SECTION 210000 - FIRE PROTECTION GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. All work under this Section shall comply with the requirements of General Conditions, Supplemental Conditions, Special Conditions and Division 1 - General Requirements, and shall include all Sections of Division 21 and shall apply to all Work specified, indicated in the Drawings, and as required to furnish a complete installation of mechanical systems for the Project. Review all Sections of the Specifications for related work and coordinate the work of this Section with all other Sections.

B. Furnish all labor, services, materials, tools, equipment, appliances, facilities, transportation and incidental work and appurtenances required to furnish a complete and properly operating system.

C. The Contractor shall refer to the architectural interior details, floor plans, elevations, and the structural and other Contract Drawings and shall coordinate the work with that of the other trades to avoid interference. The plans are diagrammatic and show the general arrangement of the conduit, panels, transformers and equipment. All dimensions and existing conditions shall be the responsibility the Contractor. Before proceeding with work check and verify all dimensions.

D. The Contractor shall assume all responsibility for fitting of materials and equipment to other parts of equipment and structure. Make adjustments that may be necessary or as requested, in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades. Where existing pipes, conduits and/or ducts prevent installation of new work as indicated, relocate, or arrange for relocation with the applicable trades, existing pipes, conduits and/or ducts.

E. Where the project involves interface with existing building and site systems, the Consultant has used reasonable care to identify existing utilities and services. The Contractor is responsible to thoroughly familiarize themselves with existing conditions and be aware that in some cases information is not available i.e. concealed conditions, which exist in the existing building affected by this work.

F. Documents do not represent to show or list every item to be provided. When an item not shown or listed, is necessary for proper operation of the system and/or equipment, the Contractor shall provide the item which will allow the system to function properly at no increase in Contract Sum.

G. Work shall include, but shall not be limited to, the following:

1. Tie-ins to the existing fire protection system.
2. Relocation of existing systems which interfere with new construction.
3. Removal of existing piping, devices, equipment and appurtenances, to be abandoned.
4. Coordinate maintenance of existing services during construction with Owner.
5. Special coordination of chases and shafts.
6. Hoisting and rigging required to complete work of this section.
7. Sleeves, inserts and hangers.
8. Equipment bases and supports.

9. Vibration isolators, and seismic restraints.
10. Motors.
11. Wet-Pipe Sprinkler Systems
12. Dry-Pipe Sprinkler Systems
13. Preaction Sprinkler Systems
14. Combined Dry-Pipe and Preaction Sprinkler Systems
15. Deluge Fire-Suppression Sprinkler Systems
16. Water Spray Fixed Systems
17. Antifreeze Sprinkler Systems
18. Foam-Water Systems
19. Fire Suppression Standpipes and Hose Connections
20. Facility Fire Hydrants
21. Carbon-Dioxide Fire-Extinguishing Systems
22. Clean-Agent Fire-Extinguishing Systems
23. Wet-Chemical Fire-Extinguishing Systems
24. Dry-Chemical Fire-Extinguishing Systems
25. Fire Pumps
26. Prime painting.
27. Equipment and major component identification.
28. Instruction manual and start up instructions.
29. Testing and balancing.
30. Commissioning.
31. Cleaning.

H. Related work specified elsewhere: The following work, unless otherwise noted is not included in this section shall be performed in other sections:

1. Plumbing and Piping. Division 22
2. Mechanical HVAC Equipment. See Division 23.
3. Integrated Automation. See Division 25
4. Electrical Power and Wiring. Division 26
5. Electronic Safety and Security. See Division 28
6. Excavation and backfill.
7. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
8. Cutting and patching of masonry, concrete, tile and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal deck.
9. Flashing of wall and roof penetrations.
10. Installation of access panels in floors, walls, furred spaces or above ceilings
11. Partitions and Painting (except as specifically indicated) See Division.
12. Structural supports necessary to distribute loading from equipment to roof or floor, except as specified herein.
13. Paving

1.2 QUALITY ASSURANCE

A. General:

1. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacturer.
2. All equipment and accessories shall be new and free from defects.
3. Supply all equipment and accessories in compliance with the applicable standards listed in this Section and with all applicable National, State and Local Codes.
4. All items of a given type shall be the product of the same manufacturer.

5. Install work by craftsmen skilled in trade involved and by apprentices as indicated in the general conditions. Rough work will be rejected.
6. The subcontractor must, within the last five years, prior to the bid opening, have successfully completed in a timely fashion at least three projects similar in scope and type to the required work.

B. Requirement of regulatory agencies:

1. In accordance with requirements of Division 1 and as specified herein.
2. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
3. When Drawings or Specifications exceed requirements of applicable laws, ordinances, rules or regulations, Drawings and Specifications take precedence.
4. It is not the intent of Drawings and Specifications to repeat requirements of codes except where necessary for completeness or clarity.
5. If any of the requirements of the above are in conflict with one another, or with the requirements of these specifications, the most stringent requirements shall govern.

1.3 APPLICABLE PUBLICATION

A. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building fire protection, plumbing, mechanical, electrical, and health department codes.
2. American Society of Plumbing Engineers (ASPE)
3. American Water Works Association (AWWA)
4. American Society of Mechanical Engineers (ASME)
5. American Welding Society (AWS)
6. American National Standards Institute (ANSI).
7. American Society of Testing and Materials (ASTM).
8. Underwriter's Laboratories (UL).
9. National Fire Protection Association (NFPA).
10. Occupational Safety and Health Act (OSHA)

B. All materials and equipment shall be listed by Underwriters" Laboratories (UL), and approved by ANSI, and ASTM for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of these Contract Documents.

1. American National Standards Institute (ANSI)
2. American Water Works Association (AWWA)
3. American Society of Mechanical Engineers (ASME)
4. American Welding Society (AWS)
5. American Society of Testing and Materials (ASTM)
6. American Society of Plumbing Engineers (ASPE)
7. Underwriter's Laboratories (UL).
8. National Fire Protection Association (NFPA).
9. Occupational Safety and Health Act (OSHA)
10. Factory Mutual Association (FM).
11. National Electric Code (NEC)
12. Environmental Protection Agency (EPA)
13. National Bureau of Standards (NBS)

14. Owner's Insurance Underwriter.
15. Specific reference is made to following NFPA codes which contain an exceptionally high quantity of mechanical, electrical, and fire protection requirements.
16. No. 13- Installation of sprinkler systems
17. No. 14- Installation of standpipe and hose systems
18. No. 20- Installation of centrifugal fire pumps.
19. No. 30- Combustible Liquids
20. No. 45- Fire Protection for Laboratories
21. No. 70- National Electric Code
22. No. 72D- Proprietary Protective Signaling Systems
23. No. 72E- Automatic Fire Detectors

1.4 DEFINITIONS

A. "Provide" means "furnish and install", complete, the specified material, equipment or other item and perform all required labor to make a finished and properly operational installation.

B. "Furnish" means to purchase and deliver to project site complete with all appurtenance and support. "Install" means to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project

C. "Consultant" means "Prime Design Consultant". An individual or organization engaged by the owner or the architect to render professional engineering consulting services complementing or supplementing the architect's services concerning the content of the Mechanical, Electrical, Plumbing & Fire Protection sections of specifications.

D. "Owner" means the individual or entity with whom Contractor has entered into the Agreement for whom the Work is to be performed

E. "Construction Manager Advisor" or "CMA" means the Construction Manager that provides services to advise the Owner and Architect on design and materials decisions during the design and document development process. The CMA coordinates the entire design process using his skills and knowledge of construction to clarify cost and time considerations of design decisions, to advise on feasibility of single, multiple-contract or fast-track delivery systems, recommend the construction process, and to handle the bidding and award, as well as to manage the construction of the Project.

F. "Construction Manager Constructor" or "CMC" means the Construction Manager that in addition to acting as an advisor to the Owner during a design period, assumes responsibility for the construction of the Project. The CMC become contractually bound to provide the labor and material for the Project. The CMC may also serve as administrator of multiple prime contract construction; however, some states prohibit that practice.

G. General Contractor/ Prime Contractor means the contractor who contracts with a property owner and, in turn, employs a subcontractor or subcontractors to perform some of all of the work.

H. "Contractor" or "Subcontractor" means the trade contractor responsible for the work in this Division of the specification.

I. "Owner's Representative" means the Consultant, Engineer, or other Specialty Consultant retained by the Owner.

J. "RFI" means "Contractor's Request for Information".

K. "Above Grade": Not buried in the ground and not embedded in concrete slab on ground.

L. "Accessible": Ability to perform recommended maintenance without removal of services or equipment and requiring no special platforms.

M. "Actuating" or "Control" Devices: Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

N. "Below Grade": Buried in the ground or embedded in concrete slab on ground.

O. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures. In general, any item not visible or directly accessible.

