4x24 at base)
      d. Color: See Finish Schedule located in Construction Drawings

2.7 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1C and as specified below:
   1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15), or polyethylene sheeting ASTM D 4397, 4.0 mils (0.1 mm) thick.
   2. Crack Isolation Membrane: "Hydra Flex" by TEC, install in accordance with manufacturers installation procedures.
   3. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A 185 and ASTM A 82, except for minimum wire size.
   4. Latex additive (thin-set) (water emulsion) described below, serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.
      a. Latex Additive: Manufacturer's standard.
   5. Latex-Portland cement Mortar: ANSI A118.4, composed as follows:
   6. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements (Contractors option):
      a. Latex Additive: Styrene butadiene rubber.
      b. Latex Additive: Acrylic resin.
   7. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.
   8. Organic Adhesive: ANSI A136.1, Type I.

2.8 GROUTING MATERIALS

A. Epoxy Grout: ANSI A118.3, a two part grout system consisting of epoxy resin and epoxy hardener. Made to have impervious qualities, stain and chemical resistant:
   1. Mix per manufactures recommendations to produce the following:
      a. Epoxy grout mixture for joints 1/8 inch (3.2 mm) and narrower.
      b. Products equal to Laticrete SpectraLOCK Pro grout
      c. Color: See Finish Schedule located in Construction Drawings

2.9 ELASTOMERIC SEALANTS

A. Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
   1. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide.
   2. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

2.10 CEMENTITIOUS BACKER UNITS

A. Provide products complying with ANSI A118.9, of thickness and width indicated, and in maximum lengths available to minimize end-to-end butt joints.

2.11 MISCELLANEOUS MATERIALS

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

B. Crack Isolation Membrane: "Hydra Flex" by TEC, install in accordance with manufacturers installation procedures.

C. Penetrating Sealer for Grout: Fluoro-chemical invisible penetrating sealer "Guard All" by TEC, install in accordance with manufacturers installation procedures.

D. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch (3.2 mm) wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

B. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Follow manufacturer guidelines to level and reshape with self-leveling underlayment.

E. The concrete surface shall be prepared by steel shot blasting. Surface shall be free of all latency, form release agents, curing agents, oil, grease and other penetrating contaminates.

F. Cracks and voids shall be repaired or filled only with materials approved by the manufacturer of the floor coating specified.

3.2 BLENDING

A. For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

3.3 ANSI TILE INSTALLATION STANDARDS

A. Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated.

B. Comply with recommendations and installation guidelines of the TCA's "Handbook for Ceramic Tile Installation".

C. Comply with the State of Wisconsin Enrolled Commercial Building Code.

D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
   1. Provide edge strips at all exposed edges of tile meeting carpet, wood or resilient flooring, unless otherwise indicated.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

3.4 JOINTING PATTERN

A. Align joints where adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. See interior elevations for tile layouts. Provide uniform joint widths, unless otherwise indicated.

B. Floor tile: Grid Pattern

3.5 EXPANSION JOINTS, CONTROLS JOINTS, ISOLATION JOINTS

A. Verify joint layouts with Architect prior to layout/installation. Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. At locations where tile bridges joint, provide soft joints on both sides of joint. Filling with Type "T" joint sealant.
      a. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
   3. Provide expansion type (caulk) joints to match color and texture of grout. Provide at all cold joints/saw cut joints in concrete floor slabs, at perimeter joints (floor tile to base or wall) and at locations recommended in the TCA "2005 Handbook for Ceramic Tile Installation, 42nd Edition.
      a. Joints for the control of changes in liner dimensions and isolation:
         1) Space expansion joints 24'-0" on center each direction the width of the grout joint in interior floors not subject to moisture and direct sunlight.
         2) Space expansion joints 12'-0" on center each direction the width of the grout joint in interior floors subject to direct sunlight and moisture.
         3) Provide isolation joints at locations where flooring meets surfaces such as perimeter walls, columns, piers, dissimilar flooring materials, etc.
   4. Provide joint preparation for isolated cracks as outlined below and recommended by membrane manufacturer.
      a. Provide non-asbestos fiber reinforced polymer modified bitumen sheet membrane for treatment of cracks in substrate. Membrane sheet width – 3 tiles minimum, 1 full tile over joint plus 1 full tile on each side. Materials by N.A.C. Products "ECB Membrane", the Noble Company "Nobleseal CIS" or equal.

3.6 GROUT

A. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, latex-portland cement grouts, and epoxy), comply with ANSI A108.10.
   2. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.
   3. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.7 FLOOR TILE INSTALLATION

A. Install tile to comply with requirements indicated, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.
   1. Joint Widths: Install tile on walls with 1/8” Joint Width

3.8 CLEANING

A. On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter. Use cleaning materials and methods that comply with tile and grout manufacturers' written instructions.

END OF SECTION 093000

SECTION 095100 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special molding.
      a. For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
      b. For sealants, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient

temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.

B. Acoustical Panel Colors and Patterns (ACT-1):

1. Armstrong Cirrus HRC Tiles Total Recycled Content: 83%, Post industrial is 54% and Post consumer is 29%.
   a. Size: 2 by 2.
   b. Color: White.
   c. Edge: Tegular.

2.2 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Grid for ACT-1: Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation, with prefinished, cold-rolled, 15/16-inch- (24-mm-) wide, aluminum caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. Face Design: Flat, flush.
   3. Face Finish: Painted white.

2.4 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   6. Do not attach hangers to steel deck tabs.
   7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
   9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095100

SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient base.

1.3 SUBMITTALS

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

1. For adhesives, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS

A. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Johnsonite.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Coved.

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: Smolder #164.

2.2 TRANSITION STRIP

A. Transition Strip:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Johnsonite Slim Line Transistions.
2. Color: See Architectural Plans Room Finish Selections
3. Performance Characteristics:
   a. Hardness: ASTM D2240 – Not less than 85 Shore A
   b. Abrasion Resistance: ASTM D3389 – 0.22 mg/cycle
   c. Slip Resistance: ASTM D2047 – Exceed ADA requirement .6 for flat surfaces
   d. Fire Resistance: ASTM E648 /NFPA 253 – Class 1

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.

END OF SECTION 096513

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Tufted carpet for direct glue application.
   2. Carpet Tile for direct glue application.

1.3 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:
   1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. For installation adhesive, including printed statement of VOC content.

B. Samples: Provide 12 inch x 12 inch sample of each type of carpet specified for verification purposes.

C. Warranties: Special warranties specified in this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.5 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to:
    a. Wear - Lifetime of Carpet. No more than 10% face yarn loss by weight in normal use.
    b. Static - Lifetime of Carpet.
    c. Edge Ravel - Lifetime of Carpet. Guaranteed no edge ravel in normal use (no seam sealer required).
    d. Delamination - Lifetime of Carpet. Guaranteed no delamination in normal use. Chair pads are not required, but are recommended for maximum appearance retention.
    e. Tuft Bind - Lifetime of Carpet. Guaranteed not to zipper, wet or dry.
    f. Adhesive - Lees warrants that the use of Lees adhesives will bond the carpet to the properly prepared substrate for the life of the carpet. Substrate must meet Lees recommended floor preparation procedures. Should Lees adhesive not be used, Lifetime Adhesive Warranties become null and void.
    g. Stain Resistance - Lees provides lifetime stain warranty and a 10 year Lightfastness and Atmospheric Contaminant Warranty on all Duracolor carpets. This lifetime stain warranty covers all Duracolor carpets made by Lees.
    h. * Under GSA requirements stain resistant carpets must score no less than 8.0 (10.0 is best) on the AATCC Red 40 Stain Scale. Carpet samples must first be exposed to 100 revolutions of the Taber abrader (1,000-gram weight per H-18 wheel) and then the abraded area must be stain tested using AATCC test method 175.

1.7 EXTRA MATERIALS

A. Before installation begins, furnish quantity of full-size units equal to 5 percent of each type and color of carpet tiles installed.

B. Deliver extra carpet tile materials to Owner's designated storage space, properly packaged with protective covering and identified with labels describing contents.

PART 2 - PRODUCTS CARPET

A. Product; Lees, Faculty IV: Vineyard #DK166-4285
1. Construction – tufted.
2. Surface Texture - performance loop pile.
3. Gauge - 1/8" (31.5/10 cm).
4. Stitches Per Inch - 8.3 per inch (32.68/10 cm).
5. Finished Pile Thickness – 145 inch avg (3.7 mm).
6. Dye Method - yarn dyed.
7. Backing Material - Unibond® by LEES.
8. Face Yarn - Antron® Legacy nylon 6,6 with DuraTech Soil Protection by DuPont.
9. Fiber Technology - Duracolor® by LEES Stain Resistant System. Passes GSA requirements for permanent stain resistant carpet.
10. Face Weight - 26 oz/yd2 (881.66 gm/m2).
11. Size/Width - 12 feet width (3.66 m).
12. Pattern Repeat - n/a.

B. Product: Lees, First Step: Windswept # dd763-438
1. Modular, 24"x24"
2. Backing System: Fiberglass Reinforced Thermoplastic Composite
3. Yarn System: Fortis Nylon 6,6 with Nylon 6,6 scraper yarn
4. Color System: Yarn Dyed
5. Yarn Weight: 38 oz.
6. Gauge: 5/32"

C. Performance:
   1. Static - 3.0 kv when tested under the Standard Shuffle Test 70 degrees Fahrenheit (21 degrees Celsius) - 20% R.H.
   2. Flammability - Passes DOC-FF-1-70 Pill Test.
   3. Flooring Radiant Panel Test - Meets NFPA Class 1 when tested under ASTM E-648 glue down.
   4. Smoke Density - NBS Smoke Chamber NFPA-258 - Less than 450 Flaming Mode.
   5. CRI Green Label Plus Certified – Y.
   6. Construction Materials - 100% man-made materials for superior stability. Specifications are subject to change without notice when such changes do not alter product performance. Slight color variation may occur from dye lot to dye lot.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpetmanufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

   1. VOC Limits: Provide adhesives with VOC content not more than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Carpet Tile Reducer Strip: Extruded or molded heavy-duty rubber carpet tile reduser strip of size and profile recommended by carpet tile manufacturer with a minimum 2-inch wide anchorage flange. Colors as selected by A/E from manufacturer’s standard colors.

E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8

inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

1. Direct-Glue-Down Installation

B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 09680

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Gypsum board.
2. Hollow metal frames.
3. Stain finish for wood windows and doors.
4. Miscellaneous interior surfaces.

1.3 SUBMITTALS

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

1. Product Data: For paints, including printed statement of VOC content and chemical components.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Label each Sample for location and application area.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" and "MPI Maintenance Repainting Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

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

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer:
1. Sherwin-Williams Company
2. Hallman Lindsay Quality Paints
3. Davis Paint Company
4. American Formulating and Manufacturing (AFM) – Safecoat.

2.2 PAINT, GENERAL

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

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

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

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

E. Insure that all mixed colors match the color selection made by the A/E prior to application of the coating.

F. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

G. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according

to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.

H. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.
    o. Hexavalent chromium.
    p. Isophorone.
    q. Lead.
    r. Mercury.
    s. Methyl ethyl ketone.
    t. Methyl isobutyl ketone.
    u. Methylene chloride.
    v. Naphthalene.
    w. Toluene (methylbenzene).
    x. 1,1,1-trichloroethane.
    y. Vinyl chloride.

I. Colors:
1. Sherwin Williams (or equal):
    a. PT-1: Softer Tan 6141 (Main).
    b. PT-2: Plum Brown 6272 (Metal Door Frame).

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer:

1. Safecoat New Wallboard Primecoat HPV
2. Safecoat Transitional Primer
3. AFM MetalCoat Acrylic Metal Primer

2.4 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

1. VOC Content: E Range of E3.

B. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

1. VOC Content: E Range of E3.

C. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

1. VOC Content: E Range of E3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

E. Wood Surfaces:
   1. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended know sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   2. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in occupied spaces including, but not limited to, the following:

   1. Mechanical Work:
      a. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   2. Electrical Work:
      a. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Surfaces to be painted are listed in the Room Finish Schedule, and indicated on the Drawings

B. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.

a. Prime Coat: Rust-inhibitive primer (water based).
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex semi gloss as scheduled.

C. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex as scheduled with the following sheen:
1) Walls, ceilings and soffits: (eggshell).
2) Walls requiring clean-down, as scheduled: (semi gloss).

D. Stained Wood Substrates:

1. Moisture-Cured Clear Polyurethane Over Stain System: MPI INT 6.3Y.

a. Stain Coat: Interior wood stain (semitransparent).
b. Two Finish Coats: Moisture-cured clear polyurethane (flat).

E. Miscellaneous Finishes
1. Finish mechanical piping and electrical conduits, boxes; sprinkler piping and brackets; ductwork and accessories scheduled to receive wall and ceiling finishes with 2 spray coats Interior Latex Satin Dryfall I-1450(waterborne Acrylic Dryfall B42 Series) over appropriate primer.

END OF SECTION 099123

SECTION 123661 – QUARTZ SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Countertops

B. Related Sections include the following:
   1. Section 060110: Rough Carpentry
   2. Section 060120: Finish Carpentry

1.3 SUBMITTALS

A. Shop Drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes in solid surface.

B. Samples:
   1. Submit minimum 6-inch by 6-inch sample in specified finish & color.
   2. Cut sample and seam together for representation of inconspicuous seam.
   3. Indicated full range of color and pattern variation.
   4. Approved samples will be retained as a standard for work.

C. Product Data:
   1. Indicate product description, fabrication information and compliance with specified performance requirements.
      a. Manufacturer's product data for installation adhesives, including printed statement of VOC content and material safety data sheets.
      b. Product data indication that building projects must use materials with recycled content such as the sum of their post-consumer recycled content is equal to or greater than 10%.

D. Product Certificates:
   1. For each type of product, signed by product manufacturer.

E. Fabricator/Installer Qualifications:
   1. Provide copy of certification number.

F. Manufacturer Certificates:
   1. Signed by manufacturers certifying that they comply with requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
   American National Standards Institute (ANSI)
   American Society for Testing and Materials (ASTM)
   National Electrical Manufacturers Association (NEMA)
   NSF International
   1. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

D. Allowable tolerances:
   1. Variation in component size: ±1/8" (3 mm) over a 10' length.
   2. Location of openings: ±1/8" (3 mm) from indicated location.
   3. Maximum 1/8" (3 mm) clearance between quartz surfaces and each wall.

