

Section 22 05 00

COMMON WORK RESULTS FOR PLUMBING

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Provide a complete working installation with all equipment in proper operational condition. Documents may not show or list every item required. The documents do not undertake to show or list every item to be provided. When an item not shown or listed is necessary for the proper operation of equipment which is shown or listed, provide an item which will allow the system to function properly at no increase in Contract Sum.
- B. Should there be any direct conflict in the specifications and drawings the most stringent requirement shall govern.
- C. Provide all control devices for mechanical equipment and systems in conjunction with control system requirements, including coordination with Division 26 for electrical connection for complete, tested and operational systems.
- D. The requirements of this section apply to all the Work of Division 22.
- E. The scope of work shall include but not be limited to the following:
  - 1. Provide and install all piping for domestic water, natural gas, sanitary, storm, fuel oil system valves, specialties and accessories.
  - 2. Provide and install water heater, and accessories.
  - 3. Provide testing, adjusting and balancing for all systems.
  - 4. Carry out the commissioning requirements specified in Section 23 08 00 and other sections referenced in Division 1.
  - 5. Provide, design, dimension, coordinate, and install the following items specified as design build under specified performance criteria:
    - a. Support and anchorage of all equipment, valving, and piping. Refer to Section 22 05 29.
    - b. ~~Vibration isolation and seismic anchorage. Refer to Section 22 05 48.~~
- F. Related Sections
  - 1. All sections within Division 23 - Heating, Ventilating, and Air Conditioning
  - 2. All sections within Division 21 – Fire Protection System
  - 3. All sections within Division 22 – Plumbing Systems
  - 4. All relevant sections within Division 26 – Electrical
  - 5. All sections within Division 1 - General Requirements
  - 6. Relevant sections within Division 3 - Concrete
    - a. Section 3 30 00 - Cast-In-Place Concrete
  - 7. Relevant sections within Division 5 - Metals
    - a. Section 55000 – Metal Fabrications
    - b. Section 55213 – Pipe and Tube Railings
  - 8. Relevant sections within Division 7 - Thermal and Moisture Protection
    - a. Section 07 84 00 - Fire Stopping

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9. Relevant sections within Division 08 - Openings
    - a. Section 8 71 00 - Door Hardware
    - b. Section 89000 – Louvers and Vents
  10. Provisions of general LEED requirements and forms: 018113  
“Sustainable Design Requirements”.
- G. Comments on Construction Documents Drawings
1. The drawings show the general arrangement of all piping, and equipment. Examine drawings and specifications very carefully and notify the Architect and/or Owner's Representative by letter or Request for Information (RFI) of any discrepancies so these can be rectified at an early date.
  2. Should conditions necessitate any rearrangements, the Contractor shall prepare and submit drawings showing the changes before proceeding with the work. If such changes are approved, they shall become a part of this contract after their approval.
  3. Due to the small scale of the drawings, it is not possible to show all offsets and every detail of construction. Additional fittings, valves, traps, transitions, ducts, etc., shall be furnished and installed at no extra cost to the Owner.
  4. The drawings are diagrammatic and are a graphic representation of the Contract Requirements, produced according to the best available standards to an optimum scale. Dimensions of work as indicated on plans are not guaranteed to be as-built dimensions. No measurements shall be scaled from the Drawings for use as a definite dimension for layout or fitting work in place. The Contractor is solely responsible for dimensional control and coordination of the work to be installed.
  5. The layout of equipment, as shown on the plans, shall be checked and exact location determined by dimensions of equipment accepted for installation. Consult the Architectural and Structural Drawings for all dimensions, locations of partitions, sizes of structural members, foundations, etc.
  6. The Contractor shall be responsible for the coordination of the plumbing systems with mechanical ducting and piping distribution, with the fire sprinklers, lighting, conduit, cable tray, structural members, ceiling support and all other trades present within the project.
- H. Minor Deviation from Construction Documents
1. The dimensions and ratings of equipment herein specified or indicated on the Drawings are intended to establish the desired performance characteristics of such equipment. Minor deviations may be permitted after review by the Engineer and/or Owner's Representative to allow manufacturers specified to bid on their nearest standard equipment that provides at least the performance required.
  2. Manufacturers' catalog or model numbers and types mentioned in the Specifications or indicated on the drawings are used as design guides. In all cases, the manufacturer shall verify the duty specified with the particular characteristics of the equipment he intends to submit and shall submit only items which comply with Specification requirements.
  3. Where the equipment furnished differs in physical character from that specified or indicated, or where Contractor's substituted equipment requires increased service and facilities to be provided by other trades,

and such substitution is acceptable to the Engineer, Architect and/or Owner's Representative, the Contractor shall bear all costs of providing services, facilities and modifications to the system or building.