P. "Connect": Complete hook-up of item with required service.

Q. "Exposed": Not installed underground or "concealed."

R. "Indicated," "Shown" or " "Noted": As indicated, shown or noted on Drawings or Specifications.

S. "Install": To erect, mount and connect complete with related accessories.

T. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

U. "Reviewed," "Satisfactory" or "Directed": As reviewed, satisfactory, or directed by or to Architect/Engineer/Owner.

V. "Rough-In": Provide all indicated services in the necessary arrangement suitable for making final connections to fixture or equipment.

W. "Shall": An exhortation or command to complete the specified task.

X. "Similar" or "Equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified products.

Y. "Supply": To purchase, procure, acquire and deliver complete with related accessories.

Z. "Typical" or "Typ": Exhibiting the qualities, traits, or characteristics that identify a kind, class, number, group or category. Of or relating to a representative specimen. Application shall apply to all other similarly identified on plan or detail.

AA. "Will": A desire to complete the specified task. Allows some flexibility in application as opposed to "Shall."

BB. "Wiring": Raceway, fittings, wire, boxes and related items.

CC. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

DD. Reference by abbreviation may be made in the specifications and the Contract Drawings for Mechanical and Electrical Work in accordance with the following list:

1. HVAC Heating, Ventilating and Air Conditioning
2. GC General Contractor
3. USS United States Standards
4. ASTM American Society of Testing Materials
5. ASA American Standards Association
6. ADA: Americans with Disabilities Act.
7. ANSI: American National Standards Institute.
8. HP: Horsepower.
9. ICEA: Insulated Cable Engineers Association
10. IEEE: Institute of Electrical and Electronic Engineers.
11. NEMA: National Electrical Manufacturers' Association.
12. NETA: National Electrical Testing Association, Inc.
13. NFPA: National Fire Protection Association.
14. OSHA: Occupational Safety and Health Act.
15. ABS: Acrylonitrile-butadiene-styrene plastic.
16. CPVC: Chlorinated polyvinyl chloride plastic.
17. PE: Polyethylene plastic.
18. PVC: Polyvinyl chloride plastic.
19. EPDM: Ethylene-propylene-diene terpolymer rubber.
20. NBR: Acrylonitrile-butadiene rubber.
21. UBC: Uniform Building Code.
22. UL: Underwriters' Laboratories,

1.5 SCOPE

A. Perform work and provide material and equipment as shown on the drawings and/or as specified and/or as indicated in this section of the specifications. Completely coordinate all work of this section with work of other trades and provide a complete and fully functional installation

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly require by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back-charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. Contractor shall be responsible with obtaining all the final inspection as required by Local Code and ordinances.

1.6 CONTRACT DOCUMENTS

A. Listing of Documents does not limit responsibility of determining full extent of work required by these Contract Documents. Refer to the Consultant's, Fire Protection, Plumbing, Electrical, HVAC, Structural, Site Utility and all other drawings and other sections that types of and work of other trades with which work of this section must be coordinated

B. Except where modified by a specific notation to the contrary; it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify coordinated routings and component. The purpose of the document is to indicate systems concept, the main components of the systems, and the approximate geometric relationships. Based on the systems concept, the main components and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational

E. Information and components shown on riser diagrams, but not shown on plans, and vice versa, shall apply and be provided as if expressly required on both

F. Data that may be furnished electronically by the Consultant is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not be substitute for Consultant's sealed or stamped construction documents.

1.7 ELECTRIONIC MEDIA FILES

A. Construction drawings for this project have been prepared utilizing AutoCAD 2013.

B. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.

C. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Release" form provided by Buro Happold.

D. The electronic contract documents can be used to assist in the preparation of shop drawings and as-built drawings however the electronic media files obtained from Buro Happold are for reference only. The information may not be used in whole or in part for any other project.

E. The drawings prepared for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

F. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.

G. The information is provided to expedite the project and assist the Contractor with no guarantee by Buro Happold as to the accuracy or correctness of the information provided. Buro Happold accepts no responsibility or liability for the Contractor's use of these documents.

1.8 REVIEW OF CONTRACT DOCUMENTS AND SITE

A. With the submission of his bid, Contractor shall give written notice to the Owner of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractor shall acknowledge that he has examined the Plans, Specifications and Site, and from his own investigations he has satisfied himself as to the nature and location of the work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, water, electric power, roads and uncertainties of weather; the conformation and condition of the ground; the character, quality and quantity of surface and subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work.

C. The location and elevation of the underground utilities, such as sewers, electrical power, water piping, steam and steam condensate return piping, conduit, etc., is as exact as can be determined from available information and its accuracy cannot be guaranteed. Exact location and elevation of these services shall be verified prior to excavation or installation of any portion of the work indicated. Exercise special care when excavating at or near the general location of underground utilities to avoid damage to the utility services. The Contractors is responsible to insure worker safety.

D. The contractor shall also acknowledge having been to the site and examined conditions under which work must be performed including preparatory work done under other Sections or other Contracts or by the Owner. Report conditions to the Consultant. Do not proceed until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

E. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract, and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.9 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise the Consultant in writing before award of Contract. Otherwise, Consultant's interpretation of the Contract documents shall be final, and no additional compensation shall be permitted due to discrepancies or ambiguousness thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturer's recommendations, or with applicable codes and standards, alert the Consultant in writing before installation. Otherwise, make changes in installed work as the Consultant requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specification, this contractor shall provide material, installation, or work which is of higher standard.

D. It is the requirement of these documents to have contractor provide systems and components that are fully complete and fully operational and fully suitable for intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of the component or its coordination with other building elements. In cases such as this, where the contractor has failed to notify the Consultant of the situation in accordance with paragraph (A) above, the contractor shall provide specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by paragraph (D) above, where the contractor believes he needs the engineering guidance, he shall submit a sketch identifying his proposed solution and the Consultant shall review, note if necessary, and approve the sketch.

1.10 MODIFICATION IN LAYOUT

A. Fire Protection, Plumbing, Electrical and HVAC Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show exact routings and locations needed to coordinate with structure and other trades to meet the Consultant's requirements

B. In order to obtain the Architect's desired aesthetics in spaces used by building occupants; prior to installation of visible materials, finishes and equipment (including access panels, review Consultant's Drawings for desired locations and where not definitely indicated, request information from the Architect/Consultant.

C. Check Contract Drawings, as well as Shop Drawings, of all subcontractors to verify and coordinate spaces in which work of this section will be installed

D. Maintain maximum headroom at all locations. All conduit, piping, duct and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components to prevent conflict with work of other trades and to coordinate according to Paragraphs A,B,C,and D above. Systems shall be run in an organized and rectilinear fashion.

F. Where conflicts or potential conflict exists and engineering guidance is desired, submit sketch of proposed resolution to the Consultant for review and approval

1.11 RFI'S

A. If the RFI is a request to resolve a conflict or a un-clarity, or a request for additional detail, Contractor's RFI shall include a sketch or equivalent description of Contractor's proposed solution, in accordance with paragraph 1.9(E) above

1.12 PROJECT COMMUNICATION

A. The specification references communication and submittal of information and documents by the Contractor to the Engineers of Record and CM or visa versa. In all cases such communication shall be submitted to the CM who will review it before forwarding to the relevant party for review and response.

B. If the information provided is not in conformance with the specification the CM shall return it to the relevant Contractor for re-submission. The time taken for this process shall be factored into all work schedules and submissions.

1.13 MEASUREMENTS

A. Contractor shall base all his measurements, both horizontal and vertical from established benchmark. All work shall agree with these established lines and levels. He shall verify all measurements at site; and check the correctness of same as related to the work.

1.14 MATERIALS AND WORKMANSHIP

A. Materials shall be new, meet detailed requirements of the Contract Documents and be identifiable as being specified or substitute products.

B. Materials which do not conform to the requirements of the Contract Documents, are not equal to approved samples or are unsatisfactory or unsuited to the purpose for which they are intended, will be rejected.

C. All work shall be performed in the best and most workmanlike manner by tradesmen skilled in their respective trades and properly licensed.

D. All equipment shall be installed in accordance with the recommendation of the manufacturer.

E. Defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or other cause shall be removed within ten (10) days after written notice is given by the Owner's Representative and the work shall be re-executed by the Contractor. The fact that the Owner's Representative may have previously overlooked such defective work shall not constitute total or partial acceptance of it.

F. In no case shall a Bidder base his bid on a class of material or workmanship less than that required by the contract documents nor the governing codes and ordinances.