E. Coordination drawings:
   1. Shall be prepared indicating:
      a. Electrical work
      b. Miscellaneous steel for the general work
      c. Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.
   2. Content:
      a. Project specific information, drawn accurately to scale.
      b. Do not base coordination drawings on reproductions of the contract documents or standard printed data. Each location must be field measured and verified.
      c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
      d. Provide alternate sketches to designer for resolution of such conflicts.
      e. Minor dimension changes and difficult installations will not be considered changes to the contract.
   3. Drawings shall be produced in 1/2-inch scale for all fabricated items.
   4. Drawings bus be complete and submitted to the architect within 60 days after award of contract for record only.
      a. No review or approval will be forthcoming.
      b. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Manufacturer's warranty period:
   1. Ten years from date of substantial completion.

1.7 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. HanStone by Hanwha Surfaces: Ruscello. (Basis of design)

2.2 MATERIALS

A. Material:
   1. Homogeneous quartz surfaces material.
   2. Material shall have minimum physical and performance properties specified.

B. Thickness:
   1. 1-1/4inch

C. Edge Treatment:
   1. Round Square

D. Seam width:
   1. <1/8" unless otherwise specified.

2.3 ACCESSORY PRODUCTS

A. Joint adhesive:
   1. Manufacturer approved adhesive to create color-matched seam.

2.4 FACTORY FABRICATION

A. Shop assembly
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
   2. Form joints between components using manufacturer's standard joint adhesive joints.
      a. Reinforce as required.
   3. Rout and finish component edges with clean, sharp returns.
      a. Rout cutouts, radii and contours to template.
      b. Smooth edges.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.
   1. Color:
      a. Piave

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
   1. Tops:
      a. Flat and true to within 1/8" (3 mm) of a flat surface over a 10' length.
      b. Allow a minimum of 1/16" to a maximum of 1/8" (3 mm) clearance between surface and each wall.

B. Form field joints using manufacturer's recommended adhesive, with joint widths no greater than 1/8" (3 mm) in finished work.
   1. Keep components and hands clean when making joints.

C. Keep components and hands clean during installation.
   1. Remove adhesives, sealants and other stains.
   2. Components shall be clean on date of substantial completion.

D. Connections:
   1. Make plumbing connections in accordance with Division 15.
   2. Make electrical connections in accordance with Division 16.

3.2 CLEANING AND PROTECTION

A. Keep components clean during installation.
   1. Remove adhesives, sealants and other stains.

B. Protect surfaces from damage until date of substantial completion.
   1. Replace damaged work.

END OF SECTION 123661

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

GENERAL
The electrical work included in all other divisions is the responsibility of the contractor performing the Division 16 work, unless noted otherwise**.**

RELATED REQUIREMENTS
Applicable provisions of Division 0 and Division 1 shall govern Work under this Section.

WORK INCLUDED IN THE ELECTRICAL CONTRACT
The mention of an Article, operation or method requires that the Contractor shall provide same and perform each operation in accordance with the conditions stated. The Contractor shall provide material, labor, equipment and transportation to complete the project in compliance with the Contract Documents.

Work shall be installed in accordance with State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.

Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become informed as to the extent and character of the work required and its relation to other work in the building.

The Contractor, in conjunction with the Architect's representative, shall establish exact locations of materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

Materials shall be suitably stored and protected prior to installation and work shall be protected after installation, during construction and prior to acceptance.

The Contractor shall furnish scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of equipment and apparatus required to be installed by the Contractor. This equipment shall be removed by the Contractor upon completion of the project.

The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

Temporary electrical service - See General Requirements – Division 1

OMISSIONS
No later than ten (10) days before bid opening, the Contractor shall call to the attention of the engineer any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

DEFINITIONS
The Owner. The City of Madison.

The Architect. Destree Design Architects

The Engineer. JDR Engineering, Inc., Madison, Wisconsin.

This contractor. The Electrical Contractor, also referred to as "The Contractor".

Provide. Furnish, install and wire ready for service.

Exposed. Exposed to view in room, corridor or stairway.

Code. National, State and Local Electrical codes including OSHA requirements.

Substitution. Manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

Signal voltage. NEC class 1, 2, or 3 remote control, signaling, or power limited circuits.

Low voltage. 50 to 600 volts.

ABBREVIATIONS

A/E: Architect or Engineer

ENGR: Engineer

NEC: National Electrical Code

NEMA: National Electrical Manufacturer's Association

NFPA: National Fire Protection Association

OSHA: Occupational Safety and Health Administration

UL: Underwriter's Laboratories

PERMITS AND LICENSES

The Contractor shall prepare and submit applications and working drawings to authorities having jurisdiction over the project. Licenses and permits required shall be secured and paid for by the Contractor.

STANDARDS AND CODES

Work shall be installed in accordance with National, State, and Local codes, ordinances, laws, and regulations. Comply with applicable OSHA regulations.

Materials shall have a UL or ETL label where a UL or ETL Standard or test exist.

DIMENSIONS AND DEFINITE LOCATIONS

The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of equipment and devices shall be established in the field in accordance with instructions from the Architect as established by manufacturer's installation drawings and details.

The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.

Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.

DRAWINGS
The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Upon completion of the project, the contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:

Locations of buried conduit or similar items. Include buried depth.

Field changes of dimension or detail.

Changes made by field order or change order.

Details not on original contract drawings.

Changes to circuit numbers.

Junction box locations and conduit runs, with trade sizes indicated, for lighting, power, and electrical systems installed.

Master-slave light fixture ballasting arrangements.

As Built Drawings - See General Requirements - Division 1.

If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless conflict is resolved by an addendum.

It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

All sizes as given are minimum except as noted.

Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the engineer's inspections, tests and approval, from the commencement of work until acceptance of the completed work.

UTILITY CHARGES
Include utility fees and charges for temporary electrical service.

Utility costs for permanent service shall be paid by the Owner.

MATERIALS AND EQUIPMENT
Materials and equipment required shall be new.

Equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions are allowed except as permitted in this specification.

Items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

SUBSTITUTIONS

Substitutions shall not be allowed. Where the Contractor wishes to use equipment or methods other then those listed by name, that equipment must be approved by the Engineer. To gain approval for equipment not listed, the Contractor shall submit the following to the Engineer for his review:

Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state exceptions taken to the specification and the reasons for exceptions. Documentation relative to the request shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.

Manufacturer's Cut Sheets: Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review. (Furnish 3 copies.)

Lighting Fixtures: Request for substitutions shall include photometric test reports performed by an independent testing laboratory.

The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.

The Contractor shall furnish other information or materials as requested by the Architect/ Engineer to establish equality.

The Contractor shall acknowledge that they have reviewed the submission criteria for the request by stamping the submission with a review stamp or acknowledgement by an accompanying letter.

Equipment and materials submitted for review without proper documentation shall be rejected without review.

Submittal, including samples, shall be received in the Engineer's office prior to bidding.

Materials, equipment, or methods of installation other than those named, shall be in accordance with the general requirements and similar in composition, dimension, construction, capacity, finish and performance.

Upon approval by the engineer, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

Contractors submitting equipment for approval, shall include in their bids incidental costs that may result from the use of equipment. Costs shall include, but not be limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of the product. The Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.

SHOP DRAWING SUBMITTALS AND EQUIPMENT BROCHURES

Submit to Engineer for review, the manufacturer's shop drawings and equipment brochures in quantities determined by the Architect for the following:

Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

Section 26 27 26 - Wiring Devices

Section 26 27 28 - Disconnect Switches

Section 26 51 13 – Interior Lighting Fixtures

Section 26 51 14A – Lamps

Section 26 51 14B – Ballasts

Section 28 31 00 - Fire Detection and Alarm

Shop drawings shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.

Data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:

The name and location of the project.

The name of the Contractor.

The date of submittal.

The date of the drawings and the date of each correction and revision.

If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.

Shop drawings for different systems and equipment shall, be bound separately by specification section and not bound by manufacturer. Submittals which contain different specification section systems bound together shall by returned unreviewed for resubmittal.

Lighting Fixture shop drawings shall consist of a single submittal with all project light fixtures included. Submittals grouped by manufacturer shall not be accepted. The contractor shall be responsible for coordinating drawings from his various suppliers in order to comply with this requirement.

The Contractor shall examine shop drawings and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted properly fit into the construction. The Contractor shall also review previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.

No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for deviations has been granted.

MAINTENANCE MANUALS

The Electrical Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, three sets of a Manual of Operation and Maintenance for each of the electrical and communications systems.

Each manual shall consist of a loose leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover phases of operation of the equipment and shall be illustrated with photographs, drawings, and wiring diagrams. Manuals shall accurately describe the operation, construction and adjustable features of the system and its component parts. The manual shall include an equipment parts listing to facilitate the ordering of spare and replacement parts.

If it is desired to provide maintenance manuals in PDF format, the contractor shall provide a written request prior to submitting the manuals indicating which equipment manuals they propose to provide in this format.

Each manual shall contain two sets of final shop drawings depicting equipment as installed.

CLEANING AND PAINTING
Rubbish resulting from this work shall be removed and disposed of on a daily basis in manner as to be acceptable to the Architect.

The Contractor shall clean exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove rubbish and debris resulting from the work.

Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall repair and paint to match original finish.

Clean other equipment indicated in other sections of the specification for specific equipment.

TESTS AND ACCEPTANCE
The operation of the equipment and electrical systems does not constitute an acceptance of the work. The acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

After the work is completed and prior to acceptance, the Contractor shall conduct the following tests, tabulate data, date, sign and submit to the Engineer:

Standard megger insulation test on each feeder.

Ground resistance test.

Clamp ammeter test on each feeder conductor with utilization equipment energized. The load current in each phase conductor of the feeder or the portion thereof supplying the panel shall not differ from the average connected load currents in the feeder conductors by more than 7½%. If the load current does differ by more than 7½%, the Contractor shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.

Upon completion of the installation, the Contractor shall furnish certificates of approval from authorities having jurisdiction. The Contractor shall demonstrate that work is in perfect operating condition, with race way and conduit system properly grounded, wiring free from grounds, shorts, and that the entire installation is free from physical defects.

In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of miscellaneous systems.

Perform other test as specifically stated in other sections of the specification for specific equipment.

GUARANTEE
See General Requirements – Division 1.

IDENTIFICATION
The entrance door to the primary electrical room shall have a porcelain enameled sign lettered "DANGER HIGH VOLTAGE". This same sign shall also be placed on primary switch.

Each distribution and lighting panel shall be equipped with a typewritten directory describing the loads served. Directory shall be contained in a steel frame mounted on the inside face of the panel's door and shall be covered with a sheet of clear plastic.

Switchboards, transformers, switchgear, telephone backboards, transfer switches, panels and cabinets shall be provided with 1/8" minimum thickness 5 ply lamecoid plastic nameplates indicating usage, plan designation and voltage where applicable. In Equipment and Mechanical Rooms this identification may be on the exterior of the unit, in other areas identification shall be inside the door or cover. Nameplates shall be black with white engraved lettering. Lettering shall be ½" high minimum. Fasten nameplates with escutcheon pins.

Junction and pullboxes smaller than 12" X 12" shall be identified by using a permanent marker on the coverplate indicating originating panelboard and circuit(s) or system served.

Junction and pull boxes with dimensions 12" X 12" and larger shall be stenciled or provided with permanent labels as follows:

Lighting and Power Feeders and Branch Circuits - 120, 208, 277, 480.

Fire Alarm - FA

Branch wiring shall be color coded per industry standards. Where wires of different systems junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

On 3-phase systems, each phase shall be identified at terminals using code markers.

Cover plates for control stations controlling remote equipment shall be engraved to identify the device being controlled.

Motor starters, remote control stations, shall be identified with engraved lamecoid nameplates fastened to the equipment with escutcheon pins. Nameplates shall be 1/8" 5 ply lamecoid with ¼" white letters on a black background. Adhesive cloth labels, similar to those manufactured by Brady Label Co., may be used on motor switches and controls only, indicating the number, designation, size and usage of the motor.

On the inside of coverplates for light switches, occupancy sensors, receptacles, and special purpose outlets, provide a permanent label identifying the panel and circuit number feeding the device. Adhesive plastic tape is permitted for this use.

On light fixtures at the wiring entrance point, provide a permanent label identifying the panel and circuit number feeding the fixture. Adhesive plastic tape is permitted for this use.

Refer to individual specification sections for more specific or additional identification requirements.

ACCESS PANELS

Access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

SPARE PARTS

Requirements for spare parts are outlines in individual specification sections. Spare parts shall be turned over, unopened, to the Owner as part of the maintenance manual submittal.

PREBID SURVEY

Before submitting his bid the Contractor shall tour the job site to review the following:

The exact configuration of areas requiring demolition, temporary power, relocating, etc.

Site conditions for material storage, staging areas, parking, etc.

Problems with work sequence.

Conditions found that are not shown on the documents but that may affect the scope of the work shall be reported to the Engineer.

PART 2 - PRODUCTS

FIRESTOPPING
Fire stopping materials shall include, but not be limited to, mortars, sealants and caulks, putties, collars, intumescent wrap strips mastics, and firestop pillows. Materials and methods used shall be recognized by an independent testing agency and shall have flame and temperature ratings assigned by that agency.

All firestopping systems shall be by the same manufacturer.

Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Materials using solvents or those requiring hazardous waste disposal shall not be used.

The firestop assemblies shall meet fire test and hose stream test requirements of an independent testing agency.

Acceptable manufacturers.
- 3M Corporation.
- STI/Specseal
- Rectorseal Corporation.
- Tremco.
- Hilti.

SLEEVES
Schedule 40 galvanized steel pipe.

ACCESS PANELS
Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12" X 12" for hand access or 24" X 24" for body access.

Panels shall be as manufactured by Milcor or equivalent.

Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.

Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

Panel construction shall be as follows:

Non-Security Areas: Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

Secure Locations: Minimum 16 gauge frame with not less than 14 gauge hinged door panel. Door locks shall be locking type. Furnish and install locking devices in accordance with types specified in Division 11. See plans for secure locations.

PART 3 - EXECUTION

CUTTING AND PATCHING
Refer to General Requirements - Division 1 - Cutting and Patching.

COORDINATION
The Contractor shall cooperate with other trades personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes but is not limited to; light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

FIRESTOPPING
Openings in fire rated construction and annular spaces around conduits, cable trays, and other penetrating items shall be protected in accordance with NEC article 300-21 and in accordance with the Wisconsin Administrative Code, Department of Commerce Chapter 51.049. The fire rating of the protective seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the construction is maintained.

Wall or floor penetrations openings shall be as small as possible.

Openings and annular spaces required by code to be protected, shall be protected whether specifically indicated on the plans or not.

Installation of materials and assemblies shall be in strict accordance with the manufacturer’s instructions.

SLEEVES
Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It shall be the Electrical Contractor's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

Floor sleeves shall extend a minimum of 2 inches above the finished floor.