4. Where the equipment furnished requires redesign of systems, connections, or configuration, and such substitution is acceptable to the Engineer, Architect, and/or Owner's Representative, the contractor shall bear all costs associated with design engineering and shall pay the time and materials cost of the Engineer, Architect and/or owner's representative's review of this documentation. In addition, it is the contractor's responsibility to obtain approval from the authority having jurisdiction.

## 1.2 REFERENCES

- A. References to standard codes, specification of regulatory agencies shall mean editions in effect at date of proposal. Reference to technical societies, trade organizations, governmental agencies is made in this Division in accordance with the following abbreviations:

1.	AGA	American Gas Standard
2.	ANSI	American National Standards Institute
3.	ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
4.	ASME	American Society of Mechanical Engineers
5.	ASSE	American Society of Sanitary Engineering
6.	ASTM	American Society for Testing and Materials
7.	AWWA	American Water Works Association
8.	AWS	American Welding Society
9.	CDA	Copper Development Association
10.	CISPI	Cast Iron Soil Pipe Institute
11.	EPA	Environmental Protection Agency
12.	IAPMO Officials	International Association of Plumbing and Mechanical Officials
13.	NEC	National Electrical Code
14.	NEMA	National Electrical Manufacturers' Association
15.	OSHA	Occupational Safety and Health Administration
16.	PDI	Plumbing and Drainage Institute
17.	UL	Underwriters Laboratories, Inc.
18.	FM	FM Global

## 1.3 QUALITY ASSURANCE

- A. Nothing in these plans or specifications is to be construed to permit work not conforming to the prevailing codes and regulations. Should there be any direct conflict between any referenced standard and the governing code, the mandatory code language shall govern to set only the minimum requirements and the most stringent requirement shall govern. A letter or Request for Information (RFI) shall be generated to highlight the discrepancy.
- B. Install Work by craftsmen skilled in the trade involved and by apprentices as indicated in the General Conditions.

- C. Electrical Testing: Provide the services of a qualified testing laboratory/agency to perform the specified field tests. Notify the Owner's Representative 24 hours in advance of performance of Work requiring testing. Provide all materials required for testing. Refer to Division 26 for detailed requirements of electrical testing.
  
- D. Factory and Field Testing
  - 1. See each Section for the required testing and procedures.
  - 2. Test reports shall include:
    - a. Description of equipment tested.
    - b. Description of test procedures.
    - c. Test results.
    - d. Names and signatures of witnesses of tests.
  
- E. Performance testing
  - 1. Upon completion of the Work and following adjustment of all equipment, conduct an operating test for each system's acceptance. Demonstrate all systems and equipment to be operational and free from all electrical and mechanical defects.
  - 2. Notify the Owner's Representative fourteen days in advance of when tests will be performed. At that time, provide a test procedure plan, test schedule and test procedure forms.
  - 3. Coordinate the work of Performance Testing with the Commissioning Requirements for Pre-Functional and Functional Testing.
  
- F. Materials and Workmanship
  - 1. Materials shall be new, meet detailed requirements of the contract document and be identifiable as being specified or substitute products. Materials shall be kept in original packing material and protected from the elements by plastic and placed on dunnage until the item is installed. Once installed, all electrical devices shall be covered with sealed plastic until the building is fully enclosed and all spraying applications are complete.
  - 2. Materials that 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 and shall not be installed.
  - 3. All work shall be performed by properly licensed plumbers, mechanics, and technicians with work limited to their respective trades.
  - 4. All equipment shall be installed in accordance with the recommendation of the manufacturer.
  - 5. 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.
  - 6. 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.
  - 7. Materials and adhesives used throughout the plumbing systems for insulation, flexible connections and jackets or coverings regardless of kind for piping system components, shall have a flame spread rating not

over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. If such materials are to be applied with adhesives the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not higher than 50.

- G. Checking and Testing Equipment By Contractors and Manufacturer's Representative
1. All equipment shall be installed per the 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.
  2. Manufacturer's representative shall review the overall system design relative to the proper application of his equipment in the particular system. That person shall note conduit, wiring, control, location, and other relevant relationships, and furnish appurtenances necessary for satisfactory operation.
  3. Before equipment start up, the manufacturer's representative shall submit to the Owner's Representative, a signed statement certifying to their inspection and noting that the equipment is properly installed and ready for operation.