1.15 CHECKING AND TESTING EQUIPMENT BY CONTRACTORS AND MANUFACTURER'S REPRESENTATIVE

A. All equipment shall be installed in strict accordance with manufacturer's instructions. During construction request supervisory assistance from equipment manufacturer's representatives so the equipment will be correctly installed. After installation, request the Owner's Representative to inspect and see the equipment is in proper working order.

B. Manufacturer's representative shall review the overall system design relative to the proper application of his equipment in the particular system. He shall note conduit, wiring, control, location, and other relevant relationships, and furnish appurtenances necessary for satisfactory operation.

C. Before final payment is issued the following shall be complete:

D. The Contractor's representative shall submit to the CM a signed statement certifying:

1. The equipment is properly installed and ready for operation
2. The owner's maintenance representatives have been thoroughly trained
3. Maintenance and operation manuals issued and accepted by the Owner's Representative.

1.16 SUBMITTALS

A. This paragraph supplements Division 1.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than shown in Contract Documents.
2. Coordination Drawings are detailed, large scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire protection work superimposed in order to identify conflicts and ensure inter-coordination of Electrical, Mechanical, Plumbing, Fire Protection, Structural and other work.

C. Submittal Cover Sheet

1. Shop drawing submittal for each product shall include the copy of following cover sheet completely filled out. Incomplete or incorrect cover sheet submittal shall constitute reason for rejection.
2. Shop drawings shall be submitted according to specification section with a separate cover sheet completed for each product, rather than one cover sheet for multiple products, whether or not supplied by one manufacturer or vendor.
3. In order to maintain the shop drawing review schedule described hereafter, it is important that all submittals include a completed submittal cover sheet for each type of equipment submitted. This requirement will be enforced by the engineer.

SHOP DRAWING COVER SHEET		
PROJECT CONTRACTOR		
DIVISION NO: SECTION NO:		
DESCRIPTION:		
CONTRACT DRAWING REFERENCE NO:		
EQUIPMENT TAG:		
SUBMISSION (CIRCLE ONE): I II III IV		
DATE:		
INFORMATION AND CHECKLIST	REPLY	COMMENTS
4. Contractor's Log # ID		
5. Name, address, and phone number of supplier		
6. Are all specified or scheduled items included and exactly match	Yes No	

	scheduled/specified items.		
7.	Is this item a substitution?	Yes No	
8.	Are deviations clearly identified?	Yes No	
9.	Does this equipment fit space shown on construction documents, coordination drawings, and actual field conditions?	Yes No	
10.	Has support, erection, weights, and installation been coordinated with all trades?	Yes No	
11.	Does the proposed installation void warranties and/or violate UL or code requirements?	Yes No	
12.	Does this material/equipment add expense to any other trade or project costs?	Yes No	
13.	Does equipment require interface with other trades? Lists divisions and specifics requiring coordination?	Yes No	
14.	Is control interface coordinated?	Yes No	
15.	List electrical characteristics (V/Ph/A)	Yes No	

D. Submittals procedure and format

1. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment.
2. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or Drawing and Detail number, identify deviations, if any.
3. Organize submittals in same sequence as they appear in Specification Sections, articles or paragraphs.
4. Shop Drawings shall show physical arrangement, construction details and finishes:
5. Drawings shall be drawn to scale and dimensioned where applicable.
6. Catalog cuts and published material shall be included to supplement scale drawings.
7. Internal wiring diagrams of equipment shall show wiring as actually furnished for this project, with all optional items clearly identified as included or excluded. Clearly identify external wiring connections. Identify and obliterate superfluous material.
8. Submittal literature, drawings and wiring diagrams shall be specifically applicable to this Project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item. Submittals shall include, but not be limited to those items listed in individual Sections.
9. Include all physical and performance data, including materials, manufacturer's names, model numbers, weights, sizes, capacities, performance curves, finishes, colors, accessories, installation instructions, and all other data required to completely describe equipment and to indicate complete compliance with Specifications and Drawings.
10. Include with complete submittals above, complete, large scale, dimensioned Shop Drawings, certified by manufacturer, of all major equipment.

11. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of all materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.
12. Submittals shall be reviewed for general compliance with Specifications only. The Contractor shall be responsible for deviations from the Drawings or Specifications and for errors or omissions of any sort in submittals.
13. The Contractor shall add and sign the following paragraph on all equipment and materials submitted for review:
14. "It is hereby certified that the equipment, material shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and Specifications and can be installed in the allocated spaces."
15. Failure to add the above written statement for compliance shall result in return of submittals to be reviewed.
16. The Contractor shall verify dimensions of equipment and be satisfied per Applicable Code Requirements for fit prior to submitting Shop Drawings for approval.
17. Submit to the Consultant a complete set of final drawings, specifications and hydraulic calculations approved by the Fire Marshal having jurisdiction.
18. Hydraulic calculations and final layout shall be the responsibility and prepared by the Fire Protection Contractor.
19. For any material specified to meet Underwriters' Laboratories, Inc. (UL) or trade standards, furnish the manufacturer's or vendor's certification that the material furnished for the work does in fact equal or exceed such Specifications.
20. Submit on all materials and equipment even if they are as specified or shown on the Drawings.
21. Equipment Floor Plans: After approval of material is secured, prepare a floor plan of each electrical equipment closet enclosures and room drawn to, scale of 1/2 inch equals 1 foot, and submit for approval in the same manner as for Shop Drawings. The layout drawings shall be to exact scale, and indicate location of all fire protection equipment.
22. Resubmittals shall include written response to each item in review of previous submittal.

E. Acceptable Manufacturers: The Consultant's mechanical/electrical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications certain Alternate Manufacturers are listed as being acceptable. These are acceptable only if, as a minimum, they:

1. Meet all performance criteria listed in the schedules and outlined in the specifications.
2. Have identical operating characteristics to those called for in the specifications. For example, a two stroke diesel generator will not be acceptable if a four stroke is specified.
3. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either space or product. Clearances to walls, ceilings and other equipment will be least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean that the Consultants have determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the contractor.
4. Products must adhere to all Consultant's considerations including, but not limited to: being of same color as the product scheduled or specified, fitting within Consultant's enclosures and details, and for sprinklers, diffusers, lighting and plumbing fixtures - being the same size and physical appearance as scheduled or specified products.
5. The proposed substitution shall meet performance and quality of scheduled equipment, whether it requires additional accessories or not.
6. There is no increase in Contract Sum and this Contractor shall pay for any additional work required by other trades as a result of the substitution.

F. Required Use of Acceptable Manufacturers on his Project: Substitution of products other than those of the Acceptable Manufacturers specified herein shall not be made. Only the specified items or the comparable product by one of the specified Alternate Manufacturers shall be submitted. Products by other manufacturers shall not be used on this project.

G. Deviations:

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice or other cause. Submit letter with transmittal of shop drawings, which flags deviation to the attention of the Consultants.
2. Without letters flagging the deviation to the Consultants, it is possible that the Consultants may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Consultants, the contractor shall hold the Consultants and his consultants harmless for any adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Consultants has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.
3. Approval of proposed deviations, if any, will be made at discretion of Consultants.
4. Any of the approved deviations shall be deemed acceptable to this Contractor with no change in contract sum, unless the Consultant also receives a written notice to the contrary.

H. Submittal Notations: Submittals will be returned from the Consultants marked as illustrated below:

1. REVIEWED: "Reviewed and found generally acceptable. Minor deviations may be noted. No further submittal required if notations are complied with."
2. REVIEWED, DEVIATIONS NOTED; REVISE AND RESUBMIT: "Submittal contains deviations which must be corrected and confirmed by a new submittal."
3. REJECTED: "Submittal is incorrect to such an extent that the material is unacceptable, or in incomplete to such an extent that a review cannot be made. Resubmit in accordance with requirements of the Contract Documents."

I. Responsibility:

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that the work meets the requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this or other Sections. Work shall comply with submittals marked "REVIEWED" to the extent they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor shop drawing errors or deviations from requirements of Contract Documents. The Consultant's noting of some errors while overlooking the others will not excuse the contractor from proceeding in error. Contract Documents are not limited, waived nor superseded in any way by review.
2. INFORM SUBCONTRACTORS, MANUFACTURERS, SUPPLIERS, ETC. OF SCOPE AND LIMITED NATURE OF REVIEW PROCESS AND ENFOREC COMPLIANCE WITH CONTRACT DOCUMENTS.

J. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following review time requirements into his project schedule. Working days listed reference the time in Engineer's office. It does not include transmittal time or review time of Contractor or the Consultant. Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted with the exception that 20 working days, exclusive of transmittal time, are required for the following:

1. Coordination Drawings.
2. If more than five shop drawings of a single trade are received in one calendar week.

1.17 List of Proposed Equipment and Materials:

A. Within four weeks of Award of Contract and before ordering materials or equipment, submit complete list of materials and equipment and indicate manufacturer's name, addresses and telephone numbers. No consideration will be given to partial lists submitted out of sequence.

