

SECTION 15000 (22 05 00)
BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General Conditions, General Requirements, and Division 1 of the Specifications, apply to all Sections of Division 22.
- B. Other Contract Documents complement the requirements and apply to the work of Division 22.

1.2 SCOPE OF WORK

- A. The work of this Section shall include the furnishing of systems, equipment and materials specified in this Division, and as called for in the Plumbing Drawings.
 - 1. All facilities, supervision, coordination, transportation, handling, labor and methods for the fabrication, installation, interconnections, painting and other finishes, start-up, tests, adjustments, clean-up and other necessary work for the complete and satisfactory systems and equipment, ready for operation and use, shall be included.
 - 2. Whenever the words "Contractor" appear in this Division, they refer to the Contractor responsible for work specified in that Section.
 - 3. The Contractor shall examine all Contract Documents including all drawings, all sections of the Specifications, plumbing and fire-protection design requirements and system design details.
 - a. The Contractor is responsible for ascertaining the extent all those documents, drawings, sections of specifications, design requirements, and system design details affect work herein specified.
 - 4. Report all errors, omissions, conflicts or code violations to Architect and Owner prior to commencement of work.
- B. Drawings for the work are diagrammatic, intended to convey the scope of the work and indicate the general arrangement and locations of the work, follow as closely as actual construction and as other work permits.
 - 1. Because of the scale of the drawings, not all basic items such as necessary duct and pipe offsets, pipefittings, access panels and sleeves may be on the plans.
 - 2. Contract documents show design basis equipment.
 - 3. Plumbing Contractor shall be responsible for selecting the District approved equipment of equal quality, capacity, performance, efficiency, weight, physical size, and configuration to fit in the space provided for the design basis equipment.
 - 4. If the Contractor selects equipment other than the design basis, he is responsible for the necessary design modifications and for coordination with other trades to meet all intended requirements of the original design documents.
 - 5. The location and the sizes of equipment, duct and pipefittings, access panels, sleeves, inserts, and other basic items required by code or other Sections shall be coordinated and included for the proper installation of the Work.
- C. The Contractor shall make any required changes from the Contract Documents to make this work conform to the building construction or the work of other trades at no additional cost to the Owner and shall not impact the project's time schedule.
 - 1. The Contractor shall indicate all changes from the Contract Documents on the shop drawings.
 - 2. Submit the shop drawings to the Architect, Engineer, and Owner for approval before commencing the work.

3. Failure to follow the approval procedure may result in the forced removal of all work, performed prior to approval.
4. Final "as build" documents shall include all changes.
- D. Equipment specification may not deal individually with the minor items required such as components, parts, controls, and devices that may be required to produce the equipment performance specified or as required to meet the equipment design performance and warranties.
 1. The equipment supplier shall include such required items whether or not specifically called for in the Contract Documents and the Contractor shall properly install them.
- E. Contractor shall verify with the supplier of the equipment the requirements for the complete installation to insure proper operation of the equipment furnished under Division 22 of the Specifications.
- F. Contract Documents may call for Plumbing Contractor to install specific equipment furnished by others, including Owner purchased equipment.
- G. Consider the specifications and drawings as complimentary one to the other.
 1. Where equipment items, material and labor are specified, indicated, called for or implied by either the drawings or the specifications, they shall be deemed as specified by both and included as part of the contract.
 2. Should conflicts occur between the drawings and the Division 22 Specifications, the more stringent requirements shall apply and take precedent.

1.3 DEFINITION OF THE WORK

- A. Plumbing work including Plumbing and Fire Protection work is specified in the following applicable sections of the Division 22:

22 05 00	Basic Plumbing Requirements
22 05 10	Minor Plumbing Demolition
22 05 29	Hangers and Supports, Plumbing Piping
22 0553	Plumbing Identification
22 07 19	Plumbing Pipe Insulation
22 11 00	Facility Potable Water Distribution
22 13 00	Facility Sanitary Distribution
22 14 00	Facility Storm Drainage
22 10 00	Plumbing Piping
22 20 00	Plumbing Specialties
22 40 00	Plumbing Fixtures
22 30 00	Plumbing Equipment
21 00 00	Fire Protection
22 05 93	Tests - Piping
- B. Additional Associated Sections from Division 25

25 50 00	Energy Management and Control System (Automated Logic)
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1.4 QUALITY ASSURANCE