#### 1.4 SUBMITTALS

- A. Section 1 33 00 - Submittal Procedures
- B. Preliminary List of Materials and Equipment
1. Submit a Preliminary List of Materials and Equipment to the Owner's Representative for approval of manufacturers of all materials and equipment proposed to be provided for this project.
  2. The review of the Preliminary List of Material and Equipment shall only be construed to be a general review that the manufacturer is a recognized and reputable supplier of that general type of product and therefore eligible to submit his product in detail for review. The review designation of "no exception taken" to the Preliminary List does not exempt the Contractor from proving that the particular and specific equipment meets the project's requirements.
  3. Submit the List of Materials and Equipment for review/approval in accordance with Section 1 33 00: Submittal Procedures. Submit at least one month prior to the first submittal.
- C. Submittal Schedule
1. Provide a submittal schedule at least one month prior to the first submittal.
  2. The submittal schedule shall be a complete list of all submittals to be made with projected date of submittal.
  3. The submittal schedule shall assume at least one "Revise and Resubmit" cycle. Delay to schedule associated with submittals' "Revise and Resubmit" designation are ineligible for change orders, as timely and correct work is a requirement of this contract.
- D. General Organization of Submittals

1. Submit as a minimum all the required data listed in the documents as specifying performance, material, and dimensions. Refer to individual specification sections, schedules, and drawings for requirements.
  2. Organize submittals in the same sequence as they appear in specification sections, articles or paragraphs.
  3. Each submission shall be made under the Specification Section Number it has been specified under. Submittals including equipment specified under a different specification section will be rejected and returned without review. Each section is required to be tracked separately for status designation, even if multiple sections are physically collated into a single binder.
  4. Identify each item with each submittal by reference to Specification Section paragraph in which the item is specified or Drawing and Detail number. Annotate the submittal sheets with the equipment identification numbers appearing on the equipment schedule.
  5. Include all information requested by the Specification Section in a single submittal. With the exception of shop drawings, incomplete submittals or phased submittals under the same specification section are not acceptable and will be returned without review.
  6. Submit pertinent catalog and performance data sheets only. Annotate pages to clearly identify which specific product is submitted and for what tag number or application. Contractors shall not submit entire catalogs.
  7. Submission shall be made in the form of a tab-indexed brochure. Index sheets shall be required for all material, plumbing fixtures and equipment, including but not limited to pipe, fittings, valves, insulation, etc. as listed. Index sheets shall be set up with columns to identify the following:
    - a. Specification clause number or drawing/detail number
    - b. Item type
    - c. Tag number as appropriate and/or application
    - d. Requirement from drawing schedule and specification
    - e. Feature data provided to show compliance
    - f. Compliance: yes or no
    - g. Notes from Contractor
  8. Provide the number of submittal and shop drawing copies as defined under Section 1 33 00.
- E. Plumbing Fixtures and Equipment Submittals:
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. Words "as specified" are not sufficient identification.
  2. Mark each item and data on each sheet. Where multiple product model types are listed on a single sheet, the contractor shall clearly indicate which specific item is submitted. If different model numbers of a single product line are submitted for different uses, this should be clearly annotated, identifying each individual use cross-referenced by the requirement it intends to fulfill. Submittals without annotation will be rejected and returned without review.
  3. 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

and its relevant features or options. Submittals shall include all those items listed in each individual Section.

- F. Shop Drawings:
1. Prepare reproducible CAD drawings in AutoCAD.
  2. Shop drawings shall be provided for all systems included in Division 23 and for all areas addressed in the Construction Documents.
  3. Piping installation drawings shall be fully dimensioned complete with elevations and all fittings, valves, devices. Include details and dimensioned locations of supports, anchors and expansion devices. Dimensions shall be from gridlines. All equipment shall be shown to scale and shall match the required dimensions from the equipment submittals. All equipment access clearances shall be marked explicitly on the Shop Drawings with manufacturer and code required distances dimensioned and annotated as such.
  4. The drawings shall be minimum 1/4" = 1'-0" scale.
  5. Independent structural support and structural pad drawings shall be submitted for review by Structural Engineer.
  6. All equipment shall be labeled to match the schedules.
  7. The Contractor shall assure that each trade has coordinated work with other trades, prior to submittal. Division 22 shop drawings shall be issued after the coordination drawings are signed off by all other trades. Any conflicts that occur with other trades shall be brought to the attention of the Owner's Representative prior to issuance of the shop drawings.
  8. Shop fabrication, coordination and installation drawings that are prepared to scale by the Contractor are for his use and shall be his responsibility. These Drawings indicate where he intends to install the fixtures, material and equipment as required by the Contract Documents. Submission of contract documents or electronic files of contract documents for shop drawings is not sufficient as this would be an indication that field-level construction coordination has not taken place. Any such submittal will be rejected and returned without review.
  9. Prepare and submit supplementary Shop Drawings for all Work in "tight" areas, clearly indicating solutions to space problems and coordination with Work in other Sections. Identify congested conditions and provide a sufficient number of sections to demonstrate the solution proposed. These Drawings, as a requirement of this Division, shall indicate, superimposed, Work of all Sections involved in congested area, including plumbing piping, ductwork, piping, electrical work, ceiling work, equipment access requirements, etc. Include all mechanical rooms at larger scale and with sections under this clause. Identification of space problems without solutions is not acceptable within a shop drawing.
  10. During the shop drawing review process the owner's representative may request that supplementary shop drawings be produced for clarification and explicit demonstration of coordination in congested areas. This work shall be performed by the contractor at no cost as necessary under the previous clause.
  11. Prepare and submit Shop Drawings for all Work deviating from that indicated on Contract Drawings. Clearly indicate deviations and cross reference through notes the reason why the deviation was made.
  12. Shop Drawings shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance,