HOUSEKEEPING AND CLEAN UP
The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION

SECTION 26 05 02
ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

JOB CONDITIONS
The existing building shall remain in service during construction. Power outages and interruptions in all building systems shall be coordinated in advance with the Owner. The time of outages shall be scheduled with the Owner and other trades affected by the outage at least ten working days in advance.

Prior to demolition or alteration of structures, the following shall be accomplished:

Owner release of structure.

Disconnection of electrical power to equipment and circuits removed or affected by demolition work.

Electrical services rerouted or shut off outside area of demolition.

Coordinate sequencing with Owner and other Contractors.

Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.

Notify utilities prior to razing operations to permit them to disconnect and remove or relocate equipment that served existing facilities.

Contractor shall dispose of obsolete material.

Contractor shall notify the Engineer of existing code violations observed during the course of performing his work. If corrective action needs to be taken that changes the scope of the work, a change order will be processed accordingly.

PART 2 - PRODUCTS

MATERIALS AND EQUIPMENT
Materials and equipment for patching and extending work as specified in the individual sections.

PART 3 - EXECUTION

MODIFICATIONS
Feeders, branch circuits, and other system wiring which are to remain in service but which are presently routed through areas being demolished shall be rerouted around demolition area.

REMOVAL
Remove or relocate conduit, wire, boxes, fixtures, and electrical equipment that are in the way of construction.

Reconnect circuits and equipment to be continued in service.

Provide temporary wiring to equipment that is to remain in operation during demolition and whose power will be interrupted as a result of demolition.

Remove electrical equipment released from service as a result of construction.

Do not reuse removed electrical equipment except as specifically shown on the drawings.

Where the plans require existing equipment to be removed or relocated, removal shall include equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors. In instances where a device is removed but active conductors remain in the backbox and the box is mounted in a wall which is remaining, the backbox may remain and a blank coverplate provided. If removal of the box is specifically indicated on the plans the active conductors shall be intercepted at convenient, accessible locations and rerouted to allow existing box to be removed. When boxes are removed from existing walls which remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand flush with adjacent surfaces. The General Contractor shall be responsible for finish work unless specifically indicated otherwise on the plans.

Remove abandoned wiring to source of supply.

DISPOSAL
Dispose of equipment that is removed unless specifically indicated on the drawings.

Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

The Contractor shall tour demolition areas with the Owner to determine the status of other equipment to be removed during demolition. Equipment that is to be salvaged for reuse shall be removed by the Contractor and transported to a designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

Contractor, at his option, may install new conductors in existing raceways provided that the raceways are in place and are properly sized and supported. Existing conduits that are removed from their existing location shall not be reinstalled.

LIGHTING FIXTURE BALLAST DISPOSAL
The contractor shall inspect ballasts in light fixtures removed as part of this project and take the actions described below.

Ballasts labeled as "NON PCB'S" or "NO PCB'S" shall be handled as described in other sections of these specifications which describe demolition or salvage materials handling. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.

PCB ballasts shall have the wires clipped off and the ballasts placed in US DOT approved type 17C or type 17H barrels and placed in storage in a location within the building as designated by the Owner. The Contractor shall provide to the Owner, in typewritten form, a total count of these ballasts and where they are stored.

These ballasts are not to be removed from the work site by the Contractor.

The Contractor shall label and mark the PCB storage barrels with EPA approved PCB labels and shall mark the storage area with signs, marks, and lines to meet the regulations of Wisconsin Code NR 157.

The Contractor shall provide approved PCB absorbent materials to be stored immediately adjacent to the barrel storage area. Do not place loose absorbent material in the barrels.

When the ballast demolition is completed and PCB ballasts are placed in barrels ready to be picked up for disposal, the Contractor shall notify the Owner in writing so the Owner can make arrangements for pick up and disposal of the PCB ballasts.

LIGHTING FIXTURE LAMP DISPOSAL

The Contractor shall be responsible for the proper removal and recycling of existing fixture lamps being removed from service in accordance with EPA and State of Wisconsin DNR requirements.

The Contractor shall be responsible for arranging for recycling of lamps by a licensed waste lamp and bulb recycler. The cost for recycling of removed lamps shall be included in the Contractor's bid.

The Contractor shall carefully package removed lamps to prevent breakage. The Contractor shall store waste lamps in a secure area, either in the container that the lamps are shipped in or in other ways so as to eliminate breakage. Both the lamp storage area and individual containers shall be labeled as hazardous waste. Store lamps in covered containers to prevent lamps from being broken as a result of other debris being placed on top of them.

ASBESTOS REMOVAL

Work involved with asbestos removal, disposal or abatement shall not be considered as part of this project. Work in this regard shall be the responsibility of the Owner. If this Contractor shall discover the presence of asbestos material he shall cease work immediately and notify Owner and Engineer of condition.

ALTERATIONS

The Contractor shall be responsible for work of other trades to facilitate installation of electrical work in the existing building.

Work required by Electrical Contractor which is normally performed by other trades shall be done under direction and at the expense of Electrical Contractor.

CLEANING AND REPAIR

Clean and repair existing materials and equipment which remain or are to be reused.

Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts (if required) and broken electrical parts.

END OF SECTION

SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

RELATED REQUIREMENTS
Application requirements of Division 0 and Division 1 shall govern work under this Section.

SCOPE
Provide wires, cables and connectors as specified herein.

Provide branch wiring and feeder systems to serve lighting, receptacles, motors, and other equipment loads.

The terms “feeders” and “branch circuits” as used in this section are as defined in NEC Article 100.

RELATED WORK
Section 26 05 00 – Common Work Results for Electrical
Section 26 05 33 – Raceway and Boxes for Electrical Systems
Section 26 27 26 - Wiring Devices

QUALITY ASSURANCE
Reference Standards of the following associations:

National Electrical Contractor's Association (NECA) - Standard of Installation

Insulated Cable Engineers Association (ICEA)

SHOP DRAWING SUBMITTALS
Submit product data: Provide for each cable assembly type.

Submit factory test reports: Indicate procedures and values obtained.

Submit shop drawings for modular wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.

Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency.

PART 2 - PRODUCTS

GENERAL
All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

CONDUCTORS
Copper conductor only.

Conductor insulation shall be rated 600 volts minimum. Insulation color for low voltage (secondary feeders and branch circuits) conductors shall vary to depict the type of conductor. Colors shall be as indicated elsewhere in this section and as required by code.

Single conductor #10 AWG size and smaller for general use wiring may be stranded or solid conductors at the contractor’s option, provided with type THWN insulation. Minimum size shall be #12 AWG on 208 volt

systems and #14 AWG for 480 volt systems. Conductors with dual rated insulations are approved provided one of the ratings is THWN.

Single conductor #8 AWG and larger for general use wiring shall be stranded configuration with type THW or THWN insulation. Conductors with triple rated insulations are approved provided the ratings include one of the ratings that are listed.

Conductors installed in wet locations and areas with high humidity shall be type THW. Wet locations shall include, but not be limited to, conduits installed in contact with the earth and underground electrical ductbanks.

Conductors shall not be installed at temperatures below the manufacturer's minimum installation temperature.

Unless specifically indicated otherwise, conductor sizes indicated on the plans are based on the ampacities listed for conductors rated at 75 degrees C. In mechanical rooms and other high temperature applications, the insulation shall be rated 90 degrees C.

All conductors, whether stranded or solid, shall be terminated using approved methods.

JOINTS, TAPS AND SPLICES

CONDUCTORS NO. 10 AWG AND SMALLER
3M Scotch-lok compression type solderless connectors with plastic cover.

JOINTS, TAPS, AND SPLICES IN CONDUCTORS NO 8 AWG AND LARGER
Solderless compression type connectors, tool and die applied, of a type that will not loosen under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.

TAGS AND LABELS

BRANCH CONDUCTOR LABELS
Sleeve type wrap around adhesive markers with factory printed circuit numbers.

FEEDER CONDUCTOR LABELS
Metal tags or flame-resistant adhesive label tags at the Contractor's option. Label shall include conductor source, voltage, and load/equipment served.

RUBBER INSULATING ELECTRICAL TAPE

Scotch 3M model 23, 30 mil tape.

PART 3 - EXECUTION

INSTALLATION
Verify that field measurements are as shown on Drawings.

Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.

Where wire and cable routing is not shown and destination only is indicated, determine exact routing and lengths required.

Install in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

Run wire and cable in conduit, unless otherwise indicated on drawings.

Do not draw conductors into conduits until building is enclosed and watertight and until work that may cause conductor damage has been completed.

Voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of NEC Article 215.

Examine areas and conditions under which conductors are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

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

JOINTS, TAPS AND SPLICES
Each tap, joint, or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and a finish wrap of color coding tape, where required by code.

Cable splices shall be made only in distribution and junction boxes.

WIRE AND CABLE IDENTIFICATION

TAGS AND LABELS
Install tags and or/labels on conductors and cables in junction boxes, pullboxes, wireways, wiring gutters of panels, and other accessible locations. Labels and tags shall contain information under “products” for branch circuit conductors and feeder conductors.

Conductor phase identification. Different conductor insulation colors and electrical tape colors shall be used to identify the different phases of conductors in a given circuit and to identify the neutral and ground conductors. Painted identification is not acceptable. Provide color identification on conductors at accessible locations. Requirements of the Code regarding conductor identification shall always be followed where applicable. In general, colors shall be as follows:

120/208 Volt Systems Neutral Conductor - Solid White: Provide additional markings for neutral conductors in the same raceway.

120/208 Volt Systems A-Phase, B-Phase, And C-Phase Unswitched Legs: Solid black, solid red, and solid blue respectively. Different colors shall be used to identify switched legs.

Ground Conductors - Solid Green: Provide additional markings for ground conductors in the same raceway.

FIXTURE WIRES
Use conductor with insulation rated for current, voltage, and temperature to which conductor is subjected. Conductors used as fixture wires shall be insulated with materials of the type recognized by the National Electrical Code, Article 402.

Minimum wire size shall be selected as defined in NEC Article 240 for the branch circuit overcurrrent device ampacity and conductor length involved.

Insulation rated for operation at 90 degrees C. minimum for lighting fixtures with integral ballast, mogul base sockets, quartz lamps, or otherwise where subject to excessive temperatures.

Fixture wiring shall be unspliced between branch circuits and lampholders (or ballasts) and unspliced between ballasts and lampholders.

FEEDER INSTALLATION
Install in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.

Extend feeders at full capacity from origin to termination.

Feeder conduits shall contain only those conductors constituting a single feeder circuit.

Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular- mil area, insulation type, and terminated in same manner.

Where parallel feeder conductors are run in separate raceways, each raceway shall have same physical characteristics.

Feeders shall follow most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation.

Confine feeders to insulated portions of building, unless otherwise specified.

Trapped feeder runs without facilities for continuous drainage are not acceptable.

Feeder conduits shall not be routed in conduit floor slabs or below basement or grade level floor slabs.

Feeder conductors in switchboards, panelboards, pullboxes, gutters, and other open wiring spaces shall be bundled by feeder using plastic tie wraps at intervals not greater than 3' on center.

BRANCH CIRCUIT CONDUCTORS
Install branch circuits and switched circuits to comply with the circuiting, switching, and functions shown on the drawings.

Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.

Size 120V branch circuits for length of run on following basis:

0 to 75 ft run from panelboard to first outlet: No. 12 AWG minimum.
75 to 125 ft run: increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.
126 to 200 ft run: increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.
201 and above: wiring to be sized for 3% maximum voltage drop.

Provide individual neutral conductors for branch circuits serving isolated ground receptacles and computer equipment. (No common neutrals for these circuits.)

Route branch circuits and switch legs as dictated by construction, these specifications, or instruction from Engineer.

Size conduit, outlet boxes, and other raceway system components in accordance with NEC requirements as minimum.

Circuit numbers as shown on drawings are for Contractor to plan his wiring and for estimating purposes and are not necessarily the exact circuit numbers to be used in that panel for that particular load. Exact circuit numbers for each load are to be selected by the Contractor at his option. Balanced load on panelboard bus is to be determining factor in arrangement of circuits. Panelboards average load shall not differ from phase to phase by ± 7½%.

MOTOR AND EQUIPMENT BRANCH WIRING

Furnish and install motor circuits in accordance with schedules on drawings and code requirements, from source of supply to associated motor starter, and from starter to motor terminal box, including necessary and required intermediate connections.

Conductor and conduit size for motor branch circuits if shown on drawings are sized for motor requirement only. Control wiring is not included in conduit sizes shown on the drawings.

Motors shall have proper conductor sizes in accordance with NEC requirements and nameplate ratings. Contractor is responsible for verification of ratings of motors and installing proper branch circuits.

Obtain manufacturer's wiring diagrams and shop drawings for equipment requiring electrical connections.

Check drawings and specifications of other divisions of work for equipment and work which shall be included.

Motor connections shall be made by compression type connectors using proper tools and fittings.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

SCOPE
Provide equipment for the support of electrical equipment as detailed or indicated on the drawings and as specified herein.

APPLICABLE STANDARDS AND CODES
National Electrical Contractors Association (NECA), Standard of Installation.

National Electrical Manufacturers Association (NEMA).

American National Standards Institute (ANSI).

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
Kindorf.

Midland-Ross Corp.

Elcen Co.

Steel City/Midland-Ross Corp.

Unistrut.

B-Line.

Power-Srut.

GENERAL
Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

LIGHTING FIXTURE SUPPORT
Items including (but not limited to) stems, hickeys, bar hangers, and clips required to securely attach fixtures to ceilings or walls.

Studs and unistrut support for fixture outlet and ceiling support.

Fixture grid hangers for mounting surface fluorescent units to exposed grid ceiling.

Drilled expansion insert type anchors rated for load and application requirements including (but not limited to) sleeve anchors, lag shields, and plastic anchors.

Provide auxiliary supports so that fixtures can be drawn up tightly, cannot be tilted or rotated, and will not be affected by vibrations.

SUPPORT STRUCTURES
Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.

Weld sections, do not use bolts.

MOUNTING PANELS
Size mounting panels to mount necessary equipment, of ¾" exterior grade plywood as specified on drawings.

Provide mounting panels for surface mounted electrical cabinets and enclosures for electrical equipment.

Provide uniform mounting panels as far as practical. Preferred sizes being 12" X 18", 18" X 24", 18" X 30", and 24". X 30".

CONDUIT SUPPORTS
Continuous slot or T-slot galvanized steel concrete insert channel.

PART 3 - EXECUTION

PREPARATION
Install hangers, supports, and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

Determine that ceiling channel system is adequately supported to receive and support lighting fixtures. Where deemed inadequate, do not install fixtures until additional support is provided.