B. If the List of Materials and Equipment is not received within the prescribed time limit, provide the first-named manufacturer for all material and equipment on this project.

1.18 EQUIPMENT SUPPLIER'S INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Pressure Boosting Pumps
2. Carbon-Dioxide Fire-Extinguishing Systems
3. Clean-Agent Fire-Extinguishing Systems
4. Wet-Chemical Fire-Extinguishing Systems
5. Dry-Chemical Fire-Extinguishing Systems
6. Fire Seal Systems
7. Seismic Restraints and Equipment Bracing

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Engineer and include copies IN THE Project Close-Out and Owner's Operation and Maintenance Manuals.

D. Refer to each Section for specific equipment inspection requirements and procedure.

1.19 COORDINATION DRAWINGS:

A. A single set of coordination drawings shall be mutually prepared by all mechanical and electrical trades.

B. The initiation of these drawings begins with Sheet Metal Subcontractor.

C. The Sheet Metal Subcontractor shall prepare a complete set of electronic background drawings at scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheet metal layout thereon. These will be Coordination Drawings.

D. Each of the mechanical, electrical, plumbing fire protection and other specialty trade shall add its work to these background drawings with appropriate elevations and grid dimensions. Specialty trade information is require for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

E. Each specialty trade shall sign and date each coordination drawing. Return drawing to the Sheet Metal Subcontractor, who shall route them sequentially to all specialty trades.

F. Where conflicts occur with placement of materials of various trades, the Sheet Metal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialled and dated by specialty trade. The Sheet Metal Subcontractor shall then final date and sign each drawing. If he cannot resolve conflicts, the decision of the General Contractor/Construction Manager shall be final.

G. A Subcontractor who fails to promptly review and incorporate his work on the drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.

H. Sheet Metal Subcontractor shall make prints of all coordination drawings. Fabrication shall not start until such transparencies of completed coordination drawings are received by the Consultant/Engineer and have been reviewed and approved.

I. The review of coordination drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with the other trades, structural and other work.

J. After review:

1. After review of coordination drawings, the method used to resolve interferences not previously identified shall be as in "MODIFICATIONS IN LAYOUT" above.
2. All changes to reviewed coordination drawings shall be in writing by the Consultants/Engineer prior to start of work in affected area.

K. Distribution of Coordination Drawings:

1. The Sheet Metal Subcontractor shall provide the following distribution of documents:

    a. One sepia (reproducible) of each Coordination Drawing to each specialty trade and affected Contractor for their use.
    b. One reproducible of each Coordination drawing to Owner.
    c. One sepia (reproducible) of each coordination drawing to the General Contractor/Construction Manager.
    d. The above documents can be submitted as electronic media upon agreement of all parties.

L. ALL FIREWALLS AND SMOKE PARTITIONS SHALL BE HIGHLIGHTED ON COORDINATION DRAWINGS FOR APPROPRIATE COORDINATION.

M. The main paths of egress and for equipment removal from main mechanical and electrical rooms must be clearly shown on coordination drawings.

N. Coordination Drawings shall include, but not limited to:

1. Fire protection and sprinkler system, piping and heads.
2. Plumbing systems, piping and equipment.
3. HVAC piping, systems and equipment.
4. Control systems.
5. Electrical distribution, systems and equipment.
6. Lighting systems and fixtures.
7. Sheet metal work, components and accessories, costs and boxes in terminals, etc.
8. Structural.
9. Electrical Equipment Room layouts.
10. Environmental Rooms and associated refrigeration/heating systems.
11. Partition/room layout.
12. Ceiling tile and grid.
13. Access panels.
14. Smoke and fire dampers.
15. Roof drain piping.
16. Major electrical conduit runs, panel-boards, feeder conduit and racks of branch conduit.
17. Above ceiling miscellaneous metal.
18. Heat tracing of piping.
19. Minimum access space requirements for all equipment for both installation and maintenance.

1.20 COORDINATION BUILDING INFORMATION MODEL (BIM)

A. General Requirements:

1. The General Contractor shall appoint a BIM Coordination Manager to prepare a BIM Execution Plan developed specifically for the project, and based on the Computer Integrated Construction (CIC) Research Program's BIM Planning procedures. The BIM Execution Plan will establish the protocols, expected levels of development, and authorized uses of Building Information Models on this Project and assigns specific responsibility for the development of each Model Element to a defined Level.

B. Services to be modelled:

1. All piping (above ½") and all equipment shall be modelled based on the proposed submitted products. The model may be used for production of shop drawings.

C. Clash Detection:

1. Perform three-dimensional component conflict analysis as part of coordination process with all other trades, including but not limited for Mechanical, Plumbing, Fire Protection and Fire Alarm. Resolve component conflicts prior to submittal of shop drawings. Indicate where conflict resolution requires modification of design requirements by Construction Manager.

D. 3D Assets:

1. The contractor shall hand over all digital data files related to the BIM execution plan at the end of the construction process, including all, but not limited to the shop drawings and as built conditions.

1.21 REGULATIONS, CODES, PERMITS, AND FEES

A. Conform to all rules, regulations, standards, ordinances and laws of local, state, and Federal governments and other authorities that have legal jurisdiction over the site.

B. Prior to commencement of work, notify State and applicable authorities as required and submit all of the applicable notifications for construction, operation and demolition. Secure required permits and inspections from any of the authorities having jurisdiction, for this work and pay for all fees required for permits, inspections and review, including special agency construction.

C. Include all utility and local building department charges for providing temporary and permanent electric services to buildings.

D. Provide Owner, Owner's Representative and Inspectors from any of the authorities / agencies having jurisdiction access to work at all times.

E. Contractor shall be responsible for all law violations caused by the work under this Division. Notify Construction Manager in writing when a discrepancy occurs between code requirements and work shown on drawings and resolve matter before proceeding with work.

F. When requirements cited in this specification conflict with each other or with Contract Documents, most stringent shall govern work. Consultants may relax this requirement when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

G. Make corrections in the work as required by the Owner's Representative or Inspector to pass local regulations.

H. Contractor shall deliver to the Construction Manager any and all certificates of inspections, permits, and approvals. Contractor shall submit final inspection certificates signed by governing authorities to the Owner.

I. Make all necessary submissions to the State Fire Marshal, Local Fire Marshal, and other agencies having jurisdiction. Pay all required fees for review, registration and sign off.

1.22 OPERATING AND MAINTENANCE MANUALS

A. Obtain at time of purchase of equipment, three copies of operation and maintenance manuals for all items. Assemble literature in coordinated "D" ring notebooks. All information shall also be provided in electronic PDF format. Divide the manuals into three sections or books as follows:

B. System General Description and Information. Section shall include a general description of the systems used and contain names and addresses of manufacturers and local representatives who stock or furnish or repair parts for items or equipment. List of all major equipment as installed and include model number, capacities, nameplate data and manufacturer's location and purchase order information. Include in the manuals, parts catalogs for each item of equipment furnished with the components identified by number for replacement ordering. This section shall also include:

1. Letters from manufacturers certifying their supervision of equipment installation and startup procedures as required.
2. Factory certification test certificates.
3. Equipment test certificates.

C. Operation, Start-up and Shutdown Procedures. Section shall include directions for and sequence of operation for each item of the Fire Protection, Plumbing, Mechanical and Electrical systems.

D. Provide a step-by-step write-up and video of the operation, start-up and shut down procedures for all major equipment.

E. Problems, Solutions and Troubleshooting. Section shall include detailed procedures to be followed in case of equipment or system malfunctions. Include manufacturer's printed troubleshooting procedures into the operating manual for reference.

F. Preventative Maintenance. Section shall include preventative maintenance requirements and schedule for each piece of equipment.

G. Furnish three copies of manuals to the Consultant for approval and distribution to Owner. Deliver manuals no less than 30 days prior to project close-out or 10 days prior to commissioning whichever is sooner.

1.23 RECORD DOCUMENTS (AS-BUILTS)

A. As work progresses and for duration of Contract, maintain current complete and separate sets of prints of Contract drawings at job site. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to original design. Include actual location of existing utilities if they differ from design documents.

B. Underground utility services, both inside and outside of buildings, shall be dimensioned from permanent structures or benchmark. Utility services outside of buildings shall also show depth of burial with reference to the finished ground floor elevation.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and correction to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation. All elements shall be dimensioned from grid lines or benchmarks and all elevations shall be noted. Construction notes (such as component numbers, conflict notes, etc.) shall be removed and the drawings shall clearly be noted in the title block as being as-built drawings.