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- access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, weight.
- a. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of the Contract Documents.
  - b. Drawings shall be to scale and dimensioned (except piping diagrams not to scale).
  - c. Drawings shall clearly show all required openings in construction, points of connection of other trades, and support locations and loads.
  - d. Drawings may be prepared by vendor but shall be submitted as instruments of the Contractor. Such drawings shall be thoroughly checked and developed by the contractor to include the full contract scope. They shall be stamped by Contractor before submission for review.
  - e. Catalog cuts and published material may be included to supplement scale drawings.
13. Each drawing shall have a blank space for use by the Owner's Representative and Contractor in recording disposition of material per Section 1 33 00.
- G. Coordinated Drawings:
1. Refer to Section 1 33 00 Submittal Procedures for requirements.
  2. Coordinated drawings shall be provided for all areas.
  3. Coordinated Drawings shall show work of all trades including, but *not limited to*:
    - a. Piping, including:
      - 1) HVAC, Plumbing and Fire Protection.
      - 2) Minor Piping such as Drains, Air Vents, Condensate Piping, etc.
      - 3) Sleeves and Penetrations.
      - 4) Expansion Devices, Anchors, Guides and Hangers, Seismic Anchorage Devices.
    - b. Equipment, including points of connection and manufacturer's recommended access space. Nothing shall enter or cross through the required access space, which is defined as the volume extending from the top of the device to be maintained down to the floor. Any ceiling which interrupts this space shall be entirely removable including T-bars, vertical supports and seismic bracing of ceiling which shall be arranged to avoid the access zone.
    - c. Supports and Suspension Devices.
    - d. Piping High Points and Low Points.
    - e. Electrical Equipment.
    - f. Main Electrical Conduits and Bus Ducts.
    - g. Equipment Support and Suspension Devices including Hangers, Supports and Bracing.
    - h. Structural and Architectural Constraints including Beams, Braces, Trusses, Flanges, Constraints, Walls, Openings Ratings, Doors, Wall Types and Glazing.
    - i. Show location of:
      - 1) Valves.
      - 2) Piping Specialties.



- 3) Access Doors and Equipment Removal Paths.
  - 4) Control and Electrical Panels.
  - 5) Disconnect, Hand/OFF/Auto, and Emergency Power Off Switches.
  - 6) All control sensors, control panels and required installation distances for access and stable performance.
4. Drawings shall indicate coordination with work in other Divisions which must be incorporated in mechanical spaces, including, but not limited to:
    - a. Mechanical equipment, piping and duct.
    - b. Irrigation Equipment and Piping.
    - c. Elevator Equipment.
    - d. Electrical Equipment.
    - e. Cable Trays.
  5. Provide sections and elevations for all mechanical rooms, mechanical areas, areas with routed piping mains, and areas adjacent to the existing structure.
- H. Substitutions:
1. In accordance with Section 1 60 00, and where permitted in each section.
  2. Specified products or equipment mean those named on the equipment schedules or identified as Specified Manufacturers herein. All other manufacturers listed are considered substitutions and must meet the requirements of this Section. Only manufacturers identified as Possible Substitutions in this specification may be offered as substitutions for approval.
  3. Substitution requests shall come simultaneous to the relevant submittal and shall not come through the RFI process, unless directed by the Owner's Representative.
  4. Submit shop drawings and proposed products that differ from the specified products and also indicate products with connections and show arrangements. Show necessary modifications of architectural, structural, plumbing, electrical and mechanical Work required by the proposed products, including relocation of drains, revised electrical circuits, relocation of roof or wall penetrations, and revised foundations.
  5. Accompany request for substitution review with table of comparison listing pertinent features of both specified and proposed materials including all scheduled data, material of construction, performance criteria, overall length, width, height dimensions, space required for tube replacement or maintenance access, motor type, horsepower, voltage, phase service factor, noise levels and controls. This is to be submitted in addition to the index sheet required above for all submittals. Review of proposed substitution will not be made without simultaneous receipt of satisfactory comparison tabulation. The substitution request shall also identify the offered reduction in contract value, which shall be inclusive of all cost associated with work by other trades. If paper copies of data from the referenced manufacturer are provided along with the submitted manufacturer as backup data for the table of comparisons, these shall be explicitly separated via tabs clearly marked as follows:
    - a. Substitution request and comparison table
    - b. Submitted data from requested manufacturer
    - c. Reference data from specified manufacturer