LIGHTING FIXTURES
Install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems so as not to cause tile to sag and so that fixture or device cannot be lifted, rotated, or displaced. Provide additional support of ceiling grid or tees at those locations where tiles and ceiling grid sags.

Install grid troffer support clips in accordance with NEC 410-16(c).

INSTALLATION OF BUILDING ATTACHMENTS
Install building attachments at required locations within concrete or on to structural steel or raceway and equipment support.

Install additional building attachments where support is required for additional concentrated loads.

Install concrete inserts before concrete is placed.

INSTALLATION OF ANCHORS
Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.

Installation methods shall be in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of expansion anchor and an edge of exterior corner of concrete shall be not less than 4½ times the diameter of the hole in which it is installed.

SUPPORT OF CONDUIT

Fasten conduit to structural parts of building in a manner acceptable to Engineer.

Do not use perforated hanger iron.

See section 16111.

Install concrete insert channel, with spacings as recommended by manufacturer. Install with anchor and caps, insert joiner clips and closer seals.

Support conduit as follows:

Single Conduit Runs:

Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for exposed conduit and conduit on exterior walls.

Horizontal Surfaces: Galvanized, heavy duty, 2 hole steel pipe straps.

Multiple Conduit Runs:

Vertical Surfaces: Horizontal or vertical rack channel with conduit straps.

Horizontal Surfaces: Single or double rack channel trapeze, with conduit straps and supported with threaded hanger rods.

Conduits Passing Between Floors and Through Roof:

1¼" and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.

Conduit extending through roof shall pass through a ceiling box at roof lines.

Provide 14-gauge minimum copper box with watertight soldered seams and flanged to serve as pitch pocket for each conduit.

Conduit and pitch pocket shall be installed in advance of roofing work.

VERTICAL CABLE SUPPORT

Conductors in vertical raceways shall be supported using cable supports. Locate supports so that each 25' length of conductor in a vertical raceway is supported.

END OF SECTION

SECTION 26 05 33
RACEWAY FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED REQUIREMENTS
Drawings and General Provisions of Contract, General and Supplementary Conditions, and Division 1 Specifications, apply to this Section

SCOPE
Provide conduit systems for power wiring and communications systems as specified. Flexible, modular-wiring systems shall not be used.

RELATED WORK AND REQUIREMENTS
Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
Section 28 31 00 – Fire Detection and Alarm

QUALITY ASSURANCE
National Electrical Contractor's Association (NECA) Standard of Installation.

National Electrical Code (NEC) including local supplements.

PART 2 - PRODUCTS

CONDUIT FITTINGS - GENERAL
Fittings for metal raceways shall be steel or malleable iron and shall be zinc galvanized, or cadmium plated.

Fittings for PVC raceways shall be of the type recommended by the raceway manufacturer.

Do not use aluminum or die cast fittings.

Do not use running threads.

Do not use indentor type fittings.

Box connector bushings shall have insulated throats. Integral grounding lugs shall be provided where required by code or detailed on the drawings and elsewhere in the specifications.

Termination bushings for conduits that terminate in free air, as at cable trays, communications backboards, in electrical vaults, and in electrical manholes.

For conduits carrying conductors rated 50 volts and below and where no ground connection is required, termination bushings may be push-on, non-metallic, insulating type as manufactured by Arlington Industries, Inc. Equivalent products by other manufacturers are acceptable.

For conduits carrying conductors rated 50 volts and below where a ground connection is required provide termination bushings with insulated throats and integral grounding lugs.

For conduits carrying conductors rated 51 volts and above, termination bushings shall have insulated throats. Integral grounding lug shall be provided where required by code or required on the drawings and elsewhere in the specifications.

GALVANIZED RIGID CONDUIT (GRC) AND INTERMEDIATE METAL CONDUIT (IMC)
Manufactured lengths, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.

Minimum conduit size shall be ½ inch.

Connectors and couplings.
Threaded.

Liquid tight.

ELECTRICAL METALLIC TUBING (EMT)
Standard lengths and size.

Minimum conduit size shall be ½ inch.

Connectors and couplings. All steel set screw type.

POLYVINYL CHLORIDE CONDUIT (PVC)
Standard lengths and sizes.

Minimum size ½ inch with the exception that the minimum size conduit for underground site lighting circuits shall be 1 inch.

Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC-2 standards, UL listed, and as required by NEC. Sunlight resistant.

Rated for 90 degrees C. cable.

Connectors and couplings.
Schedule 40 or 80, to match conduit.

Expansion Fittings: PVC material, Carlon series E945 or equivalent.

Expansion Straps: PVC material, Carlon series E978 or equivalent.

PVC COATED RIGID METAL CONDUIT
Galvanized rigid conduit with external coating of 40 mil (0.1 mm) thick polyvinyl chloride. Conduit must be hot dipped galvanized inside and out including threads. The PVC coating bond to the galvanized steel conduit shall be stronger than the tensile strength of the coating itself.

Fittings and Conduit Bodies: Threaded type, material to match conduit. PVC coated fittings and couplings shall have specially formed sleeves to tightly seal to conduit PVC coating. The sleeves shall extend beyond the fitting or coupling a distance equal to the pipe outside steel diameter or two inches (50 mm) whichever is greater.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT
Galvanized spiral strip flexible steel.

Standard conduit sizes.

Heavy wall, sunlight resistant, PVC jacket.

Minimum size ½ inch.

Connectors and couplings.

Liquid tight.

Grounding type.

Suitable for wet locations.

Tapered threaded hub.

Non-metallic materials.

Fittings and conduit bodies to be ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

FLEXIBLE METAL CONDUIT
Galvanized spiral strip flexible steel.

Standard conduit sizes.

Minimum size ½ inch with the exception that $^{3}/_{8}$ inch diameter may be used to serve individual lighting fixtures installed in a suspended accessible ceiling system.

Connectors and couplings.

Threaded.

Grounding type.

Insulated throat.

Two screw clamp type with locknuts.

Externally Secured.

SURFACE METAL RACEWAYS
Two piece metal construction.

Baked enamel paint finish.

Wiremold 500 series minimum with ivory finish, unless indicated otherwise.

EXPANSION FITTINGS
Copper bonding jumper, Crouse-Hinds Type XJ.

EXPANSION/DEFLECTION FITTINGS
Copper bonding jumper, Crouse-Hinds Type XD.

CONDUIT BODIES
Galvanized or cadmium plated.

Threaded hubs.

Removable cover, with gasket.

Corrosion-resistant screws.

SEALS
Link Seal type as manufactured by Thunderline Corporation.

PART 3 - EXECUTION

GENERAL
Requirements.

Seal conduits that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.

Install wall entrance seal where conduits or direct burial conductors pass through foundation walls below grade.

Install conduit expansion fittings with bonding jumper in following locations:

Conduit runs which cross a structural expansion joint.

Conduit runs where movement perpendicular to axis of conduit may be encountered.

Locate junction boxes, conduit bodies, and other access covers so as to be accessible to electrical wiring.

Cut joints shall be square, reamed smooth, and drawn up tight.

Keep conduit plugged, clean, and dry during construction. Before wire pulling begins, pull cleaning plug through conduits to clear of dirt, oil, moisture, and other debris.

Install #12 AWG pull wire in empty conduit.

Cap spare conduits.

Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal.

Route all conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members except conduit runs routed concealed in poured-in-place concrete floor slabs may be run in a direct line from source to load.

Make bends and offsets without kinking or destroying smooth bore of conduit. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.

Conduit runs that extend through areas of different temperature or atmospheric conditions shall be sealed, drained, and installed in a manner that will prevent drainage of condensed or entrapped moisture into cabinets, and equipment enclosures.

Install bushings with ground lugs and integral plastic linings at equipment with open-bottom conduit entrances.

Size conduit for all other wiring, including but not limited to data, control, security, fire alarm, telecommunications, signal, video, etc. shall be sized per number of conductors pulled and their cross-section. 40% fill shall be maximum for all new conduit fills.

No continuous conduit run shall exceed 100 feet (30 meters) without a junction box.

Install no more than the equivalent of three 90 degree bends between boxes.

Provide 1/8 inch (3 mm) nylon pull string in empty conduit, except sleeves and nipples.

Restrictions.

Conduits shall be routed at least 12" from parallel steam lines, hot water pipes, flues, or high temperature piping. Ducts shall not be closer than 12 inches from such and shall not be closer than 12 inches clear when crossing same.

Do not route conduit over boiler, incinerator, or other high temperature equipment.

Where conduits must cross or follow the same path as water, steam or other fluid piping, electrical conduits shall be installed above, not below, such piping.

CONDUIT LOCATION REQUIREMENTS

Interior conduits for wiring systems rated 50 to 600 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:

Conduits in poured concrete construction shall be IMC or GRC regardless of size.

Flexible conduit where required by other paragraphs in this section.

Unless otherwise restricted by codes.

Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.

Conduits in corrosive locations shall be PVC coated GRC. See floor plans for corrosive locations.

Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

Interior conduits for wiring systems rated 0 to 50 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:

Conduits in poured concrete construction shall be IMC or GRC regardless of size.

Flexible conduit where required by other paragraphs of this section.

Unless otherwise restricted by codes.

Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.

Conduits in corrosive locations shall be PVC coated GRC. See floor plans for corrosive locations.

Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

Interior underground conduit runs are defined as those conduits in contact with the earth, below basement floor slabs or below slabs on grade, within the building footprint, where the runs penetrate the floor slabs vertically. These conduits shall be schedule 40 heavy wall PVC except as follows:

Where specifically indicated otherwise on the plans.

Galvanized rigid conduit elbows shall be used where these conduit runs penetrate the floor slab so that there is no exposed PVC within the building.

Conduits embedded in concrete lighting fixture pole bases shall be galvanized rigid conduit.

Conduits containing only electrical service bare copper grounding conductors shall be schedule 40 HW PVC.

Conduit connections at motors, transformers, and other equipment that vibrates:

Flexible metal conduit between 18 inches and 3 feet long for conduit connections at equipment that vibrates.

Liquid-tight flexible metal conduit where flexible connections are required and where conduit is exposed to moisture, dirt, fumes, oil, corrosive atmosphere. Locate so it is least subject to physical abuse. Corrosive areas are identified on the floor plans.

Use double locknuts and insulated bushings with threads fully engaged.

Conduit connections at ceiling recessed light fixtures. Provide flexible steel conduit whips between an independent junction box mounted above ceiling and the recessed ceiling mounted lighting fixtures. Allow for positioning of equipment to tile increments. Maximum length of whip shall be six feet.

Conduits in electrical ductbanks shall be as specified in section 16118.

FLEXIBLE CONDUITS

Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit and prevent entrance of moisture.

CONCEALMENT

Unless specifically noted otherwise, conduits shall be routed concealed in finished spaces and shall not be visible at any point within the finished space or from the building's exterior. This requirement also applies to new conduits installed in existing construction.

At the contractor's option, conduits may be installed concealed below basement floor slabs or below slabs on grade.

Conduits may be routed exposed in mechanical equipment rooms and utility rooms.

SUPPORTS

Raceways installed concealed in the stud space of hollow, stud and drywall partitions shall be fastened to steel studs with spring steel clips. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions. Conduit supports utilizing tie wires shall not be used.

Interior surface mounted conduits attached to walls:

Raceways 1 ¼" diameter and smaller. One hole support straps.

Raceways 1 ½" diameter and larger. Two hole straps.

Light gauge steel framing fastened to wall surface with conduits fastened to steel framing using two piece conduit clamps.

Interior surface mounted conduits attached to underside of structural ceilings and roofs:

Two hole support straps.

Light gauge steel framing fastened to ceiling surface with conduits fastened to steel framing using two piece conduit clamps.

Where underside of roof structure consists of steel trusses, joists, beams, etc., spring steel clips for supporting raceways will be allowed. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions.

Interior conduit runs suspended from the underside of structural ceilings and roofs:.

Single Conduit Runs: Threaded rod fastened to structure with conduit attached to rod utilizing steel, yoke type support.

Multiple Conduit Runs: Horizontal light gauge steel framing suspended from structure with threaded rods, minimum two per frame, in a trapeze configuration. Conduits fastened to steel framing using two piece conduit clamps.

Conduit shall not be fastened to the corrugated metal roof deck.

Provide riser clamps around all conduits 1-$^{1}/_{4}$ inch or larger that are routed between floors.

Conduits shall not be supported by, or attached to the suspension systems for dropped ceiling systems unless specifically detailed on the drawings.

Secure conduits in place with malleable corrosion-proof alloy straps or hangers.

The use of perforated strapping as a conduit hanging method is not acceptable.

The use of tie wires to support conduits is not acceptable.

CONCRETE AND MASONRY CONSTRUCTION

Conduits routed within poured concrete construction (poured walls, floor slabs, topping slabs) shall comply with the following requirements:

Conduits shall be parallel to each other, spaced on center to center distance of at least three times conduit trade diameter, and provided with a minimum of 2 inches concrete covering. Contractor shall note that precast planks below topping slabs may camber with topping slab thickness less at the high point of the camber.

Conduits larger than 1¼ inch diameter shall not be installed in floor slabs. Conduits over $^{3}/_{4}$ inch diameter shall not be installed in topping slabs.

Conduit is not permitted in any slab topping of two inches (50 mm) or less.

Conduits embedded in a structural frame slab shall comply with applicable provisions of American Concrete Institute (ACI), Standard 318. Refer to structural drawings for locations of structural frames.

Conduits used for feeders shall not be embedded in concrete floor slabs or concrete topping slabs.

Conduits in poured concrete construction shall not cross other conduits or other piping.

Unless specifically indicated on the electrical plans, conduits installed in poured concrete construction shall be approved by the Structural Engineer prior to conduit installation. Submit drawings showing conduit sizes and routings to the Architect for his review. Contractors who base their bid on the assumption that conduits are allowed in concrete construction do so at their own risk. No changes will be

made to the contract if, during construction, the Structural Engineer prohibits the installation of conduit in concrete construction.

In areas constructed of precast concrete, conduits may be run in cores of planks.

FIRESTOPPING
Provide firestopping at conduit penetrations through fire rated construction in accordance with section 16010.

CUTTING AND PATCHING
Provisions for openings, holes, and clearances through walls, floors, ceilings, and partitions shall be made in advance of construction.

Provide cutting, patching and painting necessary for the installation of electrical systems.

Where conduits need to penetrate concrete or masonry construction install 22 gauge galvanized steel pipe sleeves, 1 inch larger in diameter than the conduit being installed. Sleeves shall extend 2 inches above the floor slab or wall penetrated. Install sleeves before walls or slabs are poured or constructed.

Provide drawings indicating size and location of anticipated floor sleeves for the installation of electrical conduits.