D. At the completion of the project, prepare a complete set of record drawings, showing all systems actually installed, as well as electronic files on latest CAD version.

E. The design tracings will be made available for Contractor's copying, at his expense, into reproducible to serve as background drawings. The quantity of design tracings, which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show required information. Contractor's professional draftsperson shall transfer changes to record files and then submit the electronic files and three sets of prints to the Consultant for comments as to compliance with this section.

F. The record set reproducible, as corrected and recorded by the Contractor, shall be submitted to the Owner's Representative for approval prior to authorization for final payment. Record drawings shall be certified as to their correctness by the signature of the Contractor, and shall be stamped or otherwise identified as record drawings. THE CONSULTANT WILL NOT CERTIFY THE ACCURACY OF THE RECORD DRAWINGS - THIS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

G. Each trade shall submit a record set for approval by the building department in a form acceptable to the department, when required by the jurisdiction. Such drawing format size changes, and supplemental information required for the submittal are the requirement of the contractor.

1.24 COOPERATION BETWEEN TRADES

A. Cooperate with all other Divisions performing work on this project as necessary to achieve a complete neatly fitted installation for each condition. Consult the Drawings and Specifications to determine nature and extent of work specified in other Divisions that adjoins or attaches to the work of this Division. Confer with other Divisions at the site to coordinate this work with theirs in view of job conditions to the end that interferences may be eliminated and that maximum head room and clearance may be obtained. In the event that interferences develop, the Owner's Representative's decision will be final as to which Division shall relocate its work, and no additional compensation will be allowed for the moving of piping, ductwork, conduit, or equipment, to clear such interferences. Provide templates, information, and instructions to other divisions to properly locate holes and openings to be cut or provided

1.25 HOIST, RIGGING, TRANSPORTATION AND SCAFFOLDING

A. Provide all scaffolding, staging, cribbing, tackle hoist and rigging necessary for placing all materials and equipment in their proper places in the Project. All temporary work shall be removed from the premises when its use is no longer required.

1.26 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations. Provide protective coverings during construction.

B. Identify materials and equipment delivered to Site to permit check against approved materials list, reviewed Shop Drawings.

C. Keep all materials clean, dry and free from damaging environments during construction.

D. Cap all openings in piping daily to protect against entry by foreign matter.

E. Protect premises and Work of other Divisions from damage arising out of installation of Work of this Division.

F. Perform Work in manner precluding unnecessary safety and hazard.

G. Protect from loss or damage. Replace lost or damaged materials and equipment with new at no increase in Contract Sum. Protect from damage, water, dust, etc., material, equipment and apparatus provided under this Division, both in storage and installed, until Notice of Completion has been filed. Provide temporary storage facilities for material and equipment. Material, equipment or apparatus damaged because of improper storage or protection will be rejected. Remove from Site and provide new, duplicate material, equipment or apparatus in replacement of that rejected.

H. All stock piled piping shall be placed on dunnage, and protected from weather and from entry of foreign material. All stored materials and equipment shall be carefully inspected prior to installation and replaced with new material or equipment if found to be damaged, corroded, etc.

1.27 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee the Work of this section for one year following the date of Substantial Completion or successful system performance whichever requires later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the owner.

B. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Consultant's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

C. In addition to guarantee requirements of Division 1 and of Paragraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

D. Replace material and equipment that require excessive service during guarantee period as defined and as directed by the Consultant.

E. Provide 24 hour service beginning on the date of substantial completion and lasting until the termination of guarantee period. Service shall be at no cost to Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to the Consultant and Owner approval. Submit name and phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

F. Submit copies of equipment and material warranties to Consultants before final payment.

G. At end of guarantee period, transfer manufacturer's equipment and warranties still in force to Owner.

H. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws under this Contract.

I. Part 2 Paragraphs of the Specification sections may specify warranty requirements that may exceed those of this Paragraph.

J. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by Owner, and shall not institute guarantee period.

K. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Consultant in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Consultants will suggest course of action.

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment and materials shall be as described in the respective Sections of Division 21, 22, 23 and Division 26 and as shown.

2.2 MATERIALS

A. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Furnish optional or additional accessories as specified. And or/as required to provide a fully operational installation.

B. Equipment, material damaged during transportation, installation, and operation is considered as totally damaged. Replace with new. Payment for this equipment shall not be approved. Variance from this permitted only with written acceptance.

C. All items of materials in each category of equipment shall be of one manufacturer.

D. Material and Equipment-General Requirements:

1. All equipment and components shall be New.
2. Testing agency labeled or with other identification wherever standards have been established.
3. Owner's Representative reserves right to reject items not in accordance with Specification either before or after installation.
4. Comprised to render complete and operable systems; provide additional items needed to complete installation to realized design.
5. Compatible with space allocated. Modifications necessary to adjust items to space limitations at Contractor's expense.
6. Installed fully operating and without objectionable noise or vibration.

PART 3 EXECUTION

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. General

1. Completion of startup and commissioning shall be accomplished as a prerequisite for substantial completion and shall be completed for each phase of construction.
2. Operate and maintain systems and equipment until final acceptance by Owner.
3. All guarantees and warranties shall not begin until final acceptance of the systems and equipment by the Owner. Acceptance requires, at a minimum complete systems and commissioning.
4. The Owner maintains the right to have access to the entire project site to develop his own operational procedures.

B. Comprehensive Work Plan and Reporting

1. Provide detailed, methodical, scheduled, start up and commissioning procedures and execution of same and every system and piece of equipment provided.
2. Attend start up and commissioning meetings on a regular basis, as directed by the General Contractor or Construction Manager.
3. Develop and provide a written work plan with detailed procedures for this work and submit, using shop drawing submittal procedure, within 6 weeks of the contract award. The work plan shall include provisions for an integrated start up plan and schedule. The plan and schedule shall identify tasks, start and completion dates, critical path items, interface requirements with other trades and major equipment start up, as minimum requirements of the plan. The plan and schedule shall clearly identify work in each construction phase, as well.
4. The purpose of this work plan is to provide for smooth, quick, and efficient start up and commissioning of systems and equipment and for a smooth transition to turn the complete, correctly operating building over to the Owner, at each phase of construction.
5. The Owner and the Consultant will have input to and be part of approval process for startup and commissioning plan.
6. Develop and submit for approval a specific start up, check out and sign off form for every piece of major equipment.
7. Develop and submit for approval a specific start up, check out and sign off form for every piece of major system.
8. Systems shall be operated under actual or simulated full load conditions. Identify the operating conditions in the work plan.
9. Work plan shall incorporate the below specified "Demonstration of Successful Operation"
10. The Consultant/Owner may check the completed and commissioned installation either sequentially as different parts are completed, and/or when the entire installation is complete, at sole option of the Consultant/Owner.
11. Each contractor shall arrange that an officer of his contracting company shall certify that each and every system has been tested. At the conclusion of the tests, this contractor shall submit a letter and enclosed commissioning forms signed by the officer stating:

    a. That he/she is the officer of the company.
    b. That he/she certifies that the specified testing of the systems has been performed by the company (give the name and dates of system testing).
    c. The results of testing as compared to specified performance, listing the name, title, and company affiliation of all those witnessing and performing these tests.

C. Commissioning

1. Commission equipment and systems in accordance with the approved work plan, completing the startup, check out and sign off forms for each piece of equipment and each system.

2. Provide qualified personnel, equipment, apparatus and services for startup and testing of equipment and systems, to obtain the performance shown in schedules, as specified or on commissioning forms, and as required by codes, standards, regulations and authorities having jurisdiction including Municipal Inspectors, Owners and Consultants.
3. Start up and testing procedures as may be outlined in various mechanical and electrical sections of the specifications are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly start up and test the systems and equipment actually installed on the job at no additional cost to the Owner.
4. Provide capacity and performance of equipment by field testing. Install thermowells and gauge connections and, at no additional cost to Owner, equipment and instruments required for testing.
5. Qualified representative of equipment manufacturer shall be present at test.
6. For each piece of equipment, copy nameplate data and include with the letter and start up, check out and sign off forms referred to above.
7. Do not cover or conceal work before testing and inspection and obtaining approval.
8. Leaks, damage and defects discovered or resulting from startup and testing shall be repaired or replaced by this contract to like-new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.

D. Demonstration of Successful Operation: After all components and every system have been completely commissioned provide certification from the code authority having jurisdiction the system is approved for its intended use. This shall be successfully concluded before systems are accepted by the Owner.