- A. Codes and Standards: All work shall be in compliance with, of all applicable Laws, Codes, Standards and Regulations of Governmental Bodies having jurisdiction over work performed for or on behalf of the SDPBC, and over the applicable job site
 1. See Section 01 41 00 - Regulatory Requirements
 2. The following documents developed for and approved by the SDPBC:
 - a. Educational Specifications
 - b. District Design Criteria
 - c. District Master Specifications

- d. Typical plumbing and fire-protection details
 - e. If there should be conflicting requirements between above referenced codes than the following rules shall apply:
 - 1. School District Building Official shall provide final code interpretations and resolutions of conflicts
 - 2. The code that affords the greatest degree of life safety shall take precedent.
 - B. Contractor shall request the A/E for clarification of any part of the contract documents, which may be in conflict with the above codes and regulations.
 - 1. Contractor shall prepare proposed changes for review and approval by A/E and Owner.
- 1.5 ACTIVE SERVICES
- A. Protect any existing active services: water, gas, sewer, and electric, against damage.
 - B. Do not prevent or disturb operation of active services that are to remain.
 - C. When encountering services requiring temporary interruption or relocation, request procedural information from authority having jurisdiction and coordinate work with the utility service users.
 - D. Where abandoning an existing service, terminate in conformance with the Utility or Municipality having jurisdiction, and shown termination points on "as-built" construction plans.
- 1.6 SITE INSPECTION
- A. Contractor shall carefully inspect the site to be familiar with conditions that affect the work.
 - 1. Contractor shall verify points of connection of utilities, routing of outside piping to include required clearances from any existing structures, trees or other obstacles.
 - 2. Contractor shall verify available space in the existing structure and accessibility required for the installation of work under this contract and inform the A/E to conditions, which may be detrimental or will prevent proper execution of the work.
 - B. The submittal of a bid is an acknowledgement that the Contractor performed the site inspection and has no conflicts with performing the work.
 - 1. If a conflict arises do to an observable condition the Contractor should have seen in the pre-bid site visit, the District is under no obligation to authorize any additional payments.
 - C. Submittal of bid shall indicate that the Contractor has included all required allowances in the bid.
 - 1. The District shall not make allowances for any code violations or errors resulting from Contractor's failure to visit job site and review all contract documents, applicable codes, and standards.
- 1.7 COMMISSIONING
- A. Commissioning of a system or systems specified in this section is part of the construction process.
 - B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
 - C. Project Closeout is dependent on successful completion of all documentation, and issue closure, see Section 01 77 00 - Contract Closeout, for substantial completion details.
 - D. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements

PART 2 MATERIALS

2.1 GENERAL

- A. Each system component installed by Contractor shall meet or exceed the performance specification requirements listed in the Contract Documents including drawings, specifications, Plumbing and Fire Protection Design Requirements and Design Details.

1. Components with a lesser degree of performance or quality as determined by the Owner, Building Department, design A/E or documented as inferior shall be replaced with no additional charge to Owner.
- B. Materials and equipment shall be new, unused, standard current products from manufacturers regularly engaged in the production of such equipment and shall bear label of the Underwriters' Laboratory for the intent use or shall be materials approved by the code-enforcing agency.
- C. Where two or more units of the same class of equipment or material are required, these shall be the product of a single manufacturer throughout entire project and shall fit in the allocated spaces provided, complying with all clearances and codes.
- D. All hardware and accessory fittings shall be a type designed, intended or appropriate for use, be compatible, and compliment the item with which they are used.
 1. They shall have corrosion protection suitable for atmosphere they are installed.
 2. All such hardware shall be U.S. standard size.
- E. All materials including insulation, jackets, and adhesives shall have a Flame Spread Rating not exceeding 25, and Smoke Developed Rating not exceeding 50, when tested in accordance with NFPA 255, "Methods of Test of Surface Burning Characteristics of Building Materials".
 1. Submittal data shall specifically indicate those ratings.
- F. Use materials and equipment fabricated in the United States of America and labeled accordingly, when possible, for all piping materials:
 1. Provide documentation from a U.S. testing laboratory, certified by Florida Engineer that the product delivered to the site meets the DMS requirements (ASTM standards).
 2. AS an alternative form of verification:
 - a. To verify that piping delivered to the project site meets the DMS requirements (ASTM standards); a random sample of each size pipe on each delivery to the project.
 - b. Contractor under the direct supervision of the District Senior Project Administrator or the Project Coordinator shall cut off a 12" to 24" wide section of the pipe either at the end or near the middle (Size depends on what Testing Labs requires).
 - c. The Contractor shall identify the pipe section with a label or stamp having the following information; project name, pipe size, date, and names/signatures of the Contractor and District Representative handling that piece of pipe.
 - d. The District project representative shall then send the sample to District approved laboratory for testing to verify the pipe meets the Specification.
 - e. All testing cost is at the Contractors expense.
 - f. If pipe sample does not meet specifications, the contractor at no extension of time or additional cost shall replace the bad pipe with pipe with the specification.
 - i) Before replacing the suspected pipe, Contractor at his cost and with no addition time extension may have at a minimum five-other piece of pipe tested for compliance with the specifications.
- G. All equipment and piping supports shall be hot dipped galvanized except as otherwise noted in Contract Documents.
 1. Hangers for copper pipe shall be vinyl coated.
 2. Do not use copper clad hangers.
- H. Plumbing and fire protection system components shall conform to federal, state, and local sound emission and vibration isolation guidelines.
 1. Objectionable noise or excessive vibration created in any part of the building by operation of any equipment under this contract is not permitted.
- I. Follow installations directions and recommendations of material and equipment manufacturers.

PART 3 EXECUTION

3.1 GENERAL

- A. Licensed Contractors shall perform construction work as required by FS Chapter 489.
 - 1. The Contractor shall not work outside the scope of his license.
 - 2. Any person who is not licensed must work under direct supervision of a person who has a license required by the state law and by the county or municipal licensing ordinances.
 - 3. The District may request the change of the job supervisor.
 - 4. Workers skilled and competent in the type of work involved shall accomplish the installation.
 - 5. Workmanship throughout shall correspond to the standards of the best trade practices.
- B. Contractor shall install all systems and equipment in accordance with the Contract Documents, and equipment or material manufacturer recommendations and instructions.
- C. Work lines and established grades shall be in strict accordance with the Contract Documents.
 - 1. The Contractor shall furnish to all trades, in ample time, any information they need to construct all equipment bases, trenches, pits, chases, and openings in floors, walls, and finishes to provide required working clearances.
 - 2. The contractor shall set all sleeves, anchor bolts, or inserts to fasten equipment before pouring of adjacent concrete.
- D. Coordinate location of all Division 21 & 22 work with Division 23, 25, 26, 27 & 28.
 - 1. Do not run piping, and similar Division 21 & 22 work in NEC dedicated service areas for electrical equipment, including above panel boards, starters, communication panels, control panels, telephone backboards, data panels, and similar electrical elements.
 - 2. Do not install water piping directly above electrical equipment.
 - 3. In electrical rooms with required piping, provide drain pan(s) to protect the electrical equipment.
 - 4. Refer questionable locations to the A/E for resolution prior to installation and correct non-conforming installed work at no additional cost to the Owner.
- E. Cap or plug all piping systems (hot water, potable water, pneumatic piping,) at the end of each workday until system is complete to prevent contamination.

3.2 COORDINATION OF WORK AND DRAWINGS

- A. Each contractor and subcontractor shall be responsible for coordinating the installation of his equipment/labor with the General Contractor and work of other Contractors and trades.
 - 1. The contractor shall coordinate the work of different trades to prevent interference between piping, ductwork, equipment, and structural work.
- B. Recommend each contractor prepare their shop drawings at 1/4" to 1'-0" scale clearly indicating all applicable components and coordinate the same with other trades.
 - 1. Recommend shop coordination drawings show in detail the space conditions of all concerned trades, and be reviewed and accepted by the A/E.
 - 2. Contractor's failure to coordinate work between trades using coordination shop drawings or other means will not cause for any additional cost changes to the Owner, and/or changes to the project schedule.
 - 3. If the contractor installs his work before coordinating with other trades or causes interference with work of other trades, the contractor shall make necessary changes in the work to correct the condition, at no additional cost to the Owner, and/or changes to the project schedule.

3.3 SUBMITTALS

- A. Method or procedures for submitting shop drawings and submittal data shall comply with the General Conditions.
- B. Prior to ordering equipment and material, the Contractor shall submit 3 copies of the manufacturer's cut sheets to the Engineer for review and acceptance
 - 1. Submittal data shall consist of shop drawings and/or catalog cuts showing technical data necessary to evaluate the material or equipment.
 - 2. Including dimensions, required service and maintenance clearances, wiring diagrams, performance curves, ratings, control sequence.
 - 3. Layout plan showing the arrangement of the equipment with piping, and other data necessary to describe fully the item proposed and its operating characteristics.
- C. Other submittals shall include, but not be limited to:
 - 1. Valves
 - 2. Pipe insulation
 - 3. Controls
 - 4. Thermometers and gauges

3.4 SUBSTITUTIONS

- A. Contractor shall follow the contract drawings and specifications, unless he submits written request for a substitution and receives written acceptance from the Engineer and SDPBC.
 - 1. Owner's representative shall review the request and either approve or deny the in writing.
- B. All approval procedures regarding proposed substitutions as "approved equal" or "Engineer and Owner approved" shall meet the requirements of Section 01 60 00.

3.5 ACCESS PANELS

- A. Contractor shall provide required access panels or doors for all serviceable equipment in concealed locations whether or not called for on the drawings.

3.6 CUTTING AND PATCHING

- A. Coordinate the placing of openings in the existing or new structures as required for installation of the Plumbing Work.
- B. Any additional patching and finish work required for unnecessary openings due to failure to inspect and coordinate work, is at no additional cost to the Owner.
- C. Any additional cutting and patching of the structure necessary due to failure to install piping, ducts, sleeves or equipment on schedule, or due to failure to furnish, on schedule, the information required for leaving of openings, is at no additional cost to the Owner.
- D. Provide cutting and patching, surface finishing and painting in the existing structure, as required for the installation of work, and furnish lintels and supports as required for openings.
 - 1. Do not cut structural members without written prior approval of the A/E.
 - 2. Minimize cutting by using core drills, power saws, or other machines that will provide neat, minimum openings.
 - 3. Patching shall match adjacent materials and surfaces and be performed by artisans skilled in the respective craft.

3.7 SLEEVES

- A. Sleeves are required for all piping passing through masonry or concrete partitions (walls, floors ceilings, roofs) and through concrete beams, foundations, and footings.
 - 1. Position sleeves in formwork prior to placement of concrete.
 - 2. Provide concrete reinforcing around sleeves.
- B. Sleeves for piping passing through non-load bearing or non-fire or smoke rated walls and partitions may be required if included in the design documents by the Engineer.

1. When required, sleeves shall be galvanized sheet steel with lock seam joints of minimum gauges as follows: pipes 2½" and smaller - 24 gage; 3" to 6" - 22 gage; over 6" - 20 gage.
 - C. Sleeves for piping passing through load bearing walls, concrete beams, foundations, footings and waterproof floors shall be Schedule 40 galvanized steel pipe or 18 gage galvanized sheet steel.
 - D. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and allow free movement of pipe due to expansion and contraction.
 1. Provide for continuous insulation wrapping.
 2. Waterproof sleeves shall be of sufficient internal diameter for pipe and waterproofing material.
 - E. In finished areas where pipes are exposed, terminate sleeves flush with wall, partitions, and ceilings, and shall extend ½" above finished floor level.
 1. Extend sleeves 1" above finished floors in areas likely to entrap water.
 2. Caulk floor sleeves.
 - F. Flash sleeves passing through waterproofing membrane as required by Division 7.
 - G. Protect pipe penetrations through fire-rated partitions (walls, floors, or ceilings) in per with FBC.
 1. Protected penetration shall retain the original integrity of the fire rated partition.
 2. Unprotected penetrations through fire-rated partitions not allowed.
 3. All materials, products, and procedures used to complete the fire stopping assemblies shall be tested, listed, and approved by testing laboratories such as U.L. or Factory Mutual and comply with requirements of ASTM-E-119.
 4. Securely fasten sleeves to the partition that are part of the required approved fire stopping.
 5. Close off annular spaces between sleeves, pipes, and between penetrating item and adjacent work with UL listed and approved fire stopping materials and caulk airtight.
 6. Insulation and coverings shall not penetrate the fire-rated partition unless it is part of the approved U.L or Factory Mutual fire-stopping assembly.
 7. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- 3.8 ESCUTCHEONS
- A. Provide chrome-plated escutcheons at each sleeve opening into finished spaces.
 - B. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve.
 - C. Where sleeve extends above finished floor, escutcheon shall be high cap type and shall clear sleeve extension.
 - D. Secure escutcheons or plates to sleeve but not to insulation with setscrews or other approved devices.
- 3.9 PROTECTION
- A. Take special care for the protection of equipment and materials furnished.
 1. Store and completely protect all materials from damage.
 2. Keep materials and equipment clean and dry, free from deterioration by weather elements, painting, plaster, etc., until the project is completed.
 3. Do not install damaged or defective materials.
 4. Touch up any damage from rust, paint, etc., and scratched or marred finishes on equipment to match original finish or completely refinished to restore equipment to original condition.
 - B. Provide protect of any previously finished area from mars or other damage when an installation or connection of equipment requires work in areas previously finished by other Contractors.,
 1. The Contractor shall provide drop cloths, or any other materials necessary to protect floors, walls, furniture, equipment, etc. from soil or damage.

- C. Contractor shall arrange with other Contractors for promptly repairing and refinishing any damage to the building or its contents incurred by the installation or testing of the systems installed at no charge to the Owner.
- D. Where insulated piping extends to exposed areas, or to weather exposed areas, provide finish or jacket as specified in section 22 07 19.
- E. Contractor may weld in the existing buildings under an approved fire watch and other required safety measures.
 - 1. Contractor's work, and construction means, methods, materials, and equipment used shall not compromise the building fire safety, as well as safety and welfare of coworkers and building occupants.

3.10 PLUMBING IDENTIFICATION

- A. Identification of plumbing systems shall be as specified in Section 22 05 53 PLUMBING IDENTIFICATION.

3.11 WIRING AND ELECTRICAL WORK FOR PLUMBING EQUIPMENT

- A. All electrical work, equipment, and wiring shall comply with NEC.
- B. The Plumbing Contractor, unless specified otherwise, shall furnish all Division 22 equipment.
- C. Division 26 shall provide power services for equipment furnished by Plumbing Contractor to include safety disconnect switches, wiring, and final connections.
- D. The Plumbing Contractor shall check all electrical service and control connections to ensure proper operation of equipment and systems installed under work in Division 22.

3.12 EXCAVATING TRENCHING AND BACKFILLING

- A. Provide excavation necessary for water supply, sanitary, and storm piping, etc., and backfill such trenches and excavations after the installation, testing, and approval of work.
 - 1. Take care in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing.
 - 2. Where a line must pass under footing, make the crossing by the smallest possible trench to accommodate the pipe.
 - 3. Keep excavation free from water by pumping if necessary.
 - 4. Do not open any greater length of trench, in advance of pipe or utility installation, than that authorized.
- B. Trenches for piping and utilities located inside foundation walls and five-foot outside of the wall shall be at less than 16" but no more than 24" wider than the outside diameter of the pipe.
 - 1. Site conditions shall govern the width of trenches for piping and utilities located more than five-feet outside of building foundation walls, except for sewers.
- C. Excavate trenches for sanitary and storm pipe may be laid at the proper alignment and depth and the maximum trench width at the outside top of the pipe is less than 24".
 - 1. Other trench widths governed by site conditions.
- D. Shape the trench bottom so that when pipe is in place the lower fourth of the circumference for the full length of the barrel is supported on compacted-fill.
 - 1. Dig bell holes so that no part of the weight of the pipe is supported by the bell, and not larger than necessary for proper jointing.
 - 2. Excavate all piping requiring excavation below the compacted fill required for the structure to at least 6" below pipe invert.
- E. Make trenches true to grade by means of substantial and accurately set batter-boards.
- F. Immediately after testing and/or inspection, carefully backfill the trench with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly puddle and tamp in such a manner as not to disturb the alignment or joints of the pipe.

1. Thereafter, puddle and tamp the every vertical foot.
- G. Burial depth of gravity drain lines shall have precedence over non-gravity systems.
 1. Offset chilled water and domestic water lines as required to coordinate with gravity lines.
- H. The Contractor shall coordinate exact location, depth, and scope of underground piping, electrical conduits, and similar utilities.
 1. Routing shown on drawings is schematic coordinate actual routing with field conditions, grades, and work of other trades, then document in "as-built" drawings.

3.13 ANCHORING EQUIPMENT

- A. Securely anchor all equipment designed for permanent mounting to its supporting surface in compliance with FBC.
- B. A minimum of two bolts are required per each piece of equipment.
 1. Bolts shall be of sufficient size to prevent equipment from overturning or moving from original mounting position.

3