ADJUSTMENT AND CLEANING
Restore damaged areas on PVC jacketed, rigid conduit with spray type touch-up coating compound or as recommended by manufacturer.

CONDUIT SYSTEMS
Where raceway systems are required, separate raceway systems shall be provided for each wiring system as follows:

208 volt normal power wiring systems.

Fire alarm systems.

END OF SECTION

SECTION 26 05 34
BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

SCOPE
Provide electrical boxes in accordance with this specification.

RELATED WORK
Section 26 05 33 – Raceway for Electrical Systems
Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
Section 26 27 26 - Wiring Devices
Section 26 05 29 – Hangers and Supports for Electrical Systems

QUALITY ASSURANCE
Reference Standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PRODUCTS

INTERIOR WALL OUTLET BOXES - FLUSH MOUNTED
Stamped steel, four inch square, 2-1/8" deep minimum, with square corners. Provide with raised device rings, height to match wall finish thickness. Mounting accessories. Larger width boxes shall be provided for ganging requirements indicated on plans.

INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DRY LOCATION
Stamped steel, four-inch square, 2-1/8" deep, with round corners. Provide rounded corner raised box covers with openings for devices being installed. Refer to section 16111 for restrictions on exposed conduit systems.

INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DAMP OR WET LOCATION
Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to section 16111 for restrictions on exposed conduit systems.

CEILING BOXES - FLUSH MOUNTED - FOR SURFACE AND PENDANT LIGHT FIXTURES
Dropped ceiling construction. Stamped steel four-inch octagon box set flush with finished surface, with 3/8 in. fixture stud.

Cast in place concrete construction. Stamped steel four inch octagonal, galvanized concrete boxes, having a minimum depth of 3 in. with 3/8 in. fixture stud.

SPECIAL BOXES
Provide special boxes fabricated by the manufacturer of fixtures and other devices where standard outlets are not applicable.

GENERAL PURPOSE JUNCTION AND PULL BOXES
Fabricate from code gauge galvanized steel, with covers held in place by corrosion resistant machine screws.

Size shall conform to code requirements for number of conduits and conductors entering and leaving box, minimum 4" square by 2-1/8" deep for use with 1" conduit and smaller.

Provide with welded seams, where applicable, and equip with corrosion-resistant nuts, bolts, screws, and washers.

For telecommunication, fiber optic, security, and other low voltage cable installations, the NEC box size requirements shall apply. All boxes used on telecommunication, security, other low voltage and fiber optic systems with conduits of 1 1/4" and larger, shall be sized per the NEC conduit requirements. For determining box size, the conduit is the determining factor not the wire size.

ACCESS PANELS
Furnish type necessary for the particular wall or ceiling construction in which they occur.

Panels shall contain screwdriver cam locking device.

WEATHERPROOF JUNCTION AND PULL BOXES
Stainless steel or cadmium plated malleable iron cast type with threaded hubs, cast cover, and neoprene gasket.

BETWEEN STUD BOX SUPPORT BRACKETS
Stamped and fabricated steel bracket designed to support 4" or 4-11/16" electrical boxes between wall studs.

Manufactured by Erico, RBS series or equivalent.

GENERAL
All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

PART 3 - EXECUTION

INSTALLATION
Install electrical boxes, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices.

Seal conduit at entrance to weatherproof boxes for interior and exterior locations exposed to weather or moisture.

Install knockout closures to cap unused knockout holes where blanks have been removed.

Locate boxes to provide access to electrical wiring. Relocate boxes rendered inaccessible by the installation of work by other trades.

Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers.

Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum 12 inches.

Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

Do not burn conduit holes, use knock-out punches, or hole saws.

Use "no-bolt" studs where required.

Use handy boxes only where specifically detailed on the drawings.

Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings within the box. Do not use box extensions to create additional volume to meet NEC requirements for the number of conductors contained in a box.

Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.

Install boxes in walls without damaging wall insulation.

Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

EXPOSED OUTLET AND JUNCTION BOXES
Install weatherproof outlet and junction boxes outdoors and in areas where drawings show weatherproof (WP) wiring devices.

INTERIOR OUTLET BOX ACCESSORIES
Provide outlet box accessories for each installation, including but not limited to: mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes being used and meeting requirements of individual wiring situations.

LIGHTING FIXTURE OUTLET BOXES
Securely mount with bar type hangers spanning structural members to support weight of fixture.

Do not support from conduit.

Equip with $^{3}/_{8}$ inch fixture studs and tapped fixture ears, for surface mounted or pendant mounted lighting fixtures. Fixture studs shall be provided for mounting of lighting fixtures exceeding 25 lbs. in weight. Fixture studs shall be attached through knockouts at the top of the box.

Provide additional attachments from structure for outlet boxes supporting lighting fixtures weighing in excess of 25 lb.

OUTLET BOX LOCATIONS
Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to a minimum.

Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified and shall be determined by:

Construction or code requirements.
Conflict with equipment of other trades.
Equipment manufacturer's drawings.

Where receptacles and communications outlets are shown grouped next to each other on the drawings, the boxes for these outlets shall be mounted next to each other and shall not be located according to stud spacings. The Contractor shall utilize between stud box supports to assist in mounting boxes proximal to one another on a consistent spacing between wall studs.

Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in.

Mounting heights for devices and equipment to be measured from finished floor to centerline of device.

Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

Boxes shall not be fastened to the metal roof deck.

It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.

The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch (450 mm) by 24 inch (600 mm) access doors.

Locate and install to maintain headroom and to present a neat appearance.

Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

SCOPE
Provide wiring devices generally consisting of switches and receptacles as indicated on the drawings and as specified herein.

RELATED WORK
Section 26 05 34 – Boxes for Electrical Systems

SHOP DRAWING SUBMITTALS
Listing of brand names and types of materials proposed for use.

Nameplate nomenclature.

Electrical ratings.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
Use of a manufacturer's name and model or catalog number is for purpose of establishing standard of quality and general configuration desired only:

Arrow-Hart, Inc.
Hubbell Wiring Device Div.
Pass and Seymour, Inc.
Crouse-Hinds
Leviton
General Electric
Lutron (switches & dimmers only)
Lightolier (switches & dimmers only)
Watt Stopper
Hubbell Building Automation

GENERAL
Provide factory-fabricated, NEMA specification grade wiring devices in type, color, and electrical rating for service indicated.

Provide wiring devices of one manufacturer.

See Symbols List on drawings for identification of device type.

Wiring devices for use with stranded conductor shall have a clamping type terminal that can be physically tightened. The clamping device shall not be a spring type of clamp.

SWITCHES

GENERAL USE LIGHTING SWITCHES
20 amp toggle type. Pass and Seymour Cat. No. CS20AC1-Almond. Switch color shall be red where it controls an emergency circuit.

Switches controlling equipment, the operation of which is not evident from the switch position, shall include flush neon pilot light in conjunction with proper switch. Such switches are identified on the drawings with a "P". Each switch shall be complete with engraved plate to identify equipment being controlled. (White letters on black, 1/8 in. high minimum.) Provide a two-gang switch plate. Mount toggle switch in one opening, red neon pilot light in the other. Light shall be Pass and Seymour Cat. No. 2151RED or equivalent.

RECEPTACLES
GENERAL USE DUPLEX RECEPTACLES
NEMA type 5-15R, grounding type, 15 amp, 120 volt rating. Pass and Seymour Cat. No. 5262-Almond. Receptacle color shall be red where served from an emergency circuit.

Where a single duplex receptacle is wired to a dedicated 20 ampere, 120 volt circuit, provide NEMA type 5-20R grounding type 20 ampere receptacles. Pass and Seymour Cat. No. 5362-Almond.

SPECIAL PURPOSE RECEPTACLES
As shown on drawings and schedules.

Ground fault circuit interrupter duplex receptacles. Pass and Seymour Cat. No. 1595LA with Cat. No. 1591-WP coverplate.

WIRING DEVICE PLATES AND COVERS
Provide wall plates for wiring devices, with ganging and cutouts as indicated and with metal screws for securing plates to devices, screw heads colored to match finish of plate.

PLATES FOR FLUSH MOUNTED DEVICES
Coverplates shall be of plastic, non-combustible, mar-proof thermosetting material, minimum 0.100" thick. Color of plates shall be of almond except that color shall be red for devices associated with emergency circuits.

PLATES IN DOOR FRAMES
Pass and Seymour/Sierra narrow "SNK" multiple opening type no. 430 stainless steel.

Device plates for surface mounted Type FS or FD boxes: Type FSK galvanized steel covers.

Device plates for surface mounted 4 inch square boxes: ½ in. raised galvanized steel covers.

Weatherproof plates and covers for exterior duplex receptacles or receptacles in damp locations. Provide UV stabilized polycarbonate hinged and lockable cover with gasketing between device enclosure and the mounting surface and between the device cover and cover body for a weatherproof while in use installation, Taymac cat. no. 20370 or equal. Devices required to be weatherproof are identified on the plans.

Device plates in interview rooms, dayrooms, dormitories, multipurpose rooms, locker rooms, inmate toilet rooms, and all other areas subjected to unsupervised inmates shall be 10 gauge prison coverplates: Morlite, Kenall or Fail-Safe.

CONTACT SWITCHES
Momentary contact switches shall be single pole, double throw, center OFF heavy duty toggle type

switches, Pass & Seymour Cat. No. 1081.

Multi-gang Momentary Contact Switches. (Low Voltage Switch Station LVSS) shall be single pole double throw devices. Mount up to 8 switches in a 4"/16" square box. Provide blank switches in unused switch openings.

Switches to be as follows:

Unlit standard GE Cat. No. RS2
Unlit keyed GE Cat. No. RS2-K
Lit standard GE Cat. No. RS2-L
Lit keyed GE Cat. No. RS2-LK
Pilot light standard GE Cat. No. RS2-P
Pilot light keyed GE Cat. No. RS2-PK
Unlit blank standard GE Cat. No. RA2
Red unlit standard GE Cat. No. RS2-38
Red pilot light standard GE Cat. No. RS2-38-P

Normal power switches to be almond color.

Emergency power switches to be red in color.

Maintained contact switches shall be 3 position. Center off, Pass & Seymour SPDT 1225; DPDT 1226.

Gang all switches and dimmer at one location together in the same junction box under one coverplate.

Switches controlling normal source circuits shall be "almond" in color.

Switches controlling emergency source circuits shall be "red" in color.

OCCUPANCY SENSORS
Refer to Occupancy Sensor Schedule on plans for occupancy sensor requirements.

Contractor shall provide equipment submittals which include product data sheets, equipment description and bill of materials listing all component devices.

Contractor shall provide the proper quantities and types of sensors for complete coverage of the areas to be controlled.

Contractor shall properly install, wire, test and adjust sensors according to manufacturer's instructions.

Contractor shall be responsible for a complete and operational system as specified.

Contractor shall warrant all equipment and installation for a period of one year from date of Owner's acceptance. Contractor shall make any necessary adjustments to the system at no charge to the Owner during warranty period.

Contractor/Regional Sales Manager shall provide training to the Owner's representative in the use, operation, adjustment and maintenance of the equipment.

Contractor shall set the sensors time delays per owner's instructions.

PART 3 - EXECUTION

INSPECTION
Examine areas and conditions under which wiring devices are to be installed and notify Engineer, in writing, of conditions detrimental to proper and timely completion of work.

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

INSTALLATION
Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

Do not install devices until wiring is complete.

Do not install devices until after wall finishes (wall covering, painting, wallpaper, etc.) have been completely applied. Any outlets installed prior to walls being finished and used for construction power shall be replaced at the time of substantial completion.

Before installing receptacles and switches, clean electrical boxes of dirt and debris.

Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or otherwise. Make circuit connections via wire connectors and pigtails.

Install gasket plates for devices or system components having light emitting features, such as switches with pilot lights. Where installed on rough textured surfaces, seal plates with black self-adhesive poly-foam.

Ground receptacles with an insulated green ground wire from device ground screw to a bolted outlet box connection. Route a continuous green equipment grounding conductor with branch circuit conductors serving isolated ground receptacles. Terminate the equipment ground on the ground bus in panelboards.

Install emergency switches which occur adjacent to normal light switches in separate boxes to maintain systems isolation in accordance with the NEC. Provide red wiring devices and coverplates for devices wired to emergency power circuits.

Stranded conductor terminating on wiring devices shall be terminated in a clamping terminal and not on the screw terminal.

Provide a layer of electrical tape around the perimeter sides of each wiring device so that the terminations are insulated.

Where GFI protected receptacles are indicated on the plans, each receptacle indicated shall be a GFI receptacle. Standard receptacles protected with an upstream GFI receptacle shall not be approved.

Receptacles fed from the UPS system shall have the complete circuit number marked on the device coverplate with a permanent label.

FIELD QUALITY CONTROL
Provide operational testing for all devices.

Test receptacles with Hubbell 5200, Woodhead 1750, or equal, for correct polarity, proper ground connection, and wiring faults.

SPARE PARTS
Provide one(1) of each of the following to the owner for future use;

Occupancy sensors (One of each type specified on project)
Dimmers

END OF SECTION

SECTION 26 51 13
INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable provisions of Division 0 and Division 1 shall govern work in this Section.

SCOPE
Provide and install lighting fixtures and related accessories as shown on the drawings and as specified herein.

RELATED WORK
Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
Section 26 05 29 – Hangers and Supports for Electrical Systems
Section 26 51 14A - Lamps
Section 26 51 14B - Ballasts

QUALITY ASSURANCE
Comply with the requirements of the following regulatory agencies:

National Fire Protection Association (NFPA) Chapter 70 - National Electric Code (NEC) and Wisconsin Amendments thereto.

Underwriters' Laboratories, Inc. (UL).

Conform to the standards of the following agencies:

National Electrical Manufacturers Association (NEMA).
Certified Ballast Manufacturers Association (CBM).
American National Standards Institute (ANSI), Standard C82.1.

SHOP DRAWING SUBMITTALS
Submit manufacturer's printed data on lighting fixtures.

Submit fixture shop drawings in booklet form with index and a separate sheet for each fixture, assembled in luminaire "type" alphabetical order with specified fixture and accessories clearly indicated on each sheet.

Shop drawings for project light fixtures shall be submitted to the Engineer as a single submittal. It shall be the Contractor's responsibility to combine drawings from his different distributors to produce a single submittal to the Engineer. Partial submittals will be rejected without review. Partial resubmittals of rejected fixtures are permitted.

Where the fixture requires a ballast for proper operation, cut sheets of the ballast shall be included with the shop drawings on a fixture by fixture basis.