6. Limit submittal of substitutions to one proposal for each type or kind of item, unless otherwise explicitly permitted by the Owner. If the proposed product substitution is rejected by the Owner's Representative, submit the specified product at no cost to the project.
  7. Review of drawings and other material submitted as a substitution shall not be construed as a complete check or constitute a waiver of the requirements of the Contract Documents. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangement or construction of other Work.
  8. Any additional work required by other trades as a result of a substitution shall be covered under this Contract, without any additional cost or time delay imposed on the project.
  9. When a substitution is proposed, the Contractor shall be responsible to ensure that the performance and quality of the scheduled or specified equipment is met. If additional accessories are required to achieve performance, they shall be provided at no cost.
- I. Resubmittals:
1. Resubmittals shall be reviewed for compliance with the comments made on the original submittal. Clearly identify replies to comments, through a cover letter by the Contractor that lists each comment and the resolution of that comment. Mark with submittal number and date.
  2. Non-compliant items which were not noticed in an earlier submittal but are noticed in a resubmittal shall be noted as non-compliant and the resubmittal tagged for corrective action. The fact that the owner's representative may have overlooked the defect shall not constitute total or partial acceptance of it. The contractor remains responsible for delivering an installation that meets the design intent. All corrective action shall be performed at no additional cost or delay to the project.
  3. Re-submittals shall be complete and shall be explicitly annotated to note all changes. Contractor shall not just include specific responses to review comments, but shall show how the resubmittal data has been corrected and how all consequences of the change have been accommodated.
  4. Changes made in the resubmittal which are not directly a response to an earlier review comment shall be clearly identified on the letter of transmittal provided with the re-submittal and annotated within the body of the submittal. The reason for the change shall be included.
  5. One resubmittal will be reviewed. Review time for all second and higher resubmittals will be charged on a time and materials basis to the contractor regardless of the cause of the resubmittal. This will include all submittals to change manufacturer or equipment type after an original submittal was returned with no exceptions taken, unless the change is directly related to a Bulletin.
- J. Submittals – Checking
1. Before submitting shop drawings or equipment submittals to the Owner's Representative, the contractor shall check them in detail to be sure that all requirements of the plans and specifications have been fully met.
  2. Incomplete submittals and submittals not in accordance with the above requirements shall be returned without action, and resubmittal shall be required.

3. Review of drawings and other material submitted shall not be construed as a complete check or constitute a waiver of the requirements of the Contract Documents. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, to coordinate with the other trades and to effect necessary rearrangement or construction of other Work.
4. Review is not intended to verify dimensions or quantities, or to coordinate items shown on these Drawings. Review is for general conformance with design concept of the Project and general compliance with the information given in the Contract Documents. Contractor is responsible for dimensions, which shall be confirmed and correlated at the Jobsite, for fabrication processes and techniques or construction, for coordination of his Work with that of all other trades, for installed performance and the satisfactory quality of his work.
5. Review by the Owner's Representative of Submittals does not release the Contractor from full compliance with the requirements of the plans and specifications when Submittals deviate from these requirements.
6. Even though Submittals have been stamped "Reviewed" and no exceptions have been taken by the Engineer, the Contractor shall be fully responsible for all unauthorized deviations from the Drawings and specifications. Authorization for deviation will be made only by means of a letter from the Owner's Representative. The Owner's Representative's reviewed "No Exceptions Taken" stamp on a Submittal is not an authorization for a deviation from the plans and specifications.
7. Any corrections or modifications made by the Owner's Representative shall be deemed acceptable to the Contractor with no change in contract amount unless written notice is received by the Owner's Representative prior to the performance of any work affected by any corrections or modifications.
8. No material or equipment shall be released for manufacturer or shipment without first obtaining the Owner's Representative approved shop drawings.

#### 1.5 PROJECT RECORD DOCUMENTS

- A. In accordance with Section 17700 - Closeout Procedures: Record Documents, and as follows.
- B. Keep up-to-date during the progress of the job through, one set of drawings indicating the Record installation. In addition to changes made during course of Work, show following by dimension from readily obtained base line reference points:
  1. Exact location, type, and function of concealed valves and controllers.
  2. Exact size, invert elevations and location of above floor, underground and under floor piping.
- C. Underground utility services, both inside and outside of buildings, shall be dimensioned from permanent structures or bend mark. Utility services outside of buildings shall also show depth of burial with reference to the finished ground floor elevation.