3.2 SPECIAL RESPONSIBILITIES:

A. Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this section.
4. Obtain final roughing dimensions or other information needed for complete installation of items furnished under other Sections or by Owner.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information on proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Consultants.
6. Provide information as requested as to sizes, number and locations of pads necessary for floor mounted equipment provided under this Section.
7. Notify Consultants of location and extent of existing piping, conduit, ductwork and equipment that interferes with new construction. In coordination with and with approval of Consultants, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Consultants. Dispose of or store items as requested by Consultants.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to time of installation. This trade shall be responsible for:

    a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt to Consultant's and structural conditions.
    b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

2. This contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

D. Use of premises: Use of premises shall be restricted as directed by the Consultant and as required below:

1. Remove and dispose of dirt and debris, and keep premises clean. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of the Consultant.
2. Store materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets of racks and covered with tarpaulins.
3. Do not interfere with function of existing sewers and water and gas mains, electrical or mechanical systems and services. Extreme care shall be observed to prevent debris from entering pipe, ductwork and equipment. Confer with the Consultant as to the disruption of services or other utilities due to testing, connection of new work to existing. Interruption of services shall be performed at time of day or night deemed by Owner to provide minimal interference with normal operation. Obtain Owner's approval of the method proposed for minimizing service interruption.

E. Surveys and Measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify the Consultant in writing and do not proceed with work until written instructions have been issued by the Consultant.

F. Fireproofing:

1. Clip, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible prior to start of spray fiber work.

2. Conduit and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
3. Patching and repairing of fireproofing due to cutting or damaging to fireproofing during course of work specified under this section shall be shall be performed by installer of fireproofing and paid for by the trade responsible for damage and shall not constitute grounds for an extra to Owner.

G. Temporary Utilities:

1. Refer to Division 1 regarding requirements.
2. Furnish temporary equipment, and piping as needed during the construction phase. Remove temporary items after use.

3.3 MATERIAL AND WORKMANSHIP

A. Work shall be neat and rectilinear. Conduit shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment to comply with manufacturers. Recommended Requirements. Rough Work will be rejected. Work shall be properly and effectively protected, and conduit openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. Finish of materials, components and equipment shall be as approved by the Consultant and shall be resistant to corrosion and weather as necessary.

D. Owner will not be responsible for material and equipment before testing, commissioning, and acceptance.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing services without Owner's approval.

B. Schedule interruptions in advance, according to Owner's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact to Owner's operations.

D. Subcontractor shall coordinate any shutdowns of existing systems as follows:

1. Give proper notice to Owner when making shutdowns; a minimum of fourteen full days are required.
2. Minimize shutdowns of any system.
3. Provide temporary services where required and perform shutdown and tie-ins at a time convenient to Owner.
4. Subcontractor shall be responsible for completing and filing Owner's shutdown notice questionnaire.
5. Perform required survey and inspection work required by the notice for shutdown.

E. Include premium time work associated with interruption of services and/or shutdown as necessary to avoid disruption to Owner's operations.

3.5 ANCHORS AND INSERTS:

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Insert shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment support and hangers.

3.6 CORE DRILLING

A. Core drilling is to be avoided.

B. Set sleeves prior to installation of structure for passage of conduits, etc.

C. Where core drilling is unavoidable, or required by renovation projects, locate all required openings prior to coring and submit to the Consultant for review.

D. Coordinate openings with General Contractor/Construction Manager and all other trades.

E. Core drilling is to be provided by the Contractor for General Construction and not by the M/E subcontractors.

F. Do not disturb existing systems.

G. Thoroughly investigate existing conditions in vicinity of required opening prior to coring.

3.7 CUTTING AND PATCHING:

A. Complete cutting and patching in accordance with Division 1, Cutting and Patching Article, and as follows.

B. Provide all sleeves, core drilling, carpentry, cutting and patching required for proper installation of material and equipment specified in this Division.

C. Do not cut or drill structural members without written approval of Owner's Representative and structural engineer.

D. No cutting or patching should be done without first receiving the Consultant's and Structural Engineer's written approval.

E. Any damage caused by cutting and patching shall be restored to the original condition as required by the Consultant.

3.8 VIBRATION CONTROL:

A. Coordinate with Division 1.

B. Design criteria for all the Work of Division 21 shall be as specified in 210548.

3.9 WATERPROOF CONSTRUCTION:

A. Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashing at exterior wall and roof penetrations. Caulk watertight penetrations of foundation walls and floors. Provide membrane clamps at penetrations of waterproof membranes.

B. Provide galvanized sheet metal weather protection canopies, hoods or enclosures over all out-of-doors equipment, the operation or maintenance of which would be impaired by rainwater. This requirement applies to damper operators and bearing, damper motors, controls, and instruments. See other paragraphs in this Division for application of this requirement to panels, motors, and devices.

3.10 RESTORATION OF DAMAGE:

A. Repair or replace, as directed by the Consultant and/or Owner's Representative, materials and parts of premises which become damaged as result of installation of Work of this Division. Remove replaced parts from premises.

3.11 ROOF OPENINGS AND CURBS

A. Roof openings where required shall be coordinated with the other affected trades and all flashing and patching shall be as per details indicated on the Consultant's plans.

3.12 TOOLS AND EQUIPMENT

A. Furnish all tools and equipment necessary for the proper installation, protection and upkeep of the Work.

3.13 ADJUSTMENTS

A. Preliminary Operation:

1. Operate any portion of installation for Owner's convenience if so requested by Construction Manager. Such operation does not constitute acceptance of Work as complete. Cost of utilities, such as gas and electrical power, will be borne by Owner if Owner requests operation.

B. Start-up Service:

1. Prior to startup, ensure that systems are ready for their intended use.

C. Start and operate all systems. Provide services of factory trained technicians for start up of major equipment and systems.

D. Adjusting:

1. Adjust all equipment and system components as shown or as otherwise required to result in intended system operation.
2. Thereafter, as a result of system operation or as directed by Owner's Representative, make readjustments as necessary to refine performance and to effect complete system "tune-up".
3. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions for 72 hours continuously and show specified performance.
4. If, in the opinion of the Consultant, performance of equipment or systems is not in accordance with specifications or submitted data, alter or replace equipment at no increase in Contract Sum. The Contractor, at his option, may order tests from an independent approved laboratory to prove compliance. All such tests shall be at no increase in Contract Sum. Repeat process as often as required. If the reason for unsatisfactory operation is design errors all additional cost for corrective measures will be reimbursed to the contractor.
5. At completion of Work, provide written certification that all systems are functioning properly without defects.

E. Noise:

1. Cooperate in reducing any objectionable noise or vibration caused by electrical systems to the extent of adjustments to specified and installed equipment and appurtenances.
2. Cooperate in adjustment of mechanical systems and terminal devices, as directed by Owner's Representative, to obtain specified acoustic properties.
3. Completely correct noise problems caused by failure to make installation in accordance with Contract Documents, including labor and materials required as a result of such failure, at no increase in Contract Sum. Includes refinish walls, floors etc.

3.14 INSTALLATION OF EQUIPMENT

A. Use printed descriptions, specifications and recommendations of manufacturers as a guide for installation of Work.

B. Assemble equipment required to be field assembled under the direct supervision of the manufacturers' agent. Prior to the final acceptance submit letters from the manufacturers that this has been done.

C. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to the satisfaction of the Consultant and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

D. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

E. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall of ceiling mounting of equipment as required.

F. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

G. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installations.

H. Structural steel and hardware shall conform to Standard specifications of ASTM; use of steel and hardware shall conform to requirements of Section V of Code of Practice of American Institute of Steel Construction.

I. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly, which will void warrantee. Report in writing to the Consultant, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.15 PAINTING

A. Equipment installed shall have shop coat of non-lead paint. Hangers and supports shall have one coat of non-lead primer. Finish painting, including painting of various conduit or wire way systems, shall be done under other Sections.

B. Paint all outside exposed equipment and equipment supports with two coats of weather resistant enamel.

C. Properly prepare Work under this Division to be finish painted under Division 9.

D. Refer to standard paint colors for all Fire Protection equipment inside the Building.

3.16 SELECTIVE DEMOLITION

A. Refer to all drawings for general description of areas requiring demolition.

B. Refer to General Contractor's/Construction Manager's Instructions for all existing equipment and materials that shall remain the property of the Owner.

C. Items of value which are not directed to be returned to the Owner shall become the property of the Contractor. Storage or sale of items on the project site is prohibited.

D. Protection: Ensure the safe passage of persons in and around building during demolition. Prevent injury to persons and damage to property. Provide adequate shoring and bracing to prevent collapse. Immediately repair damaged property to the condition before being damaged. Take effective measures to prevent windblown dust.

E. Utilities: Maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage. Do not interrupt utilities serving used areas without first obtaining permission from the utility company and the Owner. Provide temporary services as required.