Where indicated on the Lighting Fixture Schedule, the contractor shall provide operating light fixture samples for review to accompany the fixture shop drawings. Samples shall remain on the construction site during construction and fixtures delivered shall be of identical manufacture as the samples. Contractor shall include in his bid, purchase of samples and storage on site during construction. After completion of project these samples shall be given to Owner as spares.

Submit a copy of UL test report if requested by Engineer. Include the following information as a minimum:

Dimensional information.
Description of the fixture construction.
Recommended lamps for use in that particular fixture.
Photometric test reports.
Warnings regarding special requirements regarding the use of the lighting fixture.

PART 2 - PRODUCTS

LIGHTING FIXTURES
Provide lighting fixtures of the size, type, and rating indicated in "Lighting Fixture Schedule" with lamps, lampholders, reflectors, ballasts, starters, wiring and other equipment.

Fixture catalog numbers do not necessarily include all accessories required for the installation. Catalog numbers used in the Lighting Fixture Schedule are used to designate the fixture series, size and lamping requirements. Refer to the lighting fixture schedule notes for additional requirements.

Gasketing material for use in lighting fixtures shall be vinyl, neoprene or other non-aging type material.

Provide proper trim for each fixture for the various types of ceiling being installed throughout project. Provide the necessary plaster frames, fixture ends, caps, suspension units, mounting brackets, and other auxiliary parts required.

FLUORESCENT FIXTURES
Fabricate of sheet steel, die-formed to provide rigidity.

The color finish of each surface or pendant mounted lighting fixture is to be verified with the Architect at the time of shop drawing review.

Lens panels for fluorescent troffers shall be framed and be equipped with hinge and latch. Equip frames and louvers with retaining means to support frame during relamping.

Fluorescent rapid start fixtures, 40W and smaller, shall incorporate a grounded metal starting aid such as reflector or ballast channel strip, at least 1 inch wide over full length of lamp and within maximum ½ inch distance from lamp per ANSI C82.1.

Fixture ballast case temperature shall not exceed 90 degrees C.

At his option, contractor may provide a multi-lamp ballast in one fluorescent light fixture that drives lamps both in the fixture where the ballast is located and another light fixture. This is known as a “master-slave” ballast arrangement. This arrangement is acceptable provided the following requirements are met:

The light fixture switching and circuiting arrangements shown on the plans shall not be deviated from.

Project as-built drawings shall be marked up to reflect the master/slave ballasting arrangements as installed. As-builts shall identify fixture ballast locations and shall identify which lamps are driven by which ballasts.

LENSES
Plastic fixture lenses and diffusers, 100% virgin acrylic material. Lenses minimum .125 average thickness.

PART 3 - EXECUTION

INSPECTION
Examine areas and conditions under which lighting fixtures are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

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

Verify ceiling system compatibility with recessed fixture mounting before releasing the order for manufacture.

INSTALLATION
Install lighting fixtures of types indicated where shown on drawings and at indicated heights.

Install in accordance with manufacturer's written instructions.

Fasten fixtures securely to indicated structural support members.

Install pendant fixtures plumb.

Provide proper bushings for wire entrances. Ground fixture chassis to conduit system.

Coordinate with trades so lighting fixtures are properly aligned with items including, but not limited to diffusers, grilles, and speakers. If necessary, relocate fixtures so there is no conflict with other equipment.

Make fixture holes for wire entrance with knock-out punches or hole saw, remove burrs. Do not cut holes with tin snips.

Joints between recessed fixtures and ceiling shall be light-tight.

Recessed lighting fixtures which are installed in a rough textured ceiling surface whereby light may be emitted between fixture frame and ceiling surface shall have black self-adhesive polyfoam gasketing installed around inside edges of frame to prevent light leaks.

Care shall be taken in placement of outlets and surface-mounted fixtures to maintain alignment, spacings, layout, and general arrangement shown on drawings. Contractor may vary these dimensions slightly in order to clear obstructions. Major changes in the arrangement require acceptance by Engineer.

Install tandem fixtures in continuous rows providing that finished appearance conforms to appearance of individual units.

Align and plumb rows of light fixtures.

Mount wall and ceiling fixtures independent and secure so that they are not dependent on finish for support and cannot be rotated or displaced.

Maintain clearances required in Section 410.66 or the NEC. Notify Engineer of conflicts prior to rough-in.

Where applicable, interface with air handling accessories furnished and installed under Division 15.

FIXTURE SUPPORTS
See Section 16190 for fixture support items, including but not limited to, as devices procedures, and retaining clips.

Surface or pendant mounted lighting fixtures weighing in excess of 25 pounds shall be securely supported to the outlet box through the use of a fixture stud. The stud shall attach to the box through a knockout in the top of the box. Fixture support shall not be solely dependant on the ears of the box.

Securely attach outlet boxes to the building structure either directly to the structure or through the use of a threaded rod or steel channel.

FIXTURE BALLASTS
At the contractor's option, a single ballast may serve lamps in more than one fixture (tandem wiring) under the following conditions:

Fixtures served by a single ballast must be in the same room.

One ballast shall not serve lamps in more than two fixtures.

Multiple recessed fixtures with lamps served from a single ballast must be within ten feet of each other measured center to center.

Multiple surface or pendant fixtures with lamps served from a single ballast must be within one foot of each other measured edge to edge.

ADJUST AND CLEAN
Clean lighting fixtures of dirt and debris prior to acceptance. Cleaning shall include lamps, reflectors, lenses, louvers and exposed trims and housings.

Protect installed fixtures from damage during the construction period.

Aim adjustable fixtures to satisfaction of Engineer.

Remove conspicuous trade labels.

FIELD QUALITY CONTROL
At time of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Engineer.

PRODUCT STORAGE AND HANDLING
Handle lighting fixtures carefully to prevent breakage, denting, and scoring finish.

Do not install damaged lighting fixtures.

Do not repair damaged fixtures; replace and return damaged units to equipment manufacturer for repair.

Store lighting fixtures in a clean, dry space. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

JOB CONDITIONS
Contractor shall determine that ceiling suspension system is adequately supported to receive and support the lighting fixtures. Where deemed inadequate, do not install fixtures until additional support has been provided.

Verify local codes and ordinances that may pertain to installation and aiming of exterior fixtures. Notify Engineer prior to Bid time if problems are encountered.

END OF SECTION

SECTION 26 51 14A
LAMPS

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

SCOPE
The Contractor shall furnish and install the initial fill of lamps for lighting fixtures. Lamps shall be of size and type as called for in the lighting fixture schedule and as recommended by the fixture manufacturer. Where scheduled lamp types differs from that recommended by the manufacturer, the Contractor shall furnish lamps as recommended by the lighting fixture manufacturer.

RELATED WORK
Section 26 51 14B - Ballasts
Section 26 51 13 – Interior Lighting Fixtures

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS
General Electric Co. and Sylvania.

Special Manufacturers as noted on the lighting fixture schedule.

FLUORESCENT LAMPS – T8
Fluorescent lamps to be the color designation as specified in the lighting fixture schedule.

Lamps shall be high lumen type; minimum 3100 lumens initial, 2915 lumens mean.

Lamps shall be minimum 82CRI.

Rapid start lamps shall be siliconized at the factory.

Rapid start lamps installed in unheated spaces or areas with low ambient temperatures (60 degrees F or less) shall be standard 400 ma lamps.

PART 3 - EXECUTION

DELIVERY AND STORAGE
Lamps shall be new and delivered to the job in sealed cartons and protected from dirt and dust during storage on the project.

INSTALLATION
Lamps shall be taken directly from the cartons and installed in the fixtures with special care so that they do not become dusty and are not soiled in the process.

Lamps installed in fixtures using dimming ballasts shall be burned in at 100% rated output by the contractor for a minimum of 100 hours as recommended by the lamp manufacturer.

REPLACEMENT
Lamps not functioning properly at substantial completion of the project or lamps where light output is noticeably reduced, shall be replaced by the Contractor.

END OF SECTION

SECTION 26 51 14B
BALLASTS

PART 1 - GENERAL

RELATED REQUIREMENTS
Applicable requirements of Division 0 and Division 1 shall govern work in this section.

SCOPE
Provide ballasts for fluorescent lighting fixtures as shown on the drawings and as specified herein.

RELATED WORK
Section 26 51 14A - Lamps
Section 26 51 13 - Lighting Fixtures

QUALITY ASSURANCE
Ballasts shall have the following approvals/certifications:

Certified Ballast Manufacturer's (CBM) Approval
Underwriters Laboratories (UL) Approval
Electrical Testing Laboratory (ETL) Certified

SHOP DRAWING SUBMITTALS
Where a light fixture requires a ballast for proper operation, cut sheets of the ballast shall be included with the light fixture shop drawings on a fixture by fixture basis.

PART 2 - PRODUCTS

All ballasts shall be provided as outlined in the plans on the Lighting Fixture Schedule.

ACCEPTABLE MANUFACTURERS

HIGH FREQUENCY ELECTRONIC FLUORESCENT BALLASTS
GE

Universal.

Advance.

Osram/Sylvania.

DIMMABLE ELECTRONIC FLUORESCENT BALLASTS
GE

Osram/Sylvania.

Advance.

Universal.

GENERAL

Ballasts shall comply with UL requirements with regards to thermal protection. Each ballast shall be equipped with thermal sensitive devices that will de-activate the ballast in the event higher than normal operating temperatures occur within the ballast. Internal protective devices shall be automatic resetting.

Ballasts shall comply with applicable ANSI/IEEE standards/guides for harmonic distortion and line voltage transient protection.

Electronic ballasts shall be UL listed, Class P, Type 1, with best available audible noise rating (Class A for all electronic ballasts).

Ballasts shall not contain PCB's.

Outdoor ballasts and ballasts in unheated areas shall operate to -20 degrees F unless noted otherwise in the lighting fixture schedule.

The manufacturer shall provide written warranty against defects in material or workmanship, including replacement, for five years from date of manufacturer.

Ballasts shall be manufactured in an ISO 9001 Certified Facility. Manufacturer shall have been building ballasts for at least fifteen years.

Ballasts shall be labeled with manufacturer's name, part number, supply voltage, lamp type, amperage draw for each lamp type and UL listing.

Multiple acceptable dimmers and ballast manufacturers are listed in these specifications. Not every dimming ballast manufacturer listed is compatible with every dimming system manufacturer listed. The Electrical Contractor shall verify the compatibility between the dimmers selected and the dimming ballasts selected and shall document verification as part of shop drawing submittals

HIGH FREQUENCY ELECTRONIC BALLASTS FOR LINEAR AND LONG TWIN TUBE BI-AXIAL FLUORESCENT LAMPS

Ballasts for T8 and T5 fluorescent lamps shall be ultra efficient universal voltage program/rapid start electronic ballasts (>90%).

Ballasts shall operate from 60 or 50 Hz input source of +/- 10% nominal ballast line voltage.

Ballast nominal line voltage shall be universal 120-277 volt.

Ballasts shall operate lamps at an output frequency of 20 to 35 kilohertz with no detectable flicker.

Ballasts shall guarantee to deliver normal lamp life and light output according to lamp manufacturer's publications.

Ballast shall provide for a minimum lamp starting temperature of 0 degrees F (-22 degrees F as indicated on plans.)

Ballasts shall comply with FCC and NEMA limits governing EMI and RFI interference and shall not impede the operation of the other electrical equipment.

Ballast shall have Total Harmonic Distortion of less than 10%.

Ballast crest factor shall be 1.7 or less.

Operating temperature shall not exceed 60 degrees C. on the case during normal operation. Minimum lamp starting temperature shall be -18 degrees C/0 degrees F

HIGH FREQUENCY ELECTRONIC BALLASTS FOR 4-pin COMPACT FLUORESCENT LAMPS
Ballasts shall be universal voltage programmed start electronic ballast.

Ballast shall incorporate lamp shut-down circuitry for end of lamp life protection.

Ballasts shall operate from 60 or 50 Hz input source of +/- 10% nominal ballast line voltage.

Ballast nominal lime voltage shall be universal 120-277 volt.

Ballasts shall have input power factor above 98%. Ballast factor shall be 0.97 or higher for single lamp operation.

Ballast shall be metal can construction to meet all plenum requirements and to eliminate the need for extra grounding wires.

Ballast crest factor shall be 1.7 or less.

Ballast shall have Total Harmonic Distortion of less than 10%.

Ballast shall operate lamps with no visible flicker (< 3% flicker index)

Ballast shall be high frequency electronic type and operate lamps as frequency above 50 kHz to minimize interference with infrared control systems.

Operating temperature shall not exceed 75 degrees C. on the case during normal operation.

Minimum lamp starting temperature shall be -20 degrees C/-5 degrees F.

PART 3 - EXECUTION

GENERAL
Contractor shall verify compatibility of electronic type fluorescent ballasts with the specific lamp to be supplied.

Ballasts judged to be noisy shall be replaced.

WARRANTY
Other ballast shall have a minimum of three (3) years warranty with $10 replacement labor allowance.

SPARE PARTS
Provide one(1) of each ballast types used on the project to the owner for future use.

END OF SECTION

SECTION 27 00 00
COMMUNICATIONS CABLE AND EQUIPMENT

PART 1 - GENERAL

SCOPE
This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination Components and related sub-systems as part of a Structured Cabling System. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work and Requirements
- Regulatory References
- Design Intent
- Coordination
- Submittals
- Quality Assurance
- Delivery, Storage and Handling
- Drawings
- As-Built Construction Drawings
- Warranty
- Final Payment

PART 2 - PRODUCTS
- Station Cables
- Standard Information Outlet
- Patch Panel

PART 3 - EXECUTION
- General
- Cable Termination
- Testing and Acceptance
- Documentation
- As-Built Construction Drawings
- Warranty

RELATED WORK AND REQUIREMENTS
Section 260500 – Common Work Results for Electrical
Section 260533 – Raceway for Electrical Systems
Section 260534 – Boxes for Electrical Systems

REGULATORY REFERENCES
All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.
All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

Other applicable standards are as follows:
ANSI/IEEE C2 - National Electrical Safety Code
NFPA 70- 2005 - National Electrical Code
Comm. Chapter 16 - Wisconsin Electrical Code
TIA/EIA Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), 568B.2 (Category 6), 568B.3, 569A, 606A, and 607 (with exception)
IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
ICEA publication S-80-576-2002

DESIGN INTENT
The Station Cabling System is based on the installation of 4-Pair Unshielded Twisted Pair (UTP) DATA Category 6. The cables shall be installed from the Standard Information Outlet (SIO) in the work area to the Telecommunications Room (TR) or Equipment Room (ER) serving that area and terminated as specified in this document.

Station cables shall be installed in conduit, in cable tray and in modular furniture. Outlets shall be mounted in back boxes, in Surface Raceway and in Modular Furniture. Standard Information Outlet locations are to be identified on Project Drawings.