- D. This set of drawings shall be kept on the project site at all times and shall be available for inspection by Owner's Representative or Construction Manager weekly.
- E. Submit completed Drawings to 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.
- F. At the completion of the project the Contractor shall submit record as-built drawings as specified under Section 17700 and their electronic CAD files. Drawings shall incorporate all the Owner's and Architect's comments and represent completed as-built conditions.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Instructions and Manuals: In accordance with requirements of Section 17700 and as follows:
  - 1. Subsequent to completion of balancing and testing operations, this Division is responsible for instructing the owner's authorized representatives in all aspects of operation, adjustment and maintenance of mechanical plant and other mechanical equipment. Submit certificate, signed by owner's representative, attesting to their having been instructed per Section 17700 and as specified under individual Equipment section of this specification.
  - 2. Instructions on major items such as pumps, water heaters, etc. shall be by representative of manufacturer of the respective equipment.
  - 3. One month prior to request for final inspection, submit Operating and Maintenance manuals under Section 17700.
  - 4. Manuals shall include the following:
    - a. Section 1: A comprehensive table of contents and guide to the manuals contents and layout. This section shall enable the reader to comprehend the scope and purpose of the document and to identify readily where specific information can be obtained.
    - b. Section 2: Contractual and Legal records including:
      - 1) Name and Address of the installation.
      - 2) Details of City and State approvals.
      - 3) Name and Contact details of the Design Team and Installing Contractors and associated sub-contractors.
      - 4) Dates for Start of Installation, Substantial Completion, and Expiry of Warrantee period.
      - 5) Copies of maintenance service contracts and contact details for local service company.
      - 6) Copies of warrantees and bonds.
    - c. Subsequent Sections:
      - 1) Startup and Shutdown Procedures:
        - a) Provide a step-by-step write-up of all major equipment. When manufacturer's printed start-up, troubleshooting and shut-down procedures are available, they shall be incorporated into the operating manual for reference.

- 2) Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
  - 3) Service Instructions: Provide the following information for all pieces of equipment:
    - a) Recommended spare parts, including catalog number and the name, manufacturer's name and contact information, address and telephone number of local suppliers of factory representative.
  - 4) Lubrication and maintenance instructions and recommended service maintenance schedule for all equipment including all electric motors. Sample maintenance record forms for each equipment type.
  - 5) A lubrication chart listing each item of equipment, all points of lubrication, proper lubricant, dates lubricated, and lubrication schedule.
  - 6) Data sheets to show complete internal wiring, mechanical and electrical ratings and characteristics, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or electrical failure, and description of operating, test, adjustment, and maintenance procedures.
    - a) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
    - b) Final submittals for equipment shall have final corrections included in the prints used for the manual.
  - 7) Equipment List: List of all major equipment as installed shall include model number, capacities, and nameplate data. Include in the manuals, parts catalogs for each item of equipment furnished by him with the components identified by number of for replacement ordering.
  - 8) Valve charts organized on a room and sequence basis, detailing room, system and valve numbers.
5. Controls Binder: Bind data in vinyl covered loose-leaf binders with title index tabs identifying items therein to include:
- a. Detailed list of all control set points and control and wiring diagrams and software.
  - b. Detailed description of sequence of operation of each system, with charts and diagrams. Include emergency operation performance and resetting procedures as appropriate. Include explicit definition of all setpoints, alarm triggers, loop tuning coefficients, and ranges present within programming at time of handover.

- c. Provide full size copies of Record one-line diagrams, folded into plastic covers. Obtain Record prints from Owner's Representative at Contractor's cost and have prints thin laminated by a firm normally engaged in this work.
- d. Provide laminated control diagrams. Diagrams shall show complete equipment, controls, model numbers, etc., marked to correspond to identification on equipment.
- 6. Certification Binder
  - a. Certificates: Submit final inspection certificates signed by governing authorities.
  - b. Letters from manufacturers certifying their supervision of equipment installation and start-up procedures.
  - c. Machinery vibration test reports.
  - d. Certificates of sterilization/chlorination of plumbing systems.
  - e. Test certificates.
  - f. Instruction certificates.
  - g. Final inspection certificate signed by governing authorities.
- 7. Submit drafts of service and maintenance instruction sheets to Owner's Representative for review before preparing final sets.

#### 1.7 TEMPORARY FACILITIES

- A. Temporary Water: Provided under Section 15000.
- B. Temporary Light and Power: Provided under Section 15000.

#### 1.8 REGULATIONS, CODES, PERMITS AND FEES

- A. Conform to all rules, regulations, laws, and ordinances governing the area in which this construction occurs.
- B. Obtain the required permits from the local authorities for this work and pay for all fees required by the State and Federal authorities for permits, inspections and review, including special agency construction and operating permits. Make corrections in the work as required by the Owner's Representative or Inspector to pass local regulations.
- C. Provide local authorities with all notices relating to this Division.
- D. Provide Owner, Owner's Representative and local Inspectors access to work at all times.
- E. Contractor shall be responsible for all law violations caused by the work under this Division. Notify the Owner's Representative in writing when a discrepancy occurs between code requirements and work shown on drawings and resolve matter before proceeding with work.
- F. Make application and pay for all certificates of inspection, taxes and permits required by Local, State or Federal Governments, public utilities, or other authorities having lawful jurisdiction. Deliver to the Owner's Representative any and all certificates of inspections, permits, and approvals that may be required by such authorities.