3.17 JOBSITE SAFETY

A. Neither the professional activities of the Engineer, nor the presence of the Engineer or his or her employees and sub-consultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Engineer and the Engineer's consultants shall be indemnified and shall be made additional insured's under the Contractor's general liability insurance policy.

3.18 FINAL JOBSITE OBSERVATION

A. As the work nears completion, the Contractor is to review the requirements of the Contract Documents, inspect the work and inform all parties involved of the work to be corrected or completed before the project can be deemed substantially complete.

B. When the Project is substantially complete, In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation. Notify the Owner's Representative in writing of this fact, listing any items of Work remaining incomplete, the reason therefore, and the anticipated date that all remaining work will be completed. The Contractor shall inform the certification that the project is complete and ready for a final punch; the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.

C. It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

D. The Contractor shall carry out their own final inspection and satisfy the Work.

E. The Owner's Representative reserves the right to cancel and reschedule the inspection in the event considerable more work remains to be completed or corrected than indicated in the written request for inspection.

F. All items not completed or found not complying with drawings or specifications by the Owner's Representative will be identified in their inspection report.

G. Correct all items on inspection report. Make the correction and initial and date each item on the report after corrections have been completed.

H. Include the fee for all local inspections.

3.19 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care,and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to video tape all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The instructions shall include:

1. Maintenance of equipment.
2. Start-up procedures for all major equipment.
3. Description of fire protection system operation.

3.20 PROJECT CLOSE-OUT PROCEDURE

A. General

1. The requirements of this section are in addition to and supplement the requirements outlined in Division 1.
2. It shall be each contractor's responsibility to personally hand-deliver all of the required project close-out checklist items and to obtain Owner's authorized representative(s) signed receipt on all items requiring Owner sign-off.

B. Project Close-Out Checklist

1. Review requirements of each section of the specifications and submit for approval to Consultants the sign-off forms which shall become the project close-out checklist. These, at a minimum, shall include the following information shown in attached Project Closeout Checklist Example. The Consultants and/or Owner may incorporate additional specific items to the following checklist which shall become part of project requirements.
2. Close-Out Checklist Example:

PROJECT CLOSE-OUT			
PROJECT:			
DIVISION NO:			
CONTRACTOR:			
ITEM1	DATES		OWNER'S SIGN-OFF
	COMPLETED	RECEIVED BY OWNER	
Permits			
City and County Inspection			
Manufacturer's Warranties			
State Fire Rating Data			
Copy of Final Shop Drawings			
List and Possession of Spare Parts			
Pressure Tests			
Equipment Tests Required by Specs			
O&M Manuals			
Record Documents			

Coordination Drawings			
Commissioning Reports/Letters/Forms			
On Site Training Complete			
Protective Device Settings			
Valve Tags and Charts			
Insurance Underwriters Approvals			
Final Punch List (Initialed by contractor that items are complete)			
Building Certificate of Occupancy			
24 Hr. Phone No. for Service During Guarantee Period.			
1 Provide separate line item for each specified item (do not group items).			

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

3. 1. Penetrations fire sealed and labeled in accordance with specifications.
4. 2. Fire Protection System Operational
5. 3. Pipes and Equipment Labeled
6. 4. Inspection report approved by code authority having jurisdiction
7. 5. Provide spare parts and additional materials as specified in the individual specification sections.

Accepted by:

Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Engineer so that the final observation can be scheduled.

It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 210000

SECTION 210513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

PART 3 EXECUTION (Not Applicable)

END OF SECTION 210513

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.1 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: [EPDM-rubber] [High-temperature-silicone] [Nitrile (Buna N)] interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: [Carbon steel] [Composite plastic] [Stainless steel] [Stainless steel, Type 316].
5. Connecting Bolts and Nuts: [Carbon steel, with corrosion-resistant coating, ASTM B 633] [Stainless steel] [Stainless steel, Type 316,] of length required to secure pressure plates to sealing elements.

PART 3 EXECUTION

3.1 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.

4. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves.

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Steel Type: With finish and setscrew fastener.

2.2 FLOOR PLATES

A. Split Floor Plates: Steel with concealed hinge.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
b. Insulated Piping: One-piece cast brass with finish.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with finish.
e. Bare Piping in Equipment Rooms: One-piece cast brass with finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping : One-piece, floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 210518

SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Two-piece ball valves with indicators.
2. Iron OS&Y gate valves.
3. Trim and drain valves.

1.3 DEFINITIONS

A. NRS: Nonrising stem.

B. OS&Y: Outside screw and yoke.

C. SBR: Styrene-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

D. Protect flanges and specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of valve from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Fire Main Equipment:

    a. Indicator Posts, Gate Valve
    b. Ball Valves, System Control
    c. Butterfly Valves
    d. Check Valves
    e. Gate Valves

2. Sprinkler System & Water Spray System Devices

    a. Valves, Trim and Drain

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

    a. Indicator posts.
    b. Valves.

        1) Gate valves.
        2) Check valves
        3) Miscellaneous valves.

C. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B31.9 for building services piping valves.

D. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

E. NFPA Compliance for valves:

1. Comply with NFPA 13, NFPA 14, NFPA 20, and NFPA 24.

F. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher, as required by system pressures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

2.3 TWO-PIECE BALL VALVES WITH INDICATORS

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

1. NIBCO INC.
2. Victaulic Company.

B. Description:

1. UL 1091, except with ball instead of disc and FM Global approved for indicating valves (butterfly or ball type), Class Number 1112.
2. Minimum Pressure Rating: 175 psig.
3. Body Design: Two piece.
4. Body Material: Forged brass or bronze.
5. Port Size: Full or standard.
6. Seats: PTFE.
7. Stem: Bronze or stainless steel.
8. Ball: Chrome-plated brass.
9. Actuator: Worm gear
10. Supervisory Switch: Internal or external.
11. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
12. End Connections for Valves NPS 2-1/2: Grooved ends.

2.4 IRON OS&Y GATE VALVES

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

1. Clow Valve Company; a subsidiary of McWane, Inc.
2. Hammond Valve.
3. Kennedy Valve Company; a division of McWane, Inc.
4. NIBCO INC.
5. Victaulic Company.
6. WATTS.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.

4. Wedge: Cast or ductile iron, or bronze[with elastomeric coating].
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Flanged.

2.5 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. FNW; Ferguson Enterprises, Inc.
   c. Metso Automation USA Inc.
   d. NIBCO INC.
   e. Red-White Valve Corp.
   f. Tyco by Johnson Controls Company.
   g. Victaulic Company.

2. Description:

   a. Pressure Rating: 250 psig.
   b. Body Design: Two piece.
   c. Body Material: Forged brass or bronze.
   d. Port size: Full or standard.
   e. Seats: PTFE.
   f. Stem: Bronze or stainless steel.
   g. Ball: Chrome-plated brass.
   h. Actuator: Handlever.
   i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
   j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION, GENERAL

A. Comply with requirements in the following Sections for specific valve-installation requirements and applications:

1. Section 211100 "Facility Fire-Suppression Water-Service Piping" for application of valves in fire-suppression water-service piping.
2. Section 211200 "Fire-Suppression Standpipes" for application of valves in fire-suppression standpipes.
3. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.
4. Section 211316 "Dry-Pipe Sprinkler Systems" for application of valves in dry-pipe, fire-suppression sprinkler systems.
5. Section 211339 "Foam-Water Systems" for application of valves in AFFF piping.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply, except from fire-department connections. Install permanent identification signs, indicating portion of system controlled by each valve.

C. Install double-check valve assembly in each fire-protection water-supply connection.

D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the pipe center.

F. Install valves in position to allow full stem movement.

G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

END OF SECTION 210523

SECTION 210533 - HEAT TRACING FOR FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes heat tracing for fire-suppression piping with the following electric heating cables:

1. Self-regulating, parallel resistance.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

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

PART 2 PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

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

1. Chromalox, Inc.
2. Raychem; Tyco Thermal Controls.

B. Comply with IEEE 515.1.

C. Electrical Insulating Jacket: Flame-retardant polyolefin.

D. Maximum Operating Temperature (Power On): 150 deg F.

E. Maximum Exposure Temperature (Power Off): 185 deg F.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CONTROLS

A. Corrosion-resistant, waterproof control enclosure.

B. Provide with Bacnet BMS interface

2.3 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer or as recommended in writing by manufacturer.

B. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

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

3.2 INSTALLATION

A. Install electric heating cable where indicated and according to NFPA 70 and NFPA 13.

B. Install electric heating cable across expansion joints according to manufacturer's written instructions; use cable to allow movement without damage to cable.

C. Install electric heating cables after piping has been tested and before insulation is installed.

D. Install electric heating cables according to IEEE 515.1.

E. Install insulation over piping with electric cables according to Section 210700 "Fire-Suppression Systems Insulation."

F. Install warning tape on piping insulation where piping is equipped with electric heating cables.

G. Set field-adjustable switches and circuit-breaker trip ranges.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Connect heat-tracing controls to fire-alarm system according to NFPA 13.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
2. Test cables for electrical continuity and insulation integrity before energizing.
3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

E. Cables will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 PROTECTION

A. Protect installed heating cables, including nonheating leads, from damage during construction.

B. Remove and replace damaged heat-tracing cables.

END OF SECTION 210533

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

C. Valve Schedules: Valve numbering scheme.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Red.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

B. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

D. Pipe-Label Colors:

1. Background Color: Safety Red.
2. Letter Color: White.

2.4 VALVE TAGS

A. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass beaded chain S-hook.
3. Valve-Tag Color: Safety Red.
4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping: Painting of piping is specified in [Section 099123 "Interior Painting."] [Section 099600 "High-Performance Coatings."]

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit a view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of [50 feet] <Insert dimension> along each run. Reduce intervals to [25 feet] <Insert dimension> in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

END OF SECTION 210553

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Sprinklers.
3. Alarm devices.
4. Pressure gauges.

1.3 DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than [250 psig] [300 psig].

B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify [Architect] [Construction Manager] [Owner] no fewer than [two] <Insert number> days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without [Architect's] [Construction Manager's] [Owner's] written permission.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with [NFPA 13] [NFPA 13R].

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. High-Pressure Piping System Component: Listed for [250-psig minimum] [300-psig] working pressure.

E. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions:

a. Date: <Insert test date>.
b. Time: <Insert time> [a.m.] [p.m.]
c. Performed by: <Insert operator's name> of <Insert firm>.
d. Location of Residual Fire Hydrant R: <Insert location>.
e. Location of Flow Fire Hydrant F: <Insert location>.
f. Static Pressure at Residual Fire Hydrant R: <Insert psig>.
g. Measured Flow at Flow Fire Hydrant F: <Insert gpm>.
h. Residual Pressure at Residual Fire Hydrant R: <Insert psig>.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: [10] [20] <Insert number> percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:

1) Automobile Parking Areas: Ordinary Hazard, Group 1.
2) Building Service Areas: Ordinary Hazard, Group 1.
3) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
4) Elevator Machine Room and Hoistway: Ordinary Hazard, Group 1.
5) General Storage Areas: Ordinary Hazard, Group 1.
6) Machine Shops: Ordinary Hazard, Group 2.
7) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
8) Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.

4. Maximum protection area per sprinkler according to UL listing.
5. Maximum Protection Area per Sprinkler:

a. Office Spaces: 225 sq. ft..
b. Storage Areas: 130 sq. ft..
c. Mechanical Equipment Rooms: 130 sq. ft..
d. Electrical Equipment Rooms: 130 sq. ft..
e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Galvanized- Black-Steel Pipe: ASTM A53/A53M, , Grade B. Pipe ends may be factory or field formed to match joining method.

2.3 SPRINKLERS

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

1. Venus Fire Protection Ltd.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

F. Sprinkler Guards:

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

a. Tyco by Johnson Controls Company.
b. Victaulic Company.
c. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.4 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

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

a. ADT Security Services, Inc.
b. Potter Electric Signal Company, LLC.
c. Viking Corporation.
d. WATTS.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

C. Pressure Switches:

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

a. Barksdale, Inc.
b. Detroit Switch, Inc.
c. Potter Electric Signal Company, LLC.
d. Tyco by Johnson Controls Company.
e. United Electric Controls Co.
f. Viking Corporation.

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

2.5 PRESSURE GAUGES

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

1. AGF Manufacturing, Inc.
2. AMETEK, Inc.
3. Ashcroft Inc.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-service piping.

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gauge, and drain at connection to water supply.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join [lightwall] [and] [Schedule 5] steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

N. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

O. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.

P. Extruded-Tee Connections: Form tee in copper tube according to ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

Q. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

R. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

3.7 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of[narrow dimension of] acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.11 DEMONSTRATION

A. [Engage a factory-authorized service representative to train] [Train] Owner's maintenance personnel to adjust, operate, and maintain [specialty valves] [and] [pressure-maintenance pumps].

3.12 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [threaded ends, cast-iron threaded fittings, and threaded] [grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved] joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be[one of] the following:

1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be[one of] the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

3.13 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.

3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright sprinklers .

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Residential Sprinklers: Dull chrome.
5. Upright Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 213116 - DIESEL-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-stage, split-case fire pumps.
2. Fire-pump accessories and specialties.
3. Flowmeter systems.
4. Fuel oil storage.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire pump.
2. Include rated capacities, operating characteristics, certified performance test curves, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each fire pump.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of fire pumps.
4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
5. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fire pump.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire pumps to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Environmental Conditions:

1. Ambient Temperature: 5 to 40 deg C.
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 feet.

B. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 ASSEMBLY DESCRIPTION

A. Description: Factory-assembled and -tested fire-pump and driver unit.

B. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

C. NFPA Compliance: Comply with NFPA 20.

2.3 SINGLE-STAGE, SPLIT-CASE FIRE PUMPS

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

1. Aurora Pump; Pentair Ltd.
2. Peerless Pump Company.
3. Fairbanks

B. Pump:

1. Standard: , for split-case pumps for fire service.
2. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
3. Impeller: Double suction, cast bronze, statically and dynamically balanced, and keyed to shaft.
4. Wear Rings: Replaceable bronze.
5. Shaft and Sleeve: Alloy-steel shaft with bronze sleeve.

    a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
    b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shafts are horizontal, with pump and driver on same base.

C. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.

D. Capacities and Characteristics: See Fire Pump Schedule

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.

B. Circulation Relief Valves: UL 1478, bronze or cast iron, spring loaded; for installation in pump-discharge piping.

C. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.

D. Outlet Fitting: Concentric tapered reducer at pump-discharge outlet.

E. Discharge Cone: type.

2.5 FLOWMETER SYSTEMS

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

1. Victaulic Company.

B. Description: UL-listed or FM-Approved, fire-pump flowmeter system with capability to indicate flow to not less than 175 percent of fire-pump rated capacity.

C. Pressure Rating: 175 psig minimum.

D. Sensor: Annubar probe, orifice plate, or venturi unless otherwise indicated. Sensor size shall match pipe, tubing, flowmeter, and fittings.

E. Permanently Mounted Flowmeter: Compatible with flow sensor, with dial not less than 4-1/2 inches in diameter. Include bracket or device for wall mounting.

2.6 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Day Tank: UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:

1. Containment: Integral rupture basin, with a capacity of 150 percent of nominal capacity of day tank.

a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.

2. Tank Capacity: As recommended by engine manufacturer.

3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
5. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.

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

3.2 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting:

1. Install fire pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Attach pumps to equipment base using anchor bolts.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
4. Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.

D. Support piping and pumps separately, so weight of piping does not rest on pumps.

E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in [Section 211200 "Fire-Suppression Standpipes."] [Section 211313 "Wet-Pipe Sprinkler Systems."]

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in [Section 211200 "Fire-Suppression Standpipes."] [Section 211313 "Wet-Pipe Sprinkler Systems."]

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.

H. Install fuel system according to NFPA 20.

I. Install water supply and drain piping for diesel-engine heat exchangers. Extend drain piping from heat exchangers to point of disposal.

J. Install exhaust-system piping for diesel engines. Extend to point of termination outside structure. Install pipe and fittings with welded joints; install components having flanged connections with gasketed joints.

K. Install condensate-drain piping for diesel-engine exhaust system. Extend drain piping from low points of exhaust system to condensate traps and to point of disposal.

L. Install flowmeters and sensors. Install flowmeter-system components and make connections according to NFPA 20 and manufacturer's written instructions.

M. Electrical Wiring: Install electrical devices furnished by equipment manufacturers that are not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

N. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

A. Align split-case pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

C. Align piping connections.

D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

A. Comply with requirements for piping and valves specified in [Section 211200 "Fire-Suppression Standpipes."] [Section 211313 "Wet-Pipe Sprinkler Systems."] Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect flowmeter-system meters, sensors, and valves to tubing.

E. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit. Comply with requirements for diesel-engine-driver fire-pump controllers specified in Section 262933 "Controllers for Fire-Pump Drivers."

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:

1. After installing components, assemblies, and equipment, including controller, test for compliance with requirements.
2. Test according to NFPA 20 for acceptance and performance testing.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

G. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.7 STARTUP SERVICE

A. [Engage a factory-authorized service representative to perform] [Perform] startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. <Insert startup steps if any>.

3.8 DEMONSTRATION

A. [Engage a factory-authorized service representative to train] [Train] Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF SECTION 213116