SECTION 21 05 00 GENERAL FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The contractor shall provide all labor and materials required to install, test and place into operation the fire protection systems as called for in the Contract Documents, and according to applicable codes and regulations. The contractor shall be responsible for all work associated with the design and installation of fire protection systems for this project. This shall include, but not be limited to; code review, securing current flow test information, design and layout of fire sprinkler systems and fire standpipe systems, coordination with all trades and building structure, detailed piping layouts prepared in accordance with NFPA and State and Local authorities, hydraulic calculations proving proper system sizing, pipe sizing, water distribution and required water coverage for all hazards involved with this project. Piping layouts, supports and documents and hydraulic calculations shall be signed and sealed by the contractor's engineer who shall be licensed in the State of New Jersey and shall be submitted for review by all State and Local agencies involved and response to all review comments.

B. Provide submission of all required shop drawing submittals for review by Architect/ Engineer, complete installation of the fire sprinkler and fire standpipe systems, all valves, alarms, supports, appropriate sprinkler heads, all testing and system corrections, accurate as-built drawings submitted as CAD drawings to Architect and all required certificates. Standpipe and sprinkler systems shall recognize flow test results and shall be sized to perform without the need for additional fire pump pressurization of systems.

C. Furnish and install all labor, materials, apparatus and appliances essential to the complete functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential whether mentioned in the Contract Drawings and Specifications or not.

D. Related Sections:

1. Division 03 - Concrete Forming and Accessories: Execution requirements for inserts and sleeves specified by this section.

2. Division 09 - Painting and Coating: Execution requirements for piping painting specified by this section.

3. Division 23 05 00 - General Mechanical Requirements.

4. Divisions 22 and 23 sections as noted herein.

1.02 REFERENCE STANDARDS

A. International Building Code - 2009, New Jersey Edition (IBC-NJ).

B. New Jersey Rehabilitation Sub-Code.

C. Factory Mutual Global

D. American Society of Mechanical Engineers:

1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
2. ASME B16.11 - Forged Steel Fittings - Socket-Welding and Threaded.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B16.25 - Butt Welding Ends.
6. ASME B16.3 - Malleable Iron Threaded Fittings.
7. ASME B16.4 - Gray Iron Threaded Fittings.
8. ASME B16.5 - Pipe Flanges and Flanged Fittings.
9. ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.
10. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.

E. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
4. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
5. ASTM B32 - Standard Specification for Solder Metal.
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
7. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.

F. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 - Structural Welding Code - Steel.

G. American Water Works Association:

1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. for Water and Other Liquids.
2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

H. National Fire Protection Association:

1. NFPA 13 - Installation of Sprinkler Systems, as modified by the International Building Code - 2009, New Jersey Edition.

2. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants and Hose Systems, as modified by the International Building Code - 2009, New Jersey Edition.

1.03 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations:

ABMA	American Boiler Manufacturers Association
AGA	American Gas Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
EPA	Environmental Protection Agency
FM (FMS)	Factory Mutual (Factory Mutual System)
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
NAPHCC	National Association of Plumbing, Heating, Cooling Contractors
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SAE	Society of Automotive Engineers
U.L.	Underwriters Laboratories

B. Definitions:

1. “Provide” means to “Furnish” and “install”.

2. “Install” means to erect, join, units, fasten, link, attach, set up, connect, test and turn over to Owner, complete and ready for regular operation, the particular work referred to.

3. “Furnish” means to purchase and supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application for the particular work referred to.

4. “As Directed” means as directed by the Architect/ Engineer, or his representative.

5. “Concealed” means embedded in masonry or other construction, installed behind wall furring or within double partitions, installed within hung ceilings, pipe shafts and pipe spaces.

6. "Submit' means submit to Engineer for review. Refer to Architectural General and Special Conditions for proper procedures.

1.04 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Product Data: Submit manufacturer's catalog information. Indicate valve data and ratings.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of components and tag numbering.

C. Operation and Maintenance Data: Submit spare parts lists.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with IBC-NJ.

B. Comply with current governing codes, ordinances and regulations, as well as with requirements of EPA, NFPA, U.L. and all other applicable codes.

C. Comply with the requirements of agencies or authorities having jurisdiction over any part of the work and secure all necessary permits.

D. Where codes or standards are listed herein, the applicable portions apply.

E. Plans, specifications, codes and standards are minimum requirements. Where requirements differ, apply the more stringent.

F. Should any change in plans or specifications be required to comply with governing regulations, notify the Engineer at the time of submitting his bid.

G. Execute work in strict accordance with the best practices of the trades in a thorough, substantial, workmanlike manner by competent workmen. Provide a competent, experienced full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 50 miles of Project.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.08 DELIVERY, STORAGE AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Deliver and store valves in shipping containers, with labeling in place.

C. Furnish cast iron and steel valves with temporary protective coating.

D. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five-year manufacturer warranty for basic fire suppression materials and methods.

1.10 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish spare sprinkler heads and cabinet in accordance with NFPA-13.

C. Furnish two (2) sets of valve stem packing for each size and type of valve installed.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. If products and materials are specified or indicated on the drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of the Engineer.

B. Provide products and materials that are new, clean, free of defects and free of damage and corrosion.

C. All products and materials used in this project will not contain asbestos, P.C.B.'s or any other material which is considered hazardous by the Department of Environmental Protection or any other agency having jurisdiction.

D. Replace materials of less than specified quality as designated by the Engineer and relocate work incorrectly installed as determined by the Engineer.

E. Statically and dynamically balance rotating equipment for minimum vibration and lowest operating noise level.

F. Provide name/data plates on major components of equipment with manufacturer's name, model number, serial number, capacity data and electrical characteristics attached in a conspicuous place.

G. Install materials and equipment with qualified trades people.

H. Maintain uniformity of manufacture for equipment used in similar applications and sizes.

I. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards, and as approved by local authorities having jurisdiction.

J. Fully lubricate equipment when installed.

K. Do not operate water systems until piping has been cleaned and tested and all required equipment is in place.

L. Locate all floor-mounted equipment on a concrete pad.

M. Provide steel channel support system for all wall or floor-mounted panels, devices, etc.

N. Secure equipment with bolts, washers and locknuts of ample size to support equipment. Embedded anchor bolts to have bottom plate and pipe sleeves. Grout machinery set in concrete under the entire bearing surface. After grout has set, remove wedges, shims and jack bolts and fill space with grout.

O. Locate valves, access doors, etc. to be easily accessible, either in mechanical spaces or through access panels specified herein. Obtain Architect's and Engineer's approval of access panel locations.

P. Follow manufacturers' instructions for installing, connecting and adjusting equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of such instructions and attach to the equipment for reference during work on the equipment.

Q. Pressure vessel and relief valves shall be selected, built and labeled in accordance with ASME. Obtain a certificate from the Building Inspector having jurisdiction showing such acceptance, and mount this certificate in a black frame under glass or laminated plastic adjacent to each pressure vessel and relief valve.

R. Where factory testing of equipment is required to ascertain performance and attendance by the Owner's representative is required to witness such tests, associated travel costs and subsistence shall be borne by the Contractor.

S. Equipment capacities, etc., are scheduled or specified for job site operating conditions. Equipment sensitive to altitude shall be de-rated with the method of de-rating identified on shop drawings.