1.9 COOPERATION BETWEEN TRADES

- A. Division 1 – General Requirements
- B. 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, shares space with, 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 headroom and clearance may be obtained. If 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.
- C. Electrical Work for Plumbing Equipment
  - 1. Division 26 Contractor: Wire all mechanical equipment furnished by this Division in accordance with the following general provisions:
    - a. Provide 120-volt emergency power circuits available at panel for control contractor's use.
    - b. Provide and wire heavy-duty, quick-make, quick-break type disconnect switches, manual pushbuttons and other fire alarm hard-wiring specifically called for in the documents or noted in electrical specifications and wherever required by Code.
    - c. Receive, unload, set, and rough align all separately shipped motors.
    - d. Receive, unload, set and install all motor starters and variable frequency drives.
    - e. Wire all miscellaneous solenoid valves, relays and other components provided with equipment which is not factory wired or part of control contractor's scope.
    - f. Wire fire alarm lighting controls and other monitoring systems for interface with Building Management and Control System.
    - g. Wire interlocks between equipment as called for in Controls specifications.
    - h. Provide final equipment connections for all equipment with voltage greater than 120-volt, including overcurrent protection and disconnect.
    - i. Provide final equipment connections for 120-volt equipment that requires motor starters. Include starter, overcurrent protection, and disconnect.
  - 2. Division 22 shall provide the following:
    - a. All control devices noted on the drawings and within the specifications.
    - b. Complete and accurate wiring diagrams to Division 26 for all equipment requiring electrical power wiring.
    - c. Separately shipped motors and variable frequency drives shall be installed by Division 26. Adjustable motor bases and all bolts and nuts required for installation of base and motor shall be provided and installed by Division 22.
    - d. Field lubricate all motors prior to operation and maintain lubrication prior to acceptance of equipment by the Owner's Representative.

- e. Provide motor terminal connection diagram as prepared by motor manufacturers.
  - f. Provide 120V wiring from dedicated J-box to Control Panels or controllers.
  - g. Provide control wiring from Control Panel to controlled device.
- D. Cutting and Patching
- 1. The Contractor shall do all cutting of building materials, piping, etc., as required for the installation of work.
  - 2. No structural members shall be cut without the prior approval of the Owner's Representative. To gain approval to cut concrete, Ferrosan the affected area and submit scan results to Structural Engineer for review. Submit to Owner's Representative, drawings and details for the support of structure around the opening. If the standard structural details are to be used, then submit a plan that cross-references all penetrations against detail numbers for review. Otherwise, submit drawings, design, and calculations stamped by a Registered Professional Structural Engineer in the State of New York. Any cutting and remedial support shall be done in a manner satisfactory to the Owner's Representative.
  - 3. Patching of building structure, walls, floors, etc. during normal work progress with Requirements of Division 1.
  - 4. All patching of or repair of damage to completed work in place shall be done to meet with the approval of the Owner's Representative.
  - 5. All cutting shall be performed with machine saw. Holes for pipes in concrete walls or floors shall be drilled with core drilling equipment.
  - 6. Work in place that is subsequently cut is seen as evidence of the contractor's lack of field coordination during the shop drawing production phase. Because field coordination is a requirement of the contract, the contractor must bear all costs of cutting, patching and repair for corrective work

## **PART 2 - PRODUCTS**

- 2.1 NOT USED

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF EQUIPMENT**

- A. Install equipment according to the manufacturer's instructions, code requirements, and required access clearances.

### **3.2 LOCAL AND EXISTING CONDITIONS**

- A. Prior to bidding visit the site and determine all existing conditions affecting work in this Division. Examine all Drawings and Specifications to familiarize with the type of construction to be used, and the nature and extent of work of other trades.



- B. Observe the conditions under which deliveries of materials and equipment shall be made and under which such materials and equipment can be stored and shall include adequate provision in the bid proposal.
- C. Any connections to or relocation of any existing utility line requiring temporary discontinuance of utility services which are in active use shall be scheduled and coordinated with the utility companies and the Owner's Representative. In no case shall the services be left disconnected at the end of a working day or weekend unless authorized by representatives of the utilities and the Owner. Any existing utility service damaged shall be repaired to the satisfaction of the Owner's Representative.

### 3.3 PROVISIONS FOR LATER INSTALLATIONS

- A. At the start of the project, meet with the Owner's Representative to obtain information regarding allowable sleeve or penetration spacing and size.
- B. Where any Plumbing work cannot be installed as the work progresses, the Contractor shall provide and arrange for the building in of boxes, sleeves, inserts, fixtures or devices as necessary to permit installation of the omitted work during later phases of construction. This field coordination work shall be completed prior to structural shop drawings and shall follow the principles set forth in the meeting reference above. Arrange for and lay out any chases, holes, or other openings that must be provided in masonry, concrete or other work.
- C. The Contractor shall be responsible for being aware of the nature and arrangement of the materials and construction to which the work attaches or passes through, and shall propose support and penetration details that are consistent with maintaining the integrity and performance of the construction such as, but not limited to, fire-resistive construction, acoustically rated construction, vibrated isolated construction, water tight construction, fire proofed construction, and isolated construction.
- D. This work shall be incorporated into the initial shop drawing review of the construction (wall, floor, etc.) that is affected so that the owner's representative may review the impact of the holes.
- E. The contractor shall bear the cost of time and materials for the Owner's Representative to re-analyze the construction if the original spacing principles are not adhered to, for whatever reason.
- F. Once the structural shop drawings are returned with no exception taken, the contractor shall bear the cost of time and materials for the owner's representative to review the appropriateness of cutting or drilled holes in planned or existing construction.

