BASIC PLUMBING MATERIALS AND METHODS

PART 1 GENERAL

1.01 DESCRIPTION

A. The intent of the Division 22 specifications and the accompanying drawings is to provide complete and workable systems as shown, specified and required by applicable codes. Include all work specified in Division 22 and shown on the accompanying drawings. The following requirements are included in this Section to expand the requirements specified in Division 01.

1.02 REFERENCES

A. FM: FM Global

B. NEMA: National Electrical Manufacturers Association

C. OR-OSHA: Oregon Occupational Safety and Health Administration

1.03 SUBMITTALS

A. Follow the procedures outlined below and as specified in Division 01.

B. Submit for approval, submittal documents as required in each Specification Section.
   1. Submit all shop drawings and product data grouped to include submittals of related systems, products, and accessories in a single electronic submittal in PDF format.
   2. Each submittal shall be indexed according to Specification Section.
   3. Each Specification Section shall be a separate file.
   4. Create PDFs at native size and right-side up; illegible files and secured files will be rejected.
   5. Mark dimensions and values in units to match those specified.
   6. Include equipment mark numbers matched to drawing schedules.
   7. If hard copies are specifically requested in Division 01, they shall be indexed according to Specification Section and bound in a three-ring binder.

C. No apparatus or equipment shall be shipped or fabricated until submittal documents for same have been reviewed and accepted.

D. Submittals not requested will not be recognized or reviewed.

E. Proposed Products List: In addition to the requirements of individual specification sections, include the following:
   1. Manufacturer’s name and address
   2. Catalog designation or model number.
   3. Equipment schedule number (cross referenced from drawings).
   4. Rough-in data and dimensions
   5. Performance curves and related capacities
   6. Airborne noise levels.
   7. Detailed point-by-point control drawings, including manufacturers catalog numbers of all devices and description of all components cross referenced to the control drawings. Include sequence of operation.

1.04 QUALITY ASSURANCE

A. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects.

B. All equipment shall fit in the space provided.

C. Systems shall be built and installed to deliver their full rated capacity at the efficiency for which they were designed.

D. Plumbing systems shall operate at full capacity without objectionable noise or vibration.

E. Materials and Equipment:
   1. Each piece of equipment provided shall meet all detailed requirements of the drawings and specifications and shall be suitable for the installation shown.

2. Where two or more units of the same class of equipment are provided, use products of the same manufacturer; component parts of the entire system need not be products of the same manufacturer.

F. Workmanship:
1. Install all materials in a neat and workmanlike manner.
2. Follow manufacturer's directions. If they are in conflict with the contract documents, obtain clarification before starting work.

G. Cutting and Patching:
1. Cutting, patching and repairing for the proper installation and completion of the work specified in this division, including plastering, masonry work, concrete work, carpentry work, firestopping, and painting, shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate division of work. Additional openings required in building construction shall be made by drilling or cutting.
2. Fill holes which are cut oversize so that a tight fit is obtained around the objects passing through.
3. Do not pierce beams or columns without permission of the architect and then only as directed.
4. New or existing work that is cut or damaged shall be restored to its original condition. Where alterations disturb existing finishes, the surfaces shall be repaired, refinished and left in condition existing prior to commencement of work.

1.05 SPECIFICATIONS COMPLIANCE

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be mandatory that the job foreman, all lead mechanics, subcontractors and their foreman have completely studied these specifications, be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Failure to comply with this requirement will be reason to presume the foreman, lead mechanic or subcontractor is not in responsible charge of their work due to ignorance of job requirements, and will be reason for the owner to require dismissal and replacement with approved personnel. Every foreman and lead mechanic shall be provided with a complete copy of this specification.

B. Enlarged scale plans, sections, and details shall take precedence over small scale plans.

1.06 STANDARD SPECIFICATIONS

A. The chemical and physical properties of all materials and the design performance characteristics and methods of construction of all items of equipment shall be in accordance with the requirements of the latest issue of the various applicable Standard Specifications at the time of bid.

1.07 CONTRACT DOCUMENTS

A. Contract Documents for Work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, piping and approximate sizes and locations of equipment and outlets. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Do not scale the Contract Documents for measurements.

B. Outlets or equipment shown on the Drawings with no indication shall be completed in the same method and manner as similar outlets or equipment shown on the Drawings.

C. The Contractor shall follow the Contract Documents in laying out the work, to become familiar with all conditions affecting the work and shall verify all spaces in which the work will be installed.

D. Where job conditions require reasonable changes in indicated locations or arrangements, make changes without additional cost to the Owner.

E. The Contract Documents and Specifications are to be cooperative and whatever is called for by either shall be binding as if called for by both.

1.08 USE OF EQUIPMENT

A. The use of any equipment or any part thereof, for purposes other than startup and testing shall be prohibited.

1.09 PLACEMENT OF ORDERS

A. No consideration will be given to requests for substitutions because of delivery problems or failure to order equipment in a timely manner.

1.10 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:

B. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., strainers, expansion compensators, tanks, etc.). Valve locations diagrams, complete with valve tag chart.

C. Equipment locations (exposed and concealed), dimensioned from prominent structural building lines.

D. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.11 OPERATION AND MAINTENANCE MANUALS (O&M)

A. Prepare operation and maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:
   1. O&M Manuals, including shop drawings, shall be indexed according to Specification Section.
   2. Each Specification Section and Drawing Discipline shall be a separate file.
   3. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   4. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   5. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
   6. Servicing instructions and lubrication charts and schedules.

B. Maintenance manuals shall be submitted and approved prior to any system functional testing.

C. Manuals shall be project specific.

PART 2 PRODUCTS

2.01 ACCESS PANELS

A. Comply with the requirements of Division 08.

B. Access panels shall be minimum 18 inches by 18 inches in ceilings soffits and shafts, and minimum 12 inches by 12 inches in walls, unless indicated otherwise.

C. Provide access panels where indicated and where required to access valves, fire dampers, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Review locations prior to installation.

2.02 PIPE SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel.

B. Exterior Wall Sleeves: Cast iron.

C. On-Grade Floor Sleeves: Cast iron.

2.03 FLOOR, WALL, AND CEILING PLATES

A. Provide stamped split-type escutcheon plates for piping as follows:

B. Floor Plates: Cast brass, chromium plated.

C. Wall and Ceiling Plates: Spun aluminum.

2.04 SEALANT

A. Comply with requirements in Division 07. Sealants to be suitable for materials joined and application.

2.05 ELECTRICAL EQUIPMENT

A. General: All equipment and installed work shall be as specified under Division 26, Electrical.

B. Motors:
1. Motors shall be furnished as integral part of driven equipment. Motors shall be completely enclosed, fan cooled induction type with sealed ball bearings. Motors 1 hp and above shall be NEMA Premium Efficiency type except for emergency equipment motors, sump pumps, and sewage ejector pump motors. Motors shall be built to NEMA standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
2. Designed for a synchronous speed of 1800 rpm unless specified otherwise.
3. Motors 1/2 hp and Larger: 3-phase, 60 cycle, 460V, service factor of 1.15, unless specifically noted otherwise.
4. Motors 1/3 hp and Below: 1-phase, 60 cycle ac, 115V unless specifically noted otherwise, complete with integral thermal protection.
5. Provide motors on belt drive equipment of nominal nameplate horsepower with not less than 120 percent of equipment brake horsepower required for performance specified.
6. Have built-in thermal overload protection, or be protected externally with separate thermal overload devices with low-voltage release or lockout. Hermetically sealed motors shall have quick trip devices.
7. Life expectancy of bearings shall exceed 100,000 hours of direct couple and 40,000 hours with belt.
8. Motors controlled by variable speed drives shall be inverter duty rated and shall have a Class F insulation or better. Motors shall be able to withstand repeated voltage peaks of 1600 volts with rise times of 0.1 microseconds and greater, in accordance with NEMA Standard MG1, Part 31.
9. Motors served from variable frequency drives shall be equipped with a shaft grounding system utilizing brush grounding kits to provide a path for current to flow between the shaft and the motor frame.
10. Frequency drive manufacturers shall provide necessary filters and line reactor type equipment to protect motors from excessive voltage spikes that may exceed insulation requirements of NEMA MG1, Part 31.
11. For motors 20 hp and greater, submit the following supplemental data:
    a. Number of stator slots.
    b. Number of rotor bars.
    c. Load current.
    d. Stator resistance.
    e. Stator configuration delta or wye.
    f. Bearing manufacturer and part numbers.
12. Motors shall have a three year warranty.

C. Starters: See Division 26, Electrical. Starters shall be suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

D. Equipment Wiring: Interconnecting wiring within or on a piece of plumbing equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers specified in Division 26, Electrical.

E. Control Wiring: All control wiring for plumbing equipment (circulating pumps, sump pumps, etc.) shall be as specified in Division 26.

2.06 SEALING

A. Seal below grade and between exterior piping and wall sleeves.

B. Use modular, elastomeric pipe sealing.
   1. Material: EPDM.
   2. Hardware: Stainless steel.
   3. Acceptable Manufactures: Link-seal or approved.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

3.02 COOPERATION WITH OTHER TRADES

A. The Contractor shall cooperate with other trades to avoid interferences in the work and to avoid delays in the construction.

B. Interference, which occurs as a result of poor coordination or lack of cooperation, shall be corrected at the Contractor’s expense.

3.03 DAMAGE TO OTHER WORK

A. The Contractor shall be held responsible for damage done to existing equipment, structures, pipes, etc., which damage is a direct or indirect result of their work. Such damage will be repaired at the expense of the Contractor.

3.04 EXISTING SERVICES

A. When active sewers, gas, water, electric, telephone or other services are encountered in work, protect, brace or support, as required for proper execution of work. Do not disturb or prevent operation of active services that are to remain.

B. Existing utility interruptions are only permitted under the following conditions:
   1. Arrangement to provide temporary utility services, in accordance with Utility Provider's requirements.
   2. Notification to the Owner’s Representative not less than seven days in advance of proposed interruptions.
   3. Owner's written permission for proposed interruption.

3.05 DEMOLITION AND SALVAGE

A. Remove or relocate plumbing piping, wiring, devices and other equipment encountered in existing areas affected by this work as indicated on the drawings. Status of items not indicated for demolition on the drawings shall be verified with the Owner’s Representative.

B. Protect equipment identified to be salvaged. Remove salvaged equipment prior to demolition of adjacent services. Arrange with the Owner’s Representative for storage and return of salvaged equipment.

C. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations. Prior to demolition, verify that demolished services will not affect the operation of existing systems that are to remain and notify the Architect.

D. Demolition Service/System Requirements:
   1. Locate, identify, disconnect, and seal or cap off indicated utility services and plumbing systems serving areas to be selectively demolished.
   2. Demolish all service back to nearest active main or point of future connection as indicated. Verify with Architect extent of demolition prior to proceeding if extent is not clear.
   3. The Architect will arrange to shut off indicated services/systems when requested by the Contractor.
   4. Where demolished systems contain refrigerant or another regulated chemical, the systems shall be drained with contents captured and properly disposed of prior to demolishing the system. Coordinate with the Architect regarding environmental regulations.
   5. If services/systems are required to be removed, relocated, or abandoned: Before proceeding with selective demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   6. Remove all accessories associated with removed utilities including supports, hangers, braces, clips, etc., in their entirety.
   7. Patch penetrations of walls and floors related to demolished services restoring existing fire separations, assembly ratings, and waterproofing membranes.

3.06 SYSTEM WATER DISPOSAL

A. Do not drain water from systems treated with chemicals into the sanitary or storm sewers without written approval from the Owner's Representative.

3.07 REFERENCE TO DESIGN SCHEDULES

A. The Contractor shall refer to Equipment Schedules for Drawing unit identification number and corresponding area locations, capacity and design requirements.

B. After the equipment or materials have been installed and tested under operating conditions, if it is found that they do not meet the requirements specified, the Contractor shall remove all such equipment and/or materials that do not meet the specified conditions and replace them with the proper equipment without additional cost to the Owner.

3.08 EQUIPMENT INSTALLATIONS AND DESIGN

A. Certain equipment may need to be installed before enclosures are installed or completed. Doors and other access openings, in some case, may not be large enough to permit passage of the equipment completely assembled.

B. Investigate and coordinate these conditions prior to fabrication or shipment.

C. Make provisions for the necessary openings in the building to allow for admittance of all equipment.

D. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer.

E. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with applicable technical standards, suitable for maximum working conditions and shall have a neat and finished appearance.

3.09 EQUIPMENT SCHEDULE

A. The Equipment specified is intended to indicate the quality and type of equipment to be supplied.

B. Where the Specifications vary from the schedules, the more stringent shall apply.

C. All packaged unit equipment and skid mounted plumbing components that are factory assembled shall meet, in detail, the products named and specified.

3.10 EQUIPMENT INSTALLATION

A. The Contractor shall coordinate the delivery of the equipment with other trades.

B. The Contractor shall provide the equipment in a suitable knocked down condition for placement in the structure as dictated by available access.

C. Any costs incurred by the failure of the Contractor to comply with the above shall be at the Contractor's expense.

3.11 ACCESS PANELS

A. Install in accordance with manufacturer's recommendations, coordinated with architectural features. Review intended locations with the architect prior to installation.

3.12 SLEEVES

A. General:
   1. Lay out work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
   2. Sleeve all core-drilled penetrations, unless detailed otherwise on the drawings.
   3. Sleeves shall be large enough to allow 3/4-inch clearance around pipe. When pipe is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve.

B. Interior Wall Sleeves:
   1. Pack with fiberglass insulation.
   2. Terminate sleeve flush with face of wall unless indicated otherwise.

C. Below-Grade Exterior Wall Sleeves: Sleeves shall be large enough to allow for Link seal and made watertight. Install link seal and size based on pipe and sleeve. Secure sleeves against displacement.

D. Above-Grade Exterior Wall Sleeves: Similar to interior wall sleeves, except caulk outside with sealant.

E. Sleeves Through Floors:
   1. Floor sleeves shall extend 1 1/2 inch above finished floor, except waste stacks using carriers shall have sleeve flush with floor.
   2. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor-supported.
   3. Make penetrations watertight by sealing gap between sleeve and the floor with floor penetration sealant as specified in Part 2.

F. Sleeves Through Fire-Rated Floors: Install the same as sleeves through floors, except:
   1. Make penetrations through floor watertight by sealing gap between sleeve and floor with floor penetration sealant as specified in Part 2, and
   2. Provide firestopping system both inside and outside of sleeve as specified in Division 07, and in accordance with the recommendations of FM Global.

G. Sleeves Through Fire-Rated Walls: Provide firestopping system as specified in Division 07, and in accordance with the recommendations of FM Global.

H. On-Grade Floor Sleeves: Same as for below-grade exterior wall sleeves, except caulked from inside.

3.13 FIRESTOPPING

A. Comply with the requirements of Division 07.

B. Provide fire-rated assemblies at all penetrations of 1 hour or more.

3.14 CLEANING

A. Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

3.15 EQUIPMENT PROTECTION

A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, fixtures, equipment, and apparatus against dirty water, chemical, or mechanical damage both before and after installation. Restore damaged or contaminated piping, fixtures, equipment, or apparatus to original conditions or replace at no additional cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.16 ACCESSIBILITY

A. Conveniently locate control panels, hardware and devices, valves, thermometers, gauges, cleanout fittings, and other equipment or specialties requiring frequent reading, adjustments, inspection, repairs, or removal and replacement.

B. Install thermometers and gauges to be easily read from floors, platforms, and walkways.

C. Provide 36 inches clear access space on each side of variable and constant volume terminal units containing control valves, actuators, electrical disconnect, and DDC controls. Coordinate with other trades the locating of light fixtures, fire sprinkler piping, as well as other equipment, piping, and conduit to avoid obstructing access to serviceable components of terminal units. Provide access panels in linear metal, wood slat, gypsum board, or other hard ceilings to permit convenient access to terminal units.

D. Provide access panels in linear metal, wood slat, gypsum board, or other hard ceilings and walls to permit convenient access isolation, emergency shut-off, and other valves.

3.17 FLOOR, WALL AND CEILING PLATES

A. Install plates on piping passing through finished walls, floors, ceilings, partitions and plaster furrings. Plates shall completely cover opening around pipe.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates shall not penetrate insulation vapor barriers.

D. Plates are not required in mechanical rooms or unfinished spaces.

3.18 ELECTRICAL EQUIPMENT

A. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in the dedicated electrical space around electrical equipment.

B. The area above the dedicated electrical space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.

C. Unions in plumbing piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings.

D. Low point drains in plumbing piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings. If this cannot be avoided, the low point drain connection shall be extended outside of the electrical or IT space.

E. Protect outdoor electrical equipment from accidental spillage or leakage from piping systems.

3.19 EQUIPMENT CONNECTIONS

A. Make final connections to equipment in accordance with manufacturer's instructions, shop drawings, and as indicated.

B. Piping:
   1. Connections shall include hot and cold water, fuel and gas, compressed air, sanitary waste and vent, roof and overflow roof drains, and liquid grease.
   2. Provide easily accessible unions and gate valves in all piping at equipment, waste traps, and any other fittings required for complete installation.
   3. Piping connections shall be independently supported to prevent undue strain on equipment.

3.20 PAINTING

A. Comply with the requirements of Division 09.

B. Equipment Rooms and Finished Areas:
   1. Insulation: Not painted.
   2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, Equipment Bases: Paint one coat of black enamel.
   3. Steel Valve Bodies and Bonnets: Paint one coat of black enamel.
   4. Brass Valve Bodies: Not painted.
   5. Equipment Without Factory Finish: Paint one coat of grey machinery enamel. Do not paint nameplates.

C. Concealed Spaces (above ceilings, not visible):
   1. Insulation: Not painted.
   2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

3.21 POWDER-ACTUATED FASTENERS

A. Powder-actuated fasteners are not allowed.

3.22 ADJUSTING AND CLEANING

A. Before operating equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made properly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid blowing out seals from over-lubrication. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment or replace with new equipment when approved by the Owner's Representative.

3.23 OPERATING INSTRUCTIONS

A. Instruct the Owner's personnel in the care, operation and maintenance of all apparatus and equipment. Instructions shall be given verbally at the job site by a qualified, experienced representative of the Contractor.

B. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use. Digital format to comply with Owner's requirements.

END OF SECTION 220050