2.02 EQUIPMENT AND SYSTEMS CRITERIA

A. The criteria of design and performance to produce the required operation is based on equipment shown or scheduled, and as specified.

B. All required submittals shall be submitted to and approved by DCA.

C. Equipment of other manufacturers will be considered, subject to its acceptability and the following:

1. The equipment must conform to the structural design provisions for loads applied to the structure; to the dimensions established by drawings for spaces and other (service, etc.) clearances; and for inlet and outlet locations and relationships to associated equipment and piping.

2. Changes to the building arrangement or structure, which are required to suit equipment offered must be by the Contractor at no extra expense to the Owner.

3. Changes to the electrical requirements such as circuit breaker or starter size, conduit or wire size shall be coordinated by the Contractor and the expense borne by him with no additional cost to the Owner.

4. Changes to other Contractor's scope of work shall be the responsibility of this Contractor, at no extra expense to the Owner.

D. Operating equipment, operating systems and other products are specified by names and models and also by performance criteria standards:

1. Where both specifying media are employed, the names and models establish a standard for manufacturing quality, while the performance criteria governs the capacity, rating or output.

2. In any question regarding intent, the capacity, rating or output which is compatible with the other systems, is intended to be of prime concern and is to be provided.

3. Contractor shall follow Owner's Standards for Turn-Over Acceptance, Commissioning and Testing. Where there is a conflict between these requirements and Building Department's requirements, the more stringent requirements shall apply.

E. The descriptions of equipment and systems cover basic equipment and operation, but not all the details of design and construction.

1. The use of singular in descriptions does not limit the quantities to be furnished to produce the complete system, together with the results specified.

2. Furnish equipment required to provide specified performance under installed conditions.

3. Factory wiring and piping is to conform to specifications for field work, unless otherwise specified.

4. Provide trim, enclosures, transition pieces and accessories required to make complete installation in each instance.

F. All Mechanical Drawings of Division 21 are schematic and diagrammatic.

1. Symbols and diagrams are used to indicate the various items of work and the complete systems, but they do not necessarily have dimensional significance, neither do they necessarily include all related and subsidiary parts and equipment. Contractor shall provide all parts, elements, transition pieces, etc. as required for a complete and operational system.

2. The work is to be installed complete and ready for operation in conformity with the intent expressed on the Drawings and in the Specifications.

3. Coordinate work with the requirements of the Architectural and Structural drawings for dimensions, locations and clearances.

4. Locations of mechanical and electrical items which are exposed to view shall be taken from the Architectural Drawings where available, or are to be located as directed by the Architect.

5. Contractor shall provide all transition pieces and rises/drops for piping.

6. Minimum height of piping, valves, etc. in mechanical rooms excluding drops to equipment, shall be 7'-0" unless otherwise noted

2.03 IDENTIFICATION MARKINGS

A. Every valve, control, and apparatus installed under this Contract shall be tagged, labeled or stenciled as follows: Tags and labels securely fastened by brass chains, screws or mastic as applicable. Equipment controls numbered according to equipment schedules on Plans. Tags numbered to conform to a directory listing number, location and use. Directories to be mounted under glass in aluminum self-closing frames, 8-1/2" x 11" in size.

1. Apply identification after testing, insulation and field painting are completed.

B. Valve Identification:

1. Provide an identification tag for each valve, including control valves.

2. Differentiate between the different classes of service in the numbering systems.

3. Use 2" brass tags stamped with designation numbers 1" high, filled in with black enamel.

4. Attach tags securely to handles or spindles of valves with heavy brass "S" hooks or brass chains.

5. Provide six (6) copies of valve charts with one of each framed under glass and mounted where directed.

C. Piping Identification:

1. Provide on bare and covered pipes for all services.

2. Use a system of marking and colors conforming to ANSI A-13.1.

3. Install to provide permanent adhesion.

4. Install in readily visible location.

5. Apply legend and flow markers as required for maintenance purposes, with at least one marker in every 50'-0" of each line and at every change of direction.

6. Color Coding of Piping: After exposed and visible piping has been finish painted, the installer of the piping shall identify the type of service lines with applied color bands. The direction of flow shall be indicated with stenciled arrows. Color bands shall be 1-inch wide, finished in gloss enamel; lettering and arrows shall be same color as the bands. Indicators shall be applied at connections to other equipment; at entrances to spaces; adjacent to valves; near access doors to pipe spaces; and at maximum intervals of 50 feet on long pipe runs. Letters shall be positioned to be easily read from a normal standing position. If there is no owner's standard for color code and designation, the following colors and letter designations shall be used:

PLUMBING PIPING

Service	Color	Designation
Standpipe/Sprinkler	Red	Standpipe and Sprinkler

D. Equipment Identification:

1. Provide stencil lettering on operating equipment and units:

   a. Use black oil base paint, except where equipment finish is dark, use white paint.

   b. Make all characters distinguishable from the floor, but not less than 2" high.

2. For each motor starter, controller and similar accessory provide a lamicore nameplate attached with screws or rivets to a fixed part of the equipment in a visible location.

   a. Make plates not less than 2" x 1" x 1/8" thick with 1/4" high characters.

3. Equipment such as tanks, access doors to equipment such as filters, neatly stenciled with letters not less than 1 inch high. Any equipment too small to receive such stenciling shall be provided with brass name tags 2" x 1" in size.

4. In areas where removable ceilings occur, install appropriate color coded tile markers to indicate location of valves and other equipment or fittings that may require maintenance service.

E. Refer to Division 22 for additional requirements

2.04 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Within two (2) weeks after notice to proceed by the Owner or Owner's Representative, or after execution of Owner/ Contractor Agreement, submit to the Engineer for review, a complete typed list of all mechanical equipment manufacturers and material suppliers for the equipment intended to be furnished and installed on this project as well as names of all subcontractors.

B. Within four (4) weeks after notice to proceed by the Owner or Owner's Representative, prepare an index of all submittals for the project. Include a submittal identification number, a cross-reference to the Specification sections or Drawing number, and an item description. Prefix the submittal identification number by the Specification sections to which they apply. Indicate on each submittal, the submittal identification number in addition to the other data specified. All subcontractors will utilize the assigned submittal identification number.

C. After the contract is awarded, provide complete shop drawings, product data and samples from the manufacturers, suppliers, vendors and all subcontractors, for all materials and equipment specified in the various sections of this specification. Submit data and details of such materials and equipment for review by the Engineer. Prior to submission of the shop drawings, product data and samples to the Engineer, review and certify that these items are in compliance with the Contract Documents. Check all materials and equipment upon their arrival on the job site and verify their compliance with the Contract Documents. Modify any work installed prior to receiving accepted shop drawings in order to comply with the Contract Documents and the shop drawings, at no cost to the project.

D. Submit materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalog material. Do not assume applicable catalogs are available in the Engineer's office. Maintenance and operating manuals are not suitable substitutes for shop drawings.

E. Identify each sheet of printed submittal pages (using arrows, underlining or circling) to show applicable sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable information. Note specified features such as special tank linings, pump seals, materials or painting.

F. Include dimensional data for roughing in an installation, technical data sufficient to verify that equipment meets requirements of drawings and specifications. Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules.

G. Maintain a complete set of reviewed and stamped shop drawings and product data on site.

H. Prepare and submit detailed shop drawings for piping work and other distribution services in 3/8" = 1'-0" scale, including locations and sizes of openings in floors, walls and roofs.