At the Main Equipment Room Station, cable terminations shall be mounted on existing equipment rack.

All cables and related termination, support and grounding hardware, bonding, shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following sections.

The Contractor shall provide all labor and materials necessary to construct the system as described herein. This includes - but is not limited to - furnishing and installing cable, cable supports, innerduct, racking and termination components, termination, testing, labeling and documentation.

COORDINATION
During the project and warranty period, coordinate telecommunications system(s) installation and testing with the General Contractor, Section 01815 Communications Commissioning Contractor, Engineer, the respective user group(s), and the City of Madison Information Services department.

All correspondence between the Section 16741 contractor and the commissioning contractor shall be copied to the General Contractor, Owner and Engineer.

SUBMITTALS
Submit documentation of the contractor's BICSI certified project manager along with bid. Not including clear documentation of BICSI certification will be grounds for rejection of bid.

Under the provisions of Section 01330 and Division 1, prior to the start of work the Contractor shall submit:

> Six (6) sets of Manufacturer's Data covering all products proposed indicating construction, materials, ratings and all other parameters identified in Part 2 (Products) below.
>
> Manufacturer's installation instructions.
>
> One (1) two-foot section of each cable type to be utilized for final approval by the Engineer. This two-foot section shall have the manufacturer's cable markings visible.

Submittals should be grouped to include complete documentation of related systems, products and accessories in a single submittal. Where applicable, dimensions should be marked in units to match those specified.

Submittals shall be original catalog sheets or photocopies.

Work shall not proceed without the Engineer's approval of the submitted items.

If the Contractor wishes to substitute another manufacturer and/or catalog number, the following information shall be submitted to the Engineer for review:

> A complete description of the material which the contractor proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to the Owner. Include a letter stating that the proposed products are equal or better than the specified materials.

The Contractor shall receive approval from the Engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the Engineer.

QUALITY ASSURANCE
The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in installing cable and/or accessories similar to those specified below.

The contractor shall have been in this line of business for a minimum of five (5) years and completed four (4) jobs of the magnitude specified in this section.

The installing contractor shall have a BICSI certified technician be the project manager. The Certified Installer shall have been trained by a company(s) that offer a minimum fifteen (15) year system warranty.

DELIVERY, STORAGE AND HANDLING
Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 4 degrees C., the cable shall be moved to a heated (10 degrees C. minimum) location.

If the contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner. If necessary, cable shall be stored off site at the contractor's expense.

DRAWINGS
It shall be understood that the electrical and telecommunication details and drawings provided with the specification package are diagrammatic.

The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within ten (10) days prior to the Bid Due Date.

AS-BUILT CONSTRUCTION DRAWINGS
Drawings included with the specifications set shall be modified by the contractor to denote as-built information.

The drawings are to include equipment rack, cable pathways and SIO locations. SIO locations shall be identified by their sequential number as defined elsewhere in this document. Numbering and drawing conventions used shall be consistent throughout all documentation provided.

The Engineer will furnish floor plans in electronic (".dwg", AutoCAD rel. 2004) formats on which as-built construction information can be added. These documents will be modified by the contractor to denote as-built information as defined above and returned to the Engineer for review. This information shall be supplied to the Engineer no later than four (4) weeks prior to the scheduled occupancy of the project.

The Contractors shall annotate the base drawings and return to the Engineer in hard copy (same plot size as originals) and electronic (AutoCAD rel. 2004) form.

Each drawing submitted by the Contractor as part of the Project Documentation shall be identified as an "As-built" drawing and include the following (1) The Contractor name and/or logo (2) The date of the drawing.

All fonts, color, layer, Model Space/Paper Space conventions established in the base drawings shall be retained by the Contractor in preparation of the As-built drawings.

SIO labels and station cable pathways shall be shown on separate layers in AutoCAD.

All documentation, including hard copy and electronic forms shall become the property of the City of Madison.

WARRANTY

This Contractor shall guarantee all materials, equipment, etc., two (2) years from date of substantial completion of this work. In the case of patch panels, station cabling and SIO's the contractor shall furnish complete Category 6 system warranty consisting of no less than fifteen (15) years. This guarantee shall include all labor, material and travel time.

In the event of a warranty claim, the owner will contact the section 01815 contractor first to review the item of concern. If corrective action is required, the section 16741 contractor will receive direction from the section 01815 contractor, and then perform the necessary work to correct the situation. The section 16741 contractor will then test the work to show conformance with this section. Test results will be submitted to the section 01815 contractor for review. All aspects of section "**Coordination with Section 01815 Telecommunications Commissioning Contractor**" apply to a warranty claim.

FINAL PAYMENT
Final payment will not be made until the Section 01815 contractor's certification of commissioning letter is submitted and accepted by the Owner.

PART 2 - PRODUCTS

STATION CABLES
General
The Station Cable System is based on the installation of Un-shielded Twisted Pair (UTP) DATA Category 6 copper cables to install from the work area to the wiring hub locations(s). Refer to the Floor plan Drawings(s) which identify the location of the wiring hubs and Standard Information Outlets (SIO) locations.

Station Cables shall be constructed of individually twisted pairs with 24-AWG insulated solid copper conductors.

All Cables and Termination hardware shall be technically compliant with and installed in accordance with the referenced TIA/EIA documents.

All cables shall be suitable for installation in the environment defined and shall have the appropriate NEC rating.

Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.

Pairs of all 4-pair cables shall be unshielded and shall be identified by a banded color code in which conductor insulation is marked with a dominant color and banded with a contrasting color. By pair number, the pair colors or dominant band are:

Pair 1: Tip - White/Blue; Ring - Blue (or Blue/White)
Pair 2: Tip - White/Orange; Ring - Orange (or Orange/White)
Pair 3: Tip - White/Green; Ring - Green (or Green/White)
Pair 4: Tip - White/Brown; Ring - Brown (or Brown/White)

Station Cable (Copper)
All Station Cables shall terminate on modular Category 6 Patch Panels in their respective Telecommunications Rooms (TR) or Equipment Room (ER) as specified on the drawings.

All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.

Transmission characteristics of the Station Cables shall meet full Category 6 performance criteria as defined by the referenced TIA/EIA documents. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Cable is a part.

IMPORTANT: Cable and Termination Components (Jack, Patch Panel, Wiring Blocks) are specified to function as a System. The compatibility of the Cable to be installed with the proposed termination components shall be recognized and documented by the Termination Component Manufacturer.

The jacket color for Station Cables shall be **BLUE.**

Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages that incorporate a rotating reel.

Cables installed in a Plenum area shall be Plenum rated.

STANDARD INFORMATION OUTLET

Station cables shall each be terminated at their designated workstation location in the connector types described in the sub-sections below. These connector assemblies shall snap into a mounting frame and exit at an angle. All ports shall be installed such that the opening faces the floor. The combined assembly is referred to as the Standard Information Outlet (SIO).

SIO mounting configurations shall be as follows:

Flush in new and existing boxes.
Flush mounted in Systems Furniture (base panel)
Surface mounted only where specifically noted on the drawings.

The SIO Frame shall accommodate:

Minimum of four (4) Modular Jacks and/or Coaxial Connectors.

The outlet frame shall incorporate a mechanism for adjusting the surface plate to a plumb position.

The same orientation and positioning of Jacks and Connectors shall be utilized throughout the installation. Prior to installation, the Contractor shall submit the proposed configuration for each SIO type.

SIO Faceplates shall incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.

All Jacks and Connectors shall be fitted with a dust cover. Modular Jacks shall incorporate a dust cover that fits over and/or into the jack opening. The dust cover shall be designed to remain with the jack assembly when the jack is in use. No damage to the Jack pinning shall result from insertion or removal of these covers. Dust covers, which result in deformation of the jack pinning, shall not be accepted.

The faceplate of the SIO shall be constructed of High Impact Plastic. Faceplate color shall be **ALMOND**. Confirm faceplate color and material with Owner prior to ordering faceplates.

Wall-mounted SIO's identified on the Floorplan Drawings to accommodate a wall-mounted telephone set shall have a wall plate made from Stainless Steel construction, and accommodate one (1) SIO. Mount on a standard single gang outlet box and include mating lugs for wall phone mounting.

All Standard Information Outlets shall be of the same manufacturer throughout the project. An allowable exception, however, is the Wall-mounted telephone set SIO described above.

SIO Jacks

SIO jacks shall be an 8-pin Modular Jack.

The interface between the jack and the station cable shall be a 110-Style block or insulation displacement type contact. Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination

SIO Jacks shall be pinned TIA/EIA T568A.

Transmission characteristics of the SIO Jacks shall be as required to meet the TIA/EIA Category 6 performance criteria. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Jacks are a part.

The Jack shall be UL verified and listed.

Jack contacts shall have a minimum of 50 micro-inches of gold plating.

The color of the SIO Jack shall be **ALMOND**.

PATCH PANEL
Station cabling shall be terminated at the Main Equipment Room and Telecommunications Rooms on panels incorporating Modular Jacks meeting the specifications for the SIO's detailed in the Section above (with the exception that the jack openings shall be vertical, not angled downward).

At the Main Equipment Room and Telecommunications Rooms the patch panels shall be rack mounted.

The Patch Panel shall consist of a Modular to 110-type connector system. Modular jacks shall meet the specifications detailed above (NON-KEYED 8-pin).

The largest single patch panel configuration shall not exceed 72 ports. Panels which are modular shall be fully populated (all ports occupied by jacks) and be provided in increments of no less than 12-jacks. High density patch panel configurations must incorporate station cable management systems sized to accommodate the quantity of patch panel jacks being installed. Provide sufficient quantity of Patch Panels to terminate SIO's shown plus 20% spare jacks.

The Patch Panel blocks shall have the ability to seat and cut 8 conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Data blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

The Patch Panel as a system (including jack, cable interface and intermediate components) must maintain Category 6 performance per the referenced TIA/EIA documents. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.

Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to insure that all manufacturers minimum bend radius specifications are adhered to.

The Patch Panel shall have color coded designation strips to identify cable count.

Transmission performance shall be maintained by the Patch Panel as a system (including jack, cable interface and intermediate components).

PART 3 - EXECUTION

GENERAL
Copper Pair counts of the cables to be supplied are detailed on the Drawings. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified. It shall be noted that all cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed unless noted otherwise.

Refer to Drawings which indicate the primary cable routes to follow and the termination location(s) within each building. Duct allocation shall be coordinated as part of the construction.

It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.

Beginning installation means contractor accepts existing conditions.

Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.

All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.

The contractor will be responsible for identifying and reporting to the Site Coordinator(s) any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed. If any installed cable is kinked to a radius less than recommended dimension it shall be replaced by the contractor with no additional cost to the project.

All wiring shall be run in J-hooks, in conduit, in cable tray or in modular furniture as designated on the floorplan(s). All cable shall be free of tension at both ends.

Avoid abrasion and other damage to cables during installation.

Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.

The Cable system will be tested and documented upon completion of the installation as defined in this Section.

A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

Should it be found by the Engineer, that the materials or any portion thereof, furnished and installed under this contract, fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

Station Cabling
Station Cabling shall be routed to the Telecommunications Room (TR) on that floor or to the designated TR if on another floor.

Station cables shall be run to the SIO from the Telecommunications Room serving each area supported by J-hooks, in cable tray where shown on the drawings and/or in modular furniture.

The maximum station cable length shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any

area that cannot be reached within the above constraints should be identified and reported to the Engineer prior to installation. Changes to the plan shall be approved by the Engineer.

All cables shall be installed splice-free.

During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

Avoid abrasion and other damage to cables during installation.

All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.

Where installed in J-hooks, installation shall consider the following*:*

Cable shall run at right angles and be kept clear of other trades work.

Cables shall be supported according to code utilizing "J-hook" supports anchored to ceiling concrete, piping supports or structural steel beams. J-hooks shall be designed to maintain cables bend to larger than the minimum bend radius.

Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6-inches, another support shall be used.

Cable shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.

Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

Manufacturer's minimum bend radius specifications shall be observed in all instances.

Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.

A coil of 4 feet in each cable shall be placed in the ceiling at the last support before the cables enter a fishable wall, conduit, surface raceway or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15-feet of slack shall be left in each station cable under 250-feet in length to allow for change in the office layout without re-cabling. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

At all Telecommunication Rooms (TR), approximately 10-feet of slack shall be left in each station cable under 250-feet in length to allow for changes in the telecommunication room layout without re-cabling. These "service loops" shall be secured to the ladder rack, with "J" hooks above the equipment, racks, and patch panels and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

To reduce or eliminate EMI, the following minimum separation distances from ≤480V Power lines shall be adhered to:

Twelve (12) inches from power lines of <5-kVa.

Eighteen (18) inches from high voltage lighting (including fluorescent).

Thirty-nine (39) inches from power lines of 5-kVa or greater.

Thirty-nine (39) inches from transformers and motors.

All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

IMPORTANT: Within the room in which Data Cabling is to be terminated, Hook and Loop(e.g. “Velcro”) ties only shall be used from room entry to the point of termination. This is to facilitate the addition of future cables.

Station Cabling in Modular Furniture
Install station cabling in modular furniture raceways.

Coordinate the scheduled installation date of the modular furniture with the Owner. Make arrangements to install station cable and SIO’s in the modular furniture at the convenience of the Owner.

Cabling shall be protected in the transition from the "Poke-thru" or Wall Fittings to the modular furniture via a length of flexible plastic conduit or other approved protective means. Conduit fittings shall be compatible with the "Poke-thru" and Wall Fittings proposed. There shall be no exposed cable in the transition to the modular furniture. Fill Ratio (Cable Area vs. Conduit Area) in each feed shall not exceed 40%.

Station cables shall be run through the standard modular furniture factory channels to the SIO location.

The Contractor shall punch and re-install the bottom molding panels on the modular furniture as required to accommodate the station cabling and SIO’s.

The SIO shall be secured to the panel via mounting tabs, pop-rivets, screws or other approved method. Use of adhesive tape is not acceptable. The method of securing the SIO to the panel shall not result in sharp protrusions (e.g. sheet metal screw tip) into the channel behind the panel.

Standard Information Outlet
General
SIO’s shall be flush mounted in recessed boxes, in Surface Raceway and in modular furniture as shown on the drawings.

Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Engineer. Nominal height (from finished floor to center line of SIO) in new installation shall be as follows:

Standard Information Outlet	18-inches
Wall-Mounted Telephone Outlet	46-inches.

CABLE TERMINATION

General
At the Telecommunications Rooms, all Station Cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number.

Cable Termination – Cat. 6 Station Cable UTP
Patch Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.

Patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.