### 3.4 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.

- B. Prior to placing equipment or scaffolding, the contractor shall provide written verification that the structure on which the load is imposed has sufficient strength to accommodate the point and/or line loads.

### 3.5 PROTECTION AND STORAGE

- A. All stock-piled material shall be placed on pallets and protected from weather and from entry of foreign material and construction dust by plastic. All stored materials and equipment shall be carefully inspected and cleaned prior to installation and replaced with new material or equipment if found to be damaged, corroded, etc.
- B. Equipment which is observed to be exposed to the weather, dirt or construction debris can be interpreted by the owner's representative as defective equipment under this clause.

### 3.6 FIELD VERIFICATION

- A. All dimensions, locations of equipment and connections to utilities or pre-existing equipment shall be verified in field prior to construction and installation.
- B. Architectural plans will hold precedence over mechanical plans as to location of partitions and diffusers.
- C. Measurements in existing buildings shall take precedence over all other plans with regards to identifying location of existing installations.
- D. All roughing in construction dimensions shall be made from architectural plans where discrepancies may exist. No change orders will be allowed for shifts in mechanical piping, ductwork, or equipment to match rough-in hole locations within 10 feet or original mechanical drawings.
- E. Plumbing plans shall take precedence over electrical and mechanical plans with regards to placement of plumbing equipment and layout of electrical and mechanical equipment within rooms designated as "plumbing rooms."

### 3.7 TOOLS AND EQUIPMENT

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

### 3.8 EXCAVATION, TRENCHING AND BACKFILL

- A. Coordinate trenching and backfill required for the installation of this Division as detailed in Division 31. Repair or replace all street, roadway, sidewalk, pavements and other work incidental thereto.
- B. Perform all excavations, trenching, and backfill required to complete the work in this Division, regardless of the character of the materials encountered or the method of excavation required.

- C. All excavations shall be inspected by the Owner's Representative and approved before placing of any pipe or duct.
- D. Pumping equipment shall be provided as necessary to keep trenches free from standing water. All shoring necessary to maintain the banks of excavations and to prevent any sloughing or caving-in, and as necessary to prevent damage of any kind which may occur in connection with this work shall be furnished and installed by the Contractor.

### 3.9 CLEANING

- A. Clean premises of all excess construction material and debris caused by work, in accordance with Section 17700.
- B. Surfaces shall be left clean, debris shall be removed, and equipment shall be furnished in prime coat finish unless otherwise specified.
- C. Clean exterior of piping and equipment, exposed in complete structure. Remove rust, paint overspray, fireproofing overspray, plaster and dirt by wire brushing; remove grease, oil and similar materials by wiping with clean rags and suitable solvents.
- D. Motors, Pumps and Other Items with Factory Finish: Remove grease, oil, paint overspray, fireproofing overspray, gypsum board mud splatters and leave surfaces clean.

### 3.10 FINAL INSPECTION

- A. As the work nears completion, review the requirements of the Contract Documents, inspect the work and inform all parties involved in work to be corrected or completed before the project can be deemed substantially complete.
- B. When the project is substantially complete, notify the Owner's Representative in writing of this fact, listing those items of work remaining incomplete, the reason for incompleteness, and the anticipated date that all remaining work will be completed. Carry out own final inspection and be satisfied that the work is complete. Final inspection of the project will then be scheduled by the Owner's Representative.
- C. 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.
- D. All items not completed or found not complying with drawings or specifications by the Owner's Representative will be identified in an inspection report by Owner's Representative.
- E. Correct all items on inspection report. Make the correction and initial and date each item on the report after corrections have been completed.

3.11 PROJECT CLOSE-OUT

- A. Prior to requesting Owner's Representative's inspection for certification of substantial completion, complete the following and list known exceptions in request:
1. Obtain final inspections and approvals from all governmental jurisdictions that are required for the project.
  2. Submit record drawings, maintenance manuals, warranties, and similar final record information.
  3. Deliver tools, spare parts, extra stocks of materials, and similar physical items to the Owner.
  4. Complete start-up, testing and demonstration of systems to the satisfaction of the Owner's Representative that the entire installation is complete, properly adjusted and is in proper operating condition.
  5. Complete final cleaning requirements.

End of Section