I. The Contractor is not relieved of the responsibility of dimensions or errors that may be contained on submissions reviewed by the Engineer, or for deviations from requirements in the Contract Documents. Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the shop drawings, product data and samples, the Contract Documents govern the work and are neither waived nor superseded in any way by the review of shop drawings, product data and samples.

J. Inadequate or incomplete shop drawings, product data and/or samples will not be reviewed by the Engineer and will be returned to the Contractor for re-submittal.

K. Indicate in the lower right hand corner of each shop drawing, and each product data brochure on the front cover, the following: The submittal identification number; title of the sheet or brochure; name and location of the Project; names of the Architect, Engineer, Contractor, Subcontractor, manufacturer, supplier and vendor; the data of submittal; and the date or each correction and version and revision. Number all pages and drawings in product data brochures consecutively from beginning to end. Unless the above information is included, the submittal will be returned for resubmission. Include with re-submittals of product data or brochures a cover letter summarizing the corrections made in response to the review comments and the submittal page numbers which were revised.

L. Submit signed/sealed shop drawings by a professional engineer licensed in the State of New Jersey for the following:

1. All piping and equipment layouts.

2. All piping supports.

3. All hydraulic calculations.

2.05 CONTRACTOR'S COORDINATION DRAWINGS

A. Coordination efforts of all trades and furnish, in writing, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Prepare a complete set of construction Coordination Drawings indicating the equipment actually purchased and the exact routing for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. Use the sheetmetal shop drawings as the base drawings to which all other contractors will add their work.

C. Coordination Drawing shall be signed-off by the other subcontractors and the General Contractor prior to the installation of the work in the area covered by the specific drawing.

D. Indicate piping loads and support points for all piping 4" and larger, racked piping and submit to the Structural Engineer for review and approval. Indicate the elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, anchor points and size of all lines. Indicate all beam penetrations and slab penetrations sized and coordinated. Indicate all work routed underground or embedded in concrete by dimension to column and building lines.

E. Indicate in the lower right hand corner of each shop drawing, and each product data brochure on the front cover, the following: The submittal identification number; title of the sheet or brochure; name and location of the Project; names of the Architect, Engineer, Contractor, Subcontractor, manufacturer, supplier and vendor; the date of submittal; and the date of each correction and version and revision. Number all pages and drawings in product data brochures consecutively from beginning to end. Unless the above information is included, the submittal will be returned for resubmission. Include with re-submittals of product data or brochures a cover letter summarizing the corrections made in response to the review comments and the submittal page numbers where were revised.

F. This requirement for Coordination Drawings is not authorization for the Contractor or Subcontractor to make any unauthorized changes to the Contract Drawings. Maintain all Design Drawing space allocations such as ceiling height, chase walls, equipment room size, etc., unless prior written authorization is received from the Architect to change them.

G. Work installed which interferes with work of any other trade will be corrected at no cost to the project.

2.06 REVIEWS

A. The Engineer's review is for general compliance with the design concept and contract documents. Markings or comments or the lack thereof does not relieve the Contractor from compliance with the project plans and specifications. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of construction, for performing his work in a safe manner and for coordinating his work with that of other trades.

B. No part of the work shall be started in the shop or in the field until the Architect and/or Engineer have reviewed the shop drawings and samples for that portion of the work.

C. A minimum period of ten (10) working days, exclusive of transmittal time, will be required in the Engineer's office each time a shop drawing, product data and/or samples are submitted for review. This time period must be considered by the Contractor when scheduling his work.

D. Submit one sepia transparency and two prints of all equipment and piping drawings. Submit six (6) copies of catalog cuts.

2.07 ALTERNATIVE MATERIALS AND EQUIPMENT

A. Contract Documents are based on materials specified and on equipment manufacturers indicated on the Drawings. Approval by Engineer of equipment manufacturers other than indicated on the Drawings or materials other than specified, does not relieve Contractor of any responsibility to provide equipment and materials which will meet the performance as stated or implied by the Contract Documents.

B. Only the equipment manufacturers listed in individual sections are acceptable for this project, subject to requirements of contract documents.

C. Submit proposals to supply alternative materials or equipment, in writing, to the Engineer with sufficient lead time for review by Architect and Engineer prior to the date equipment must be ordered to maintain project schedule. Contractor submitting alternative will reimburse Owner for all costs associated with the review of the proposed alternative whether alternative is accepted or rejected.

D. Include all revisions required to adapt alternatives in such proposals, including revisions by other trades. Acceptance of an alternative will only be considered if there is no increase in the contract price.

E. Wherever operating results such as quantity delivered or pressure obtained are scheduled, or when the make and size of apparatus, for which such quantities are readily determinable, is specified, the substitution being proposed must conform substantially to the quantities specified or implied. The substitution must fit into available space conditions and must function properly in coordination with the rest of the system.

F. Proposed changes and substitutions of systems, apparatus, equipment and manufacturers will be considered, subject to the approval of the Engineer. Include the following information with the proposal.

1. A description of the difference between the existing contract requirements and that proposed, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of implementation costs.

2. Schematic drawings and details to supplement the description.

3. A list of the contract requirements that must be revised if the change is accepted, including any suggested specification revisions.

4. Complete list of materials and equipment proposed for use in the change.

5. Include a description and estimate of costs the Owner may incur in implementing the change, such as test, evaluation, operating and support costs.

6. A projection of any effects the proposed change would have on collateral costs to the Owner.

7. A statement of the time by which a contract modification accepting the change must be issued, noting any effect on the contract completion time or the delivery schedule.

8. A statement indicating the reduction to the contract price if the Owner accepts the change. Be responsible for appropriate modifications to all trades.

2.08 PROTECTION OF ELECTRICAL EQUIPMENT

A. Keep piping 2'-0" outside the vertical line of unprotected electrical equipment or provide non-corrosive metal (soldered 20 gauge copper or welded stainless steel), watertight support, pans piped to an open drain.

1. Construct and support pans to hold minimum depth of 3 inches of water.

2.09 ACCESS DOORS

A. General:

1. Provide steel, flush four-sided frame and door assembly, chemically cleaned after fabrication and painted with rust inhibitive primer.

2. Provide hardware and locking devices.

3. Provide access doors required for access to mechanical work through finished wall construction and non-removable ceiling construction.

4. Coordinate location information with appropriate trades.

B. Provide flush type access door or panel no smaller than 18" x 18" and no larger than 30" x 30" for all dampers, valves, cleanouts, or apparatus located in chases, walls, non-accessible hung ceilings or floors; finish shall be prime coat, except floor panels which shall be polished brass or chrome plate. Doors and trim 14 gauge steel, frame 16 gauge steel, with flush concealed and standard flush locks, screwdriver operated cams, of Milcor manufacturer or approved equal.

1. All panels and their exact location subject to approval of the Architect.

2. Where space conditions prevent door swinging open, provide removable door on lift-up hinges. This will only be accepted on a case-by-case basis. This condition must be submitted to the Owner and Engineer for approval prior to installation.

3. Furnish a complete list locating all access doors required in finished walls, ceilings, partitions, shafts and other inaccessible locations.

2.10 PRIME PAINTING

A. All piping, supports, auxiliary steel and miscellaneous iron within all MER's shall be prime painted as specified herein.