At SIO’s and Patch Panels, the installer shall insure that the twists in each cable pair are preserved to within 0.5-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.

Identification and Labeling

SIO's shall be labeled according to the following: [Telecom Room]-[Floor]-[Outlet number].
Example: TR1-2-46 represents Telecom Room number one, second floor, outlet number 46.

All Copper Backbone and Station Cables, Outlet Faceplates and Termination components (e.g. Patch Panel) shall be clearly labeled.

All labels shall be machine generated, black capital letters on a white background. Install labels under clear protective covers on SIO faceplates and patch panels.

Prior to installation, the Contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used.

Cooperation
The Contractor shall cooperate with other trades and State personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the State, provided such decision is reached prior to actual installation. The Contractor shall check the location of electrical outlets with respect to other installations before installing.

The contractor shall cooperate with the Section 01815 Telecommunications Commissioning contractor.

TESTING AND ACCEPTANCE

General
The contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed.

All tests shall be documented.

The Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests.

The Contractor shall visually inspect all cabling and termination points to insure that they are complete and conform to the wiring pattern defined herein. The contractor shall provide the Engineer with a written certification that this inspection has been made

The Contractor shall conduct acceptance testing according to a schedule coordinated with the General Contractor and Owner. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall provide a minimum of one (1) week advance notice to the Owner as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.

IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

Tests related to connected equipment of others shall only be done with the permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.

The Contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used and the procedures followed. At the request of the Engineer, the contractor shall provide copies of the original test results.

All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.

Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the

Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

Coordination with Section 01815 Communications Commissioning Contractor
This project includes a separate Communications Commissioning Contractor. The scope of work for the Communications Commissioning Contractor is specified in Section 01815.

The Section 16741 contractor shall complete all work and testing indicated in this section. Submit test results to the Section 01815 contractor for review. Copy the Engineer and Owner on all transmittals (including documents) to the Section 01815 contractor. If the Section 01815 contractor finds any work not in conformance with the specifications or has a test result that fails, the Section 16741 shall correct the condition, retest and resubmit the test information to the Section 01815 contractor. If the Section 01815 contractor finds a repeated failure of the same item, the Section 16741 contractor will reimburse the Section 01815 contractor $200 per Cat. 6 test until the item is corrected. The Engineer will resolve all disputes between the Section 16741 and Section 01815 contractors.

All work shall be done to the satisfaction of the Section 01815 contractor, the Engineer and the Owner.

Voice Cabling (Copper UTP)
Station Cabling (Category 6)
Testing shall be from the Jack at the SIO to the Patch Panel at the TR on which the cables are terminated. The cabling must pass all Cat 6 TIA requirements.

Station cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.

Testing of the Cabling Systems rated at TIA Category 6 shall be performed to confirm proper functioning and performance.

Category 6 Performance Testing

In addition to the above, Performance Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6) shall include the following:
Length
Attenuation
Pair to Pair NEXT Loss (new limits)
PSNEXT Loss
Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
PSEFEXT Loss
Propagation Delay
Delay Skew
Return Loss

Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.

Testing shall be per ANSI/TIA/EIA 568B.2 Permanent Link test configurations and ANSI/TIA/EIA 568B.2 Category 6.

The maximum length of station cable shall not exceed 90 meters which allows 10 meters for equipment and patch cables. Worst case performance at 20°C, based on a Horizontal Cable length of 90 meters and Equipment Cord length of 4 meters, shall be as follows:

Category 6 Test Parameters:

		Category 6 Cable Permanent Link Test			
TIA/EIA	TIA/EIA	TIA/EIA	TIA/EIA	TIA/EIA	TIA/EIA

Frequency	568B.2-1 Insertion Loss Attenuation	568B.2-1 NEXT Worst Pair to Pair	568B.2-1 PSNEXT Worst Case Loss	568B.2-1 ELFEXT Worst Pair to Pair Loss	568B.2-1 PSELFEXT Loss	568B.2-1 Return Loss
Mhz	Max. dB	dB	dB	DB	dB	dB
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	31.1	35.3	32.7	16.2	13.2	10.0

Propagation Delay
The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In determining the permanent link propagation delay, the propagation delay contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 100MHz).

Delay Skew
For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the propagation delay skew between all pairs shall not vary more than +/- 10ns from the measured value at 20 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be determined using a minimum 100m of cable.

In order to establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be calculated based on this test and be utilized during the testing of the installed cable plant. This requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type under test.

In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or Owner.

DOCUMENTATION

General
Upon completion of the installation, the contractor shall provide three (3) full Documentation Sets to the Engineer for review. Documentation shall include the items detailed in the sub-sections below.

Documentation of Test Results shall be submitted in hard copy and in electronic form (pdf format). Electronic documents shall be submitted on CD-ROM.

Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and *draft* as-built drawings. Draft drawings may include annotations done by hand. Computer generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.

Test Data - Copper Media
Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

DESCRIPTION
Applicable requirements of Division 1 shall govern work in this section.

SCOPE
The work covered by this section of the specifications includes the furnishing of labor, equipment, materials, and performing operations in connection with the extension of the Simplex #4005 multiplexed/intelligent Fire Alarm System as shown on the drawings, and as specified.

RELATED WORK AND REQUIREMENTS
Section 26 05 33 – Raceway for Electrical Systems
Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

GENERAL SYSTEM DESCRIPTION
The Fire Alarm System shall consist of necessary hardware and software equipment to perform or initiate functions as a Multiplexed Fire Alarm and Detection System.

The system shall use the latest intelligent and intelligent analog, addressable technology currently available from the manufacturer. Non-intelligent addressable devices shall be unacceptable.

QUALITY ASSURANCE
Applicable sections of the following codes and standards shall be considered to be an integral part of these specifications. Vendors and installers are required to meet applicable sections of these codes:

NFPA-70 National Electrical Code (NEC)

NFPA-72 National Fire Alarm Code

NFPA-101 Code for Safety to Life

Underwriters' Laboratories, Inc. (UL)

MANUFACTURER'S SERVICES
The system manufacturer shall provide an authorized representative to supervise the installation. Supervision shall be provided by a trained service technician from the manufacturer of the fire alarm equipment. The Technician shall possess a minimum of NICET (National Institute for Certification in Engineering Technology) Level 2 certification and have had a minimum of two (2) years of service experience in the installation of fire alarm systems. The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be made available to the engineer, upon request. The manufacturer's service technician shall be responsible for the following items:

Pre-installation visit to the job site to review equipment submittals and verify method by which the system shall be wired. Prepare and submit a report documenting the observations made and directives given.

During job progress, make job site visits to verify installation and wiring of system. For each visit, the technician shall prepare and submit a report documenting the observations made and directives given.

Upon completion of wiring, connections shall be made under the supervision of this technician.

Checkout and certification of the system shall be performed.

At the time of checkout, technician shall give operational instructions to the Owner his representative on the system.

Job site visits shall be dated and documented in writing and signed by the Electrical Contractor. Discrepancies shall be noted on this document and a copy kept in the system job folder shall be available to the Project Engineer during the project.

SHOP DRAWING SUBMITTALS

Shop drawing submittal shall include the following as minimum:

Cover sheet including the submittal date, specification section, contractor name, fire alarm vendor name, name of manufacturer's on site technician, and the project name.

Equipment list, including quantities, manufacturer, manufacturer part number, and equipment description. Spare parts shall be listed separately and labeled as spares. Vendors utilizing equipment from other manufacturers shall provide both the vendor part number and the manufacturer's part number as it appears on the packing lists. Both part numbers shall be listed on the individual data sheets as well. A separate equipment list shall be provided for each specification section.

Manufacturer's Data Sheets for each piece of equipment provided. Data sheets shall be bound in the order they occur in the equipment list. If an item occurs more than once in the equipment list, only one data sheet is needed. Data sheets shall be clearly marked, noting which item or items on that sheet are being provided.

Sequence of Operation shall be provided giving a description of functions of the system. The sequence of operation shall be in a narrative form or a matrix form. The System Operation section, of this specification shall be acceptable providing changes be highlighted on the original copy and the new operation inserted. If there are no changes to the original system operation then each paragraph shall be labeled "No Change".

Addressable Device List showing device address, device type, and room number/name.

Floor Plan Drawing shall be provided at the time of submittal and shall be job specific. Floor plan drawings shall show panel locations, device locations, device addresses, and wire types. Copies of CAD Files, for the fire alarm floor plans, shall be made available to the successful bidder. Contact JDR Engineering for CAD files.

Riser diagrams shall be provided to illustrate fire alarm circuits. Each riser diagram shall be job specific and show the point of origin for each circuit, areas served by each circuit, circuit type and wire type.

Standby battery calculations showing current draw for each device and module during standby, alarm, and trouble conditions. Battery calculations shall be provided for each fire alarm and NAC panel. Maximum load calculations shall be acceptable. The required spare battery capacity shall be indicated.

Voltage Drop Calculations for each signal circuit. Voltage drops shall be calculated using the voltage supplied by the batteries after a period of 24 hours of standby. The listed minimum operating voltage for each signaling device shall be provided.

The Addressable Device List, as stated above, shall be provided to the owner, for review, a minimum of 20 (twenty) days prior to acceptance testing. This version shall include device types, addresses, and proposed custom labels, as they are to be programmed into the system.

WISCONSIN DEPARTMENT OF COMMERCE - FIRE PROTECTION SYSTEM PLAN APPROVAL
Contractor shall note that fire alarm system shall be submitted and approved prior to the installation of the system.

AS BUILT DRAWING SUBMITTAL
As-Built Drawings shall be provided to the owner within 25 days of final acceptance. Drawings shall consist of:

Floor plan layout showing devices, addresses, wire types, circuiting and conduit runs.

Panel module drawings showing wiring terminations inside the fire alarm panels.

Addressable Device List, as programmed.

A set of Operation and Maintenance manuals.

PRODUCT DELIVERY, STORAGE AND HANDLING
The contractors and suppliers involved in the installation and checkout of the fire alarm system shall, as a minimum, observe the following material handling precautions:

Receive equipment at job site; verify applicable components and quantity delivered.

Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.

Do not install damaged equipment.

Store equipment in a clean, dry space and protect from dirt, fumes, water, construction debris and physical damage.

After installation, protect equipment from damage by work of other trades.

PART 2 - PRODUCTS

GENERAL
Being listed as an acceptable Manufacturer in no way relieves obligation to provide equipment and features in accordance with these specifications.

ACCEPTABLE MANUFACTURERS
Simplex.

FIRE ALARM CONTROL PANEL
Panel is existing. Extend existing system as shown on the plans. Coordinate devices/equipment required with Simplex.

PART 3 - EXECUTION

INSTALLATION
The Contractor shall provide and install the system in accordance with the plans and specifications, national and state applicable codes, NEC wiring criteria, and the manufacturer's recommendations. Communications wiring shall be twisted and shielded cables.

Wiring shall be in a conduit system separate from other building wiring. Junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the scope of the work.

CONDUCTORS
Cable shall be installed in accordance with NEC Article 760.

Cables and wires size #14 AWG and larger shall be stranded.

Wiring shall be supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of components, open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.

Conductors shall be color-coded. Coding shall be consistent through out the facility. Green wire shall be used only for equipment ground.

Fire Alarm Control Panel shall be connected to separate dedicated branch circuit from the building emergency panel, maximum 20 amperes. Circuit shall be labeled as "FIRE ALARM".

Power wiring for Fire Alarm Control Panel shall be #12 AWG.

Fire Alarm Control Panel shall have #12 AWG green equipment ground wire.

Leave 8-inch wire tails at each device box and 36-inch wire tails at the Fire Alarm Control Panel and Remote Annunciator Panel(s).

Cable for Intelligent Detector Loops shall be #18 to #12 AWG twisted/shielded pair. Shield continuity must be maintained and connected to earth ground only at the control panel. Intelligent detector wiring must not be in the same conduit with 120/240 VAC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for class B intelligent loop circuits.

Splices or connections shall be made within junction boxes and with acceptable fittings. Boxes shall be red labeled "FIRE ALARM SYSTEM" by decal or other approved markings.

The EC shall provide two separate phone lines for DACT use. The EC shall be responsible for coordinating phone requirements with the owner's phone system provider.

NAC panel wiring shall be #14 AWG minimum.

Strobe wiring shall be #12 AWG minimum.

Horn wiring shall be #14AWG minimum.

DEVICE MOUNTING
The electrical contractor and fire alarm vendor are responsible for mounting devices according to code. The following comments are to be used as guidelines to supplement the codes where required:

Remote Annunciators: Mount annunciators with LCD readouts at 60 inches above finished floor (AFF). Annunciators are to be flush mounted unless otherwise noted on the plans.

Smoke and Heat Detectors: Detectors shall be ceiling mounted unless otherwise noted. Detectors shall be a minimum of 3 feet from HVAC supply or return vents.

Addressable Control Modules and Relays: Control modules and relays shall be mounted within three (3) feet of the device being controlled, unless wired for fail safe operation.

Notification Appliances: Wall mounted strobes shall be mounted per ADA requirements (80 inches AFF to the bottom of the device). Ceiling mounted strobes shall be approved by the engineer and local AHJ.

Manual Stations: Pull stations shall be mounted per ADA requirements (48 inches AFF to the operable part of the station).

DEVICE IDENTIFICATION

Each intelligent device must be uniquely identified by an address code entered on each device at the time of installation. This address, along with the SLC loop number shall be indicated on a permanent, machine-generated label. The label shall be affixed to the device to be readable from the ground.

Each end of line device shall be identified with a permanent, machine-generated label.

TESTING

The fire alarm system shall be tested by the Contractor in the presence of the Owner's representative, the Architect, the Consulting Engineer, and the manufacturer's technical representative. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner, Architect and General Contractor using a form similar to the standard NFPA Fire Alarm System Record of Completion Form found in NFPA 72 Chap. 1. Forms submitted must provide the same information required in the NFPA Record of Completion Form.

The vendor shall perform a pre-test of the system before final testing with the AHJ. Peripheral interface equipment (air handlers, electric locks, and DACT operation shall be part of the pre-test. The vendor shall be responsible for retesting fees due to inoperable fire alarm equipment at the time of testing.

TRAINING

The equipment manufacturer's representative shall provide, as part of this Contract, a minimum of six (6) hours system operating training for the building Owner, the Consulting Engineer, and fire department personnel. The Training sessions shall be broken up into two parts: System Operation and System Maintenance. These sessions shall be set up at the owner’s convenience.

INSTRUCTION MANUALS

The contractor shall supply, in a three ring binder, three sets of O&M manuals to include: one approved copy of the original submittal (including corrected items from shop drawing review), operating instructions and system service and testing documentation. Manuals shall be furnished prior to, or during training.

END OF SECTION