B. All exposed uninsulated piping, fittings, equipment stands, supports, platforms, cradles, and hangers; except chrome finished materials, shall be painted. All ungalvanized surfaces shall be painted with zinc chromate, or approved equal, and all galvanized surfaces shall be prime coated with a phosphate pretreatment coating, dry film thickness of 0.35 with a 0.50 mil. one coat Glid-Guard galvanized steel primer Y5229, or approved equal.

C. Upon completion of the prime coat of all mechanical equipment specified above, all insulated and exposed piping shall be painted with finish coating, as specified under Division 09 90 00 and/or other Sections. This Section shall complete stenciling and color identification, specified under Division 22, following the finish painting.

D. Except where otherwise specified, steel piping in concrete and buried steel piping and steel tanks:

1. Provide heavy coat of bituminous solution primer.

2. In accordance with NFPA and other applicable codes.

E. Provide factory finishes, except as noted, to match Architect's color samples, for items appearing in exposed finished work, and including:

1. Equipment

2. Enclosures on equipment

F. All damaged factory painted surfaces shall be repaired to match original surface. If, in opinion of Owner, such repairs are unsatisfactory, item in question shall be completely refinished or replaced with new.

2.11 WELDING

A. General:

1. All welding procedures, welders, and welding operators shall be qualified in accordance with the requirements of ASME/ANSI B31.9 and Section IX of the ASME Code, latest editions.

2. Welding procedures shall be reported on ASME Section IX Forms "QW," or its equivalent. Joint preparation sketches (to be included with the welding procedures) shall show all dimensions including tolerances, for bevel angle, land size, offset and root gap.

3. Contractor shall be responsible for the welding performed by personnel of his organization and shall conduct the required qualification tests and submit results to the Owner for his review and approval.

4. All welding procedures shall meet requirements of New Jersey Fire Department Certified Requirements. The filing of MSDS form shall be held in the field office.

5. A copy of the welders and fire watch certificate shall be held in the field office of the sight.

B. Processes:

1. Employ the Manual Shielded Metal-Arc (SMAW) welding process.

2. Double butt welding shall be permitted on all joints accessible from both sides. Where double butt-welding is employed, the first root pass shall be back-chipped.

3. Welding of pressure parts shall be performed with low hydrogen type electrodes. Electrodes of Classifications E6012, E6013, E7014 and E7024 shall not be used.

4. Brazing and Soldering:

a. The Contractor shall prepare applicable "Brazing and Soldering Procedures" forms for approval of the Owner.

b. Brazing shall conform to ASME Section IX.

c. Soldering shall conform to the relevant procedures in the manuals of the Copper Development Association.

d. The Owner may reject any brazed or soldered joint for lack of penetration or for other applicable grounds. These defective joints shall be redone until satisfactory.

C. Quality of Workmanship - In addition to conformance with the procedural and quality requirements set forth in the applicable Code or material specification, all welding shall meet the following requirements.

1. Butt welds shall have full penetrations and shall be slightly convex with uniform height.

2. Each weld shall be uniform in width and size throughout its full length.

3. Each layer of welding shall be smooth, free of slag, cracks, pinholes, undercut in excess of 1/32" and completely fused to adjacent weld beads and base metal.

4. Cover passes shall be free of coarse ripples, irregular surface, non-uniform bead patterns, high crown, and deep ridges or valleys between heads. The surface smoothness of the finished weld shall be suitable for the proper interpretation of non-destructive examination of the weld.

5. Surfaces of parts to be joined by welding shall be cleaned of all oil, grease, paint, scale and rust with solvent and/or wire brushing.

6. Fillet weld size shall be in accordance with the applicable code or as specified on the drawings with full throat and legs of equal length.

7. Welding filler metal and welding flux shall be properly stored in such a manner as to insure that no damage to the coating or corrosion of weld rod will occur. Low hydrogen type electrodes shall be stored in enclosures which provide a regulated temperature as prescribed by the electrode manufacturer. All electrodes shall be properly identified.

8. Socket welds shall have a gap of approximately 1/16" between the bottom of the socket and the end of the pipe prior to welding. Socket welds shall have a minimum of two weld layers.

D. Repair and Weld Defects:

1. A weld is defective and shall be repaired if it does not meet the acceptance standard of each applicable non-destructive examination as defined ASME/ANSI B31.9, latest edition.

2. Repairs shall be made in accordance with ASME/ANSI B31.9, latest edition.

E. Welding Identification and Weld Marking:

1. All welds must be identified with the welder's identifying symbol. Welds, where more than one welder performs the work, shall be stamped by each welder.

2. Marking shall be done by a permanent method that will not result in sharp discontinuities.

3. Where stamping or marking on the base materials is not practical or feasible, permanently affixed metal bands of the same material may be applied. Stamping or any method of permanent marking on the bands is acceptable.

2.12 CLEANING AND ADJUSTING

A. Notification:

1. Inform owner and architect's field representatives of all cleaning, blowing out and fill-up schedules one week prior to starting.

2. Notify owner and architect again, 48-hours prior to each event. If neither attends the procedures, notify in writing, the specific task performed 24-hours after each event.

3. Leaks appearing during the various pressure tests shall be corrected by replacing all defective materials or welds and subsequent tests shall not be made until the piping is found in perfect condition. Caulking of screwed joints or peaning of welds is prohibited. Wherever it is necessary to cut out a weld and the ends of the pipe cannot be conveniently brought together, then a short piece shall be fitted in and welded.

4. Damage to the building and equipment resulting from tests shall be repaired at no additional cost to the Owner.

5. Tests claimed to have been performed without following above procedures shall be deemed as not performed.

B. Cleaning:

1. Blow out, clean and flush each piping system and equipment, to clean thoroughly. MSDS forms for clean agent and procedure shall be presented to the field office. After cleaning, the systems shall be tested by an independent organization, approved by Owner’s representative prior to testing.

2. Clean all materials and equipment; leave in condition ready to operate and ready to receive succeeding finishes where required.

3. Clean the operating equipment and systems to be dust free inside and out.

4. Clean concealed and unoccupied areas such as plenums and pipe spaces and equipment rooms to be free of rubbish and dust.

5. After completion of all pressure tests, properly clean every piece of apparatus furnished and remove caps and other provisions made for testing purposes only.

6. Cutting oil, excess pipe joint compound, finely divided solids and other similar foreign material shall be removed from all circulating water systems before they go into operation. Before chemical cleaning of water systems flush with clean water. Each system shall be cleaned chemically with circulating solution. Fill, vent and circulate the system with this solution at maximum operating temperature for required duration. During cleaning procedure, circulation shall be stopped periodically followed by blow off at all low points. Immediately following chemical cleaning, system to be drained and then refilled with clean water to which treatment shall then be added. After systems have been drained, flushed and refilled, a chemical test shall be made to determine that the cleaning solution remaining in the system does not impart alkalinity to the water in excess of 300 ppm.

7. After the water piping system has been properly cleaned as indicated above, each water system shall be operated for a minimum of 3 days with 1/2" surgical felt, bonded to baskets on each pump strainer. Felt filters shall be run for as long a time as necessary to thoroughly clean all piping until approved by Owner's representative. During the cleaning period, heat exchangers and coil valves shall be kept closed for the entire cleaning period. Provide one (1) inch manual bypass at equipment to permit flushing of branch piping. For flushing and blow-off for main risers, provide drain valves at the bottom in the horizontal runout to the riser. Also provide an additional valve in the cyclo-clean separator piping for pumps with mechanical seals so that separator discharge water may be wasted during the cleaning procedure.

8. All pipe strainers shall be removed and cleaned upon completion of blow-down period.

9. After this period of operation, all systems shall be drained and refilled with fresh water as specified.

10. All equipment installed shall be thoroughly cleaned in preparation of the finished painting.

11. All dowels shall be aligned after system is running.

C. Adjusting:

1. Adjust and align equipment interconnected with couplings or belts. After one week of continuous operation, the technician will return to check and realign all shafts, bearings, seals, couplings and belt drives as needed. Provide report indicating completion of this work.

2. Adjust valves of all types and calibrate equipment of all types to provide proper operation.

3. Clean all strainers after system cleaning and flushing and again before final system startup.

4. Motors, fans, pumps, compressors, etc. shall be properly oiled and left ready for operation.

5. Verify that each and every fixture is in proper operating condition. All fixtures shall be cleaned, adjusted and inspected.

6. Submission of certified tests shall, in no way, relieve the Contractor of fulfill-ment of guarantee.

7. Gauges, instruments, thermometers and meters shall be checked and tested to specified accuracy.

8. Alarms shall be tested to fulfill satisfactory operating conditions.

9. Allow sufficient time to perform all tests, adjustments, etc., necessary to place the various systems in final operating condition, verify performance requirements and check all safety devices. Labor, instruments, etc., required for various tests shall be furnished by Contractor. The Contractor shall see that all his Sub-Contractors, manufacturer's representatives or Field

Engineers necessary to check and adjust various systems are present, with sufficient forms, and that all test results are recorded properly and turned over to Owner for approval.

10. The Owner's representative will make final check for all systems only after Contractor has completed and returned to the Owner all recorded test data together with letter that his work is 100% complete. Additional tests may be required to meet the requirements of Owner's documents for demonstration of various systems, whether or not specified, to verify performance, workmanship or for adjustments.

11. Unless otherwise specified, equipment shall be installed and adjusted in accordance with manufacturer's recommendations to function properly with capacities required or specified.

D. Running Test of Piping Systems:

1. Any section of the work, after it has been completed and otherwise satisfactorily tested, shall be put in actual operation by Contractor and operated by him for a period of 2 days of 24 hours each, during which time any defects which may appear shall be remedied and any necessary adjustments shall be made. Test shall be performed in the presence of the Owner or his representative, and serve as part of the Instructions Program.

2. During the time of the tests, repack all valves, make all adjustments and otherwise put the apparatus in perfect condition for operation, and shall instruct the Owner's authorized personnel in the use of management of the apparatus. All joints shall be made absolutely tight under tests. Caulking of pipe joints or makeshift methods of repairing leaks shall not be allowed. Piping which is not tight under tests shall be taken down and reassembled.

3. All gauges, thermometers, alarms, instruments, etc. shall be tested to demonstrate that they are functioning properly and within the range of these devices, and to show their degree of accuracy.

4. If during the first test run, the system cannot be completely vented within 24 hours, install additional air vents at high points of system to facilitate quick venting of all water systems.

E. Permanent Equipment Operating During Construction:

1. Use only in same service as the permanent applications, provided that written approval is granted by Owner's representative.

2. Use disposable filters during temporary operation.

3. Expendable media, including belts used for temporary operation and similar materials are to be replaced just prior to acceptance.

4. Packings in equipment operated during construction must be repacked just prior to system acceptance, using materials and methods specified by the supplying manufacturer.

F. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.

G. Tools:

1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

H. Pump Characteristic Charts:

1. Pump Characteristic Charts: Furnish 4 characteristic charts for each pump. Charts shall be not less than 8-1/2" x 11" showing head developed, efficiency and power required for varying capacities at the operating speed of the equipment.

PART 3 - EXECUTION

3.01 FEES

A. All required fees shall be paid by the Contractor.

B. Pay royalties or fees required in connection with the use of patented devices and systems.

C. Provide inspections where required by NFPA, local authorities or by these specifications.

3.02 COORDINATION OF WORK

A. The fire protection drawings show the general arrangement of equipment, piping and appurtenances. Follow these drawings as closely as the actual construction and as the work of other trades will permit. Provide offsets, fittings and accessories which may be required but not shown on the drawings. Investigate the site, structural and finish ground conditions affecting the work, and arrange the work accordingly. Provide such work and accessories as may be required to meet such conditions.

B. Carefully check space requirements with other trades to insure that material can be installed in the spaces allotted thereto including finished suspended ceilings.

C. Wherever work interconnects with work of other trades, coordinate with other trades, insure that they have the information to properly install the necessary connections and equipment. Identify items (valves, etc.) requiring access in order that the Ceiling Trade will know where to install access doors and panels.

D. Consult with other trades regarding equipment so that, wherever possible, motors, motor controls, pumps and valves are of the same manufacture.

E. Furnish and set sleeves for passage of pipes through structural masonry and concrete walls and floors and elsewhere as will be required for the proper protection of each pipe passing through building surfaces.

F. Properly provide firestopping around all pipes, sleeves, etc., which pass through rated walls, partitions and floors. Refer to Section 21 05 05 for requirements.

G. Provide detailed information on openings and holes required in precast members for fire protection work. Cast holes 4 inches and larger in diameter. Field-cut holes smaller than 4 inches. Obtain structural engineer's approval before cutting any openings or holes.

H. Provide required supports and hangers for piping and equipment, designed so as not to exceed allowable loading of structures.

I. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between them to the Engineer and obtain from him written instructions for changes necessary in the work. Install and coordinate the work in cooperation with other related trades. Before installation, make proper provisions to avoid interferences.

J. Wherever the work is of sufficient complexity, prepare additional detail drawings, to scale similar to that of the design drawings, prepared on tracing medium of the same size as contract drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the drawings as to the area to which it applies. Submit these drawings to the Engineer for review. At completion include a set of such drawings with each set of as-built drawings.

K. Before commencing work, examine adjoining work on which this work is in any way dependent for perfect workmanship and report conditions which prevent performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

L. Adjust location of pipes, panels, equipment, etc., to accommodate the work and to prevent interferences, both anticipated and encountered. Determine the exact route and location of each pipe prior to fabrication.

1. Right-of-Way: Lines which pitch have the right-of-way over those which do not pitch. For example: condensate, steam and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have right-of-way lines whose elevations can be changed.

2. Make offsets, transitions and changes in direction in pipes, as required to maintain proper head room and pitch on sloping lines. Furnish and install traps, air vents, drains, etc., as required to effect these offsets, transitions and changes in direction.

M. Install fire protection work to permit removal (without damage to other parts) of coils, heat exchanger plates and tube bundles, filters, belt guards, sheaves and drives, and other parts requiring periodic replacement or maintenance. Arrange pipes and equipment to permit access to valves, cocks, traps, starters, motors and control components, and to clear the openings of swinging doors and access panels.

N. Provide access panels in equipment, etc., as required for inspection and maintenance of internal equipment.

O. In case of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary instructions from the Architect and/or Engineer.

P. Immediately upon the award of this Contract, but prior to commencing any work, confer together with designated major subcontractors, and with the Construction Manager concerning the work under this Contract.

3.03 EXCAVATION AND BACKFILL

A. Provide excavation of the work of this Division. Excavate all material encountered, to the depths indicated on the drawings or required. Remove from the site excavated materials not required or suitable for backfill. Provide grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Remove any water accumulating therein. Provide sheeting and shoring as may be necessary for the protection of the work and for the safety of personnel.

B. Provide trenches of widths necessary for the proper execution of the work. Grade bottom of the trenches accurately to provide uniform bearing and support the piping on undisturbed soil at every point along its entire length. Except where rock is encountered, do not excavate below the depths indicated. Where rock excavations are required, excavate rock to a minimum overdepth of four inches below the trench depths indicated on the drawings or required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly machined tamped to a compaction level of at least 95% to standard proctor density or 75% relative density or as specified by the Architect. Whenever unstable soil that is incapable of properly supporting the work, as determined by the Architect, is encountered in the bottom of the trench, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel or other suitable material.

C. Excavate trenches for utilities that will provide the required depths of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

D. Trenches should not be placed within ten feet of foundation or soil surfaces which must resist horizontal forces.

E. Do not backfill trenches until all required tests have been performed and the installation observed by the Engineer. Comply with the requirements of other sections of these specifications. Backfill should consist of non-expansive soil with limited porosity. Deposit in layer and thoroughly and carefully tamp until complete. Uniformly grade the finished surface.

3.04 CUTTING AND PATCHING

A. Lay out the work carefully in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of piping or other equipment, do the work carefully. Repair any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc., using skilled mechanics of the trades involved at no additional cost to the Owner.

B. Do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless permission from the Architect is first obtained. If permission is granted, perform this work in a manner approved by the Architect.

C. Where piping or equipment are mounted on a painted finished surface, or a surface to be painted, paint to match the surface. Cold galvanize bare metal whenever support channels are cut.

D. Provide slots, chases, openings and recesses through floors, walls, ceilings, and roofs as required to install piping. Be responsible to properly locate such openings and for any cutting and patching caused by the neglect to do so.

3.05 RESPONSIBILITY FOR EVALUATION

A. The Engineer makes no representations, regarding the character or extent of the sub-soils, water levels, existing structural, plumbing, fire protection, mechanical and electrical installations, above or below ground, or other subsurface conditions which may be encountered during the work. This Contractor must make his own evaluation of existing conditions which may affect methods or cost of performing the work, based on his own examination of the facility or other information. Failure to examine the drawings or other information does not relieve the Contractor of his responsibility for satisfactory accomplishment of the work.

3.06 ACCESS TO FIRE APPARATUS

A. Do not interfere with access to hydrants and fire alarm boxes. In no case allow material or equipment to be within 20' of a hydrant or fire alarm box.

3.07 EQUIPMENT PAD AND ANCHOR BOLTS

A. Provide concrete pads for all pieces of equipment and all piping restraint systems.

B. Provide pads in all mechanical equipment rooms. This shall include floor-mounted equipment, equipment mounted on legs and pipe support stands. General conform equipment pads to the shape of the piece of equipment it serves with a minimum 6" margin around the equipment and supports. Construct pads a minimum of 12" high and made of a minimum 28 day, 2500 psi concrete reinforced with 6" x 6" 6/6 gauge welded wire mesh. Trowel tops and sides of pad to smooth finishes, equal to those of the floors, with all external corners bullnosed to a 3/4" radius.

C. Furnish and install galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs. Provide bolts of the size and number recommended by the manufacturer of the equipment and locate by means of suitable templates. When equipment is placed on vibration isolators, secure the equipment to the isolator and secure the isolator to the floor, pad or support as recommended by the vibration isolation manufacturer.

D. Where control panels, motor controllers, etc., are mounted on gypsum board partitions, provide steel channel support system and the mounting screws will pass through the gypsum board and be securely attached to the partition studs. Toggle bolts installed in gypsum board partitions will not be acceptable.

3.08 DELIVERY AND HAULING

A. Include all hauling, hoisting, shoring and placement in the building of equipment specified herein. Be responsible for the timely delivery and introduction of equipment to the project as required by the construction schedule for this project. If any item of equipment is received prior to the time it is required, be responsible for

its proper storage and protection until such time as it may be required. Pay for all costs of demurrage or storage.

B. If any item of equipment is not delivered to or installed at the project site in a timely manner as required by the project construction schedule, be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modification, delays, overtime costs, etc. No additional cost or delays to be incurred by the Owner.

3.09 EQUIPMENT AND MATERIAL PROTECTION

A. Protect the work, equipment and material of all other trades from damage by work or workmen of this trade, and correct all damage thus caused without additional cost to the Owner.

B. Be responsible for all work, materials and equipment until finally inspected, tested and accepted; protect work against theft, injury or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material. Cover and protect in an acceptable manner to the Owner, all equipment and materials from damage due to water, spray-on fireproofing, construction debris, etc. Coordinate all new work with existing systems to maintain all required systems in operation. Insure proper transitions of existing to new systems with minimum downtime and schedule with Owner.

C. Provide adequate means for fully protecting finished parts of the materials and equipment against damage from whatever cause during the progress of the work until final acceptance. Protect materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred, and moving parts kept clean and dry. If items are damaged, do not install, but take immediate steps to obtain replacement or repair.

3.10 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. In general, do not install piping not included as part of the electrical work, in any switchgear, transformer, elevator equipment, telephone, or electrical equipment room unless shown on drawings.

B. Do not install piping above switchboards, panel boards, control panels, motor control centers, individual motor controllers, etc.

C. Provide drip pans under all piping installed in any electrical equipment room. Pan shall be water tight copper, extending 4" in each direction from the pipe wall and turned up at least one-half the diameter of the pipe but not less than 2". The pan shall extend at least 1 foot beyond the electrical equipment. Provide a drip pipe to spill into floor drain or service sink.

3.11 EQUIPMENT GUARDS

A. Provide easily removable expanded metal guards for all belts, couplings, and other moving parts of machinery. Provide tachometer openings in the guards at least 2"

in diameter, for all belt-driven or variable speed machinery. Comply with OSHA requirements for all equipment guards.

3.12 LUBRICATION

A. Provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a metallic lubrication tube with suitable fitting to an accessible location and suitably identify it.

B. After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated with a lubricant recommended by the equipment manufacturer until the Owner issues a Certificate of Substantial Completion for the specific equipment item or system.

3.13 DATE OF COMPLETION AND TESTING OF FIRE PROTECTION SYSTEMS

A. Comply with the project construction schedule for the date of final performance and acceptance testing, and be sufficiently in advance of the Contract completion date to permit the execution of the testing prior to occupancy and the closeout of the Contract. Complete any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper functioning of all equipment prior to the completion date. See individual sections for extent of testing required.

B. Provide a detailed schedule of completion indicating when each system is to be completed and outlining when tests will be performed. Submit completion schedule to the Engineer and Owner for review within six (6) months after the notice to proceed by Owner or Owner's Representative has been given. Update this schedule periodically as the project progresses.

C. Provide all temporary piping and associated equipment, devices, testing, etc. as required to allow for a phased occupancy of the building.

3.14 OPERATING INSTRUCTIONS

A. Provide the services of a factory trained specialist to supervise the operation of all equipment specified herein and to instruct the Owner's operators for the time specified herein. The operating instruction period is defined as straight time working hours and not including nights, weekends or travel time to and from the project.

B. Notify the Owner in writing at least two (2) weeks before each operating instruction period begins. Commence no instruction period until the Owner has issued his written acceptance of the starting time.

C. Operating Instruction Period

1. Standpipe/Sprinkler system: Reserve time as required to complete training personnel properly.

3.15 OPERATING AND MAINTENANCE BOOKS

A. Provide operating instructions and maintenance data books for all equipment and materials furnished under this Division.

B. Submit three (3) final copies of operating and maintenance data books for review at least ten (10) weeks before final review of the project. Assemble all data in a completely indexed volume or volumes in three-ring binders and identify the size, model and features indicated for each item. Print the project name and logo on the outside of the binders.

C. Deliver two (2) initial copies of the operation and maintenance data books to the Engineer six (6) months after notice to proceed has been given by the Owner or Owner's Representative. Include in the initial copies of all information in Paragraph E. below.

D. Maintenance instruction manuals to include complete oiling, cleaning and servicing data compiled in clearly and easily understandable form. Show all model numbers of each piece of equipment, complete lists of replacement parts, motor ratings and actual loads.

E. Include the following information where applicable:

1. Identifying name and mark number.
2. Locations (where several similar items are used, provide a list).
3. Complete nameplate data.
4. Certified Record Drawings and "Final Reviewed" Shop Drawings.
5. Parts list.
6. Performance curves and data.
7. Wiring diagrams.
8. Lubrication charts.
9. Manufacturers' recommended operating and maintenance instructions with all non-applicable information deleted.
10. List of spare parts recommended for normal service requirements.
11. Assembly and disassembly instructions with exploded view drawings where available.
12. Trouble shooting diagnostic instructions where applicable.

3.16 RECORD DRAWINGS

A. Maintain on a daily basis at the project site a complete black and white set of "As-Built Drawings", reflecting an accurate dimensional record of all deviations between work shown on drawings and that actually installed.

B. Record dimensions clearly and accurately to delineate the work as installed; suitably identify locations of all equipment by at least two dimensions to permanent structures. In addition, mark the Record Drawings to show the precise location of concealed work and equipment, including concealed or embedded piping and valves and all changes and deviations in the mechanical work from that shown on the

Contract Documents. This requirement is not construed as authorization for the Contractor to make changes in the layout or work without written instructions from the Engineer.

C. Upon completion of the installation, prepare "As-Built" drawings of the project in a compatible AutoCAD drawing file format, with Engineer's seal and firm name removed. Submit three (3) sets of black and white prints of these drawings to the Engineer for review of completeness. After review by the Engineer, make necessary changes to the drawing files and then deliver them, along with three (3) sets of black and white prints to the Engineer for transmittal to the Owner. Engineer will not review these drawings for accuracy nor will the Engineer bear any responsibility for accuracy or completeness.

D. Mark all "As-Built Drawings" on the front lower right hand corner with a rubber stamp impression that states the following:

"AS-BUILT DRAWINGS" (3/8" high letters)
"To be used for recording

Field Deviations and
Dimensional Data Only". (5/16" high letters)

E. The Record Drawings will also consist of a set of prints of the final "Signed Off" Contractor's "Coordination Drawings" prepared by the Subcontractors.

3.17 CERTIFICATION

A. Any certifications required by the Specifications, in addition to those required for shop drawings, product data, equipment and other items, are to be so certified by the Owner, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and in behalf of the Owner, Partner or Corporation.

3.18 FINAL REVIEW

A. At a time designated by the Owner, the entire system will be reviewed for compliance with the Contract Drawings and Specifications. Be available at all times during this review.

B. Demonstrate to the Owner and/or the Engineer's personnel prior to the Final Review that all systems and all equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are satisfactorily completed, but prior to the Final Review field visit, the Contractor will submit to the Engineer a written certification that: 1) attests to the Contract document compliance for this Project, prior to the Engineer's Final Review field visit, and 2) certifies that the equipment and materials installed in this project under this Division contain no asbestos or P.C.B.

C. Operate the entire system properly with all systems balanced and all controls adjusted.

D. Certificates and Documents required herein to be in order and presented to the Engineer at least two (2) weeks prior to the Final Review.

E. After the review, any changes or corrections noted as necessary for the work to comply with these specifications and the Drawings to be accomplished without delay in order to secure final acceptance of the work.

3.19 PROTECTION

A. Contractor shall protect the work and material of all trades from damage by his work or workmen, and shall replace all damaged material with new material. The plan shall outline corrective action to repair and/or replace the object(s) including all materials to be utilized. Implementation of corrective plan shall be subject to final approval from the Architect.

The Building systems are to remain active during the project as the construction will be phased. Refer to Scope of Work document prepared by the Construction Manager.

Contractor shall be responsible for protecting and maintaining the systems for the duration of the project. Contractor shall note that the building shall remain in operation throughout the duration of construction.

B. Contractor shall be responsible for work and equipment until his work is finally inspected, tested and accepted; he shall protect his work against theft, injury or damage; and carefully store material and equipment received on site which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

C. Contractor shall be responsible for the preservation of all public and private property, along and adjacent to the work, and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits and other underground structures or utilities, and shall carefully protect from disturbance or damage all property marks until an authorized agent has witnessed or otherwise referenced their location, and shall not remove them until directed.

D. Where pipe, ductwork, insulation or equipment to remain is inadvertently damaged or disturbed, cut out and remove damaged section and provide new pipe, ductwork, insulation or equipment of equal capacity and quality.

E. Where conduit and wiring to remain are inadvertently damaged or disturbed, cut out and remove damaged portion and all damaged wiring from the source switchboard, panelboard or pullbox to the destination connection point. Provide new wiring of equal capacity.

F. Vibration: Contractor shall reduce the construction dust not to adversely affect operation of the building. Contractor shall keep vibration to a minimum and not have adverse effect to the operation of the building.

G. Dust Control: Provide adequate filters and dust collectors as required for building operation. Provide duct end caps for all open-ended ducts.

3.20 DEMOLITION WORK RELATED TO EXISTING WORK

A. Contractor shall disconnect and remove all abandoned, unused or discarded equipment (piping, conduits, wires, ductwork, tubing, supports, etc.) from the areas of work as indicated on Drawings.

B. Contractor shall mark out all items to be removed and all items to remain in the field and review with the Construction Manager and Owner prior to demolition.

C. Provide firestopping at all conduit/pipe penetrations at rated construction, where ducts, piping/conduit, etc. have been removed.

D. Whenever existing equipment is disconnected from its services, remove all pipe, conduit or duct branches or runnouts to the point of connection to the existing pipe riser or electrical panel or duct shaft as the case may be. Cap off pipes or ducts near the risers, valved outlets or at mains. Remove all ductwork as indicated on plans and provide sheet metal cap (minimum 24 gage) at all connections to existing ductwork that is to remain. Provide temporary ducts with dampers and valved pipes as required to keep system in operation and occupancy of building.

E. Remove all piping as indicated on plans and provide capped outlets at the point of connection to the existing risers or as indicated on plans. For steel piping to be removed, provide Steel Schedule 40 welded cap. For brass and copper piping, provide 95/5 (tin-antimony) soldered copper Type 'L' Cap. All waste and vent lines shall be capped with a no hub coupling.

F. All welding and soldering shall conform to the following:

1. General:

a. All welding procedures, welders, and welding operators shall be qualified in accordance with the requirements of ASME/ANSI B31.9 and Section IX of the ASME Code, latest editions.

b. Welding procedures shall be reported on ASME Section IX Forms "QW," or its equivalent. Joint preparation sketches (to be included with the welding procedures) shall show all dimensions including tolerances, for bevel angle, land size, offset and root gap.

c. Contractor shall be responsible for the welding performed by personnel of his organization and shall conduct the required qualification tests and submit results to the Owner for his review and approval.

2. Processes:

a. Employ the Manual Shielded Metal-Arc (SMAW) welding process.

b. Use backing rings for welds above 6" diameter pipe.

c. Double butt welding shall be permitted on all joints accessible from both sides. Where double butt-welding is employed, the first root pass shall be back-chipped.

d. Welding of pressure parts shall be performed with low hydrogen type electrodes. Electrodes of Classifications E6012, E6013, E7014 and E7024 shall not be used.

e. Provide ventilation and exhaust.

3. Brazing and Soldering:

a. The Contractor shall prepare applicable "Brazing and Soldering Procedures" forms for approval of the Owner.

b. Brazing shall conform to ASME Section IX.

c. Soldering shall conform to the relevant procedures in the manuals of the Copper Development Association.

d. The Owner may reject any brazed or soldered joint for lack of penetration or for other applicable grounds. These defective joints shall be redone until satisfactory.

4. Quality of Workmanship - In addition to conformance with the procedural and quality requirements set forth in the applicable Code or material specification, all welding shall meet the following requirements.

a. Butt welds shall have full penetrations and shall be slightly convex with uniform height.

b. Each weld shall be uniform in width and size throughout its full length.

c. Each layer of welding shall be smooth, free of slag, cracks, pinholes, undercut in excess of 1/32" and completely fused to adjacent weld beads and base metal.

d. Cover passes shall be free of coarse ripples, irregular surface, non-uniform bead patterns, high crown, and deep ridges or valleys between heads. The surface smoothness of the finished weld shall be suitable for the proper interpretation of non-destructive examination of the weld.

e. Surfaces of parts to be joined by welding shall be cleaned of all oil, grease, paint, scale and rust with solvent and/or wire brushing.

f. Fillet weld size shall be in accordance with the applicable code or as specified on the drawings with full throat and legs of equal length.

g. Welding filler metal and welding flux shall be properly stored in such a manner as to insure that no damage to the coating or corrosion of weld rod will occur. Low hydrogen type electrodes shall be stored in enclosures which provide a regulated temperature as prescribed by

the electrode manufacturer. All electrodes shall be properly identified.

h. Socket welds shall have a gap of approximately 1/16" between the bottom of the socket and the end of the pipe prior to welding. Socket welds shall have a minimum of two weld layers.

5. Repair and Weld Defects:

a. A weld is defective and shall be repaired if it does not meet the acceptance standard of each applicable non-destructive examination as defined ASME/ANSI B31.9, latest edition.

b. Repairs shall be made in accordance with ASME/ANSI B31.9, latest edition.

G. Cutting shall be done carefully in order not to disturb systems or services in areas where demolition is not required.

H. Fully charged fire extinguisher and/or active hoses are to be on sight for fire watch during all burning conditions that require Oxygen/Accel gas for cutting or welding, soldering and the creation of dust, that may activate the fire alarm system, requires that the system be put on bypass for the affected zones. Coordinate shutdown with Owner.

I. Equipment specified or indicated to be demolished shall be removed from the project site. All ballasts shall be tested for PCBs and mercury before removal. Test results shall be submitted to the Owner, and ballasts shall be disposed of properly.

J. Provide additional support for all existing conditions, cabling and devices to remain which are affected by demolition of existing ceilings and partitions.

K. Protect existing systems, pipes, conduits and communications wiring to remain with flame retardant plywood.

L. Drawings are general in nature and do not indicate full extent of removal required, including all hangers, supports, ancillary devices, etc.

3.21 MODIFICATIONS TO EXISTING WORK

A. Contractor shall perform all work as shown or as specified, within the existing site and structures as part of this Contract without detriment to the existing systems or equipment to be kept in operation or maintained in their places.

B. For full extent of modifications to be done to existing systems, Contractor shall inspect existing systems and site conditions to familiarize himself with the complexity of his work related to removals and relocations required, and the existing finishes to be preserved without any damage resulting from possible careless installation procedures. Upon written request by the bidders, Owner shall make the existing schematic plans available for inspection (at his own address) without any responsibility for their completeness or accuracy.

C. As-Built drawings are not available on the existing installations. Any drawings that may be available to the Contractor are for information only. All field criteria must be field verified by Contractor.

D. All cutting shall be done only by mechanics skilled in the particular trade which is affected. No cutting shall be done without proper protections against damage, dirt and dust resulting therefrom or without proper safeguards to workmen, the public, and occupants of buildings.

E. Before cutting is started in any location, Contractor shall carefully investigate conditions influencing human and structural safety. Existing piping, wiring and items concealed in walls and slabs, wherever these walls and slabs are removed, shall be properly relocated, rerouted or removed as the case may require.

F. General Construction trades shall perform all finish masonry, repairing, restoring and finishing of all cut openings, closing up of existing openings, and removing and restoring the affected sections of the suspended ceilings.

G. If, during partial occupancy of the building, circumstances necessitate temporary shutdown of any facilities or otherwise interfere with access to building, owner shall be given a minimum of 48 hours' notice before doing such work.

H. Provide Fire Watch for all periods when existing fire suppression system is taken off-line.

I. In all areas where interface, relocation or alternation work is to be done, Contractor shall disconnect and remove from the premises all existing ductwork, piping, etc., that will not be required to remain in service after the alterations are completed. All such equipment (except as requested as salvage by the Owner) shall become the property of this Contractor, and he shall remove same from the premises immediately upon disconnection. Existing ductwork, piping, etc., being removed shall not be reused.

J. Contractor shall move or relocate any existing mechanical equipment, piping, ductwork, etc., which may temporarily interfere with the construction, (to a temporary location) if the existing equipment is to be kept in operation during construction. He shall also install temporary piping, ductwork or equipment that might be required (during demolition or excavation and during the construction of tunnels, retaining walls, footings or columns) for offsetting all piping around the construction area in order to maintain services to the existing systems. Provide temporary piers, supports and hangers as required for excavation.

K. Provide all cuts and openings through structural slabs and walls. Contractor shall coordinate his work with concrete contractor and provide necessary dimensions for all openings.

L. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from work performed under this Section. Provide rough patching in areas shown.

M. Test all piping to be retained or shown to be re-used together with the new extensions connected to them. Install isolation valves as required.

3.22 CODES, RULES, PERMITS & FEES

A. The Contractor shall give all necessary notices, obtain all permits and filings including, but not limited to, New Jersey DEP, New Jersey DEC, New Jersey Building Code requirements, and pay all government sales taxes, fees, and other costs, in connection with his work. However, all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity shall be paid directly to utility companies and/or agencies by the Owner, unless otherwise indicated. The Contractor shall file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Owner's Representative before request for acceptance and final payment for the work.

B. The complete design and construction shall conform to the requirements of the IBC-NJ, NJRSC, NFPA, NEC, FM, UL and any other local or state code which may govern.

C. Provide all New Jersey State permits for all equipment as required.

END OF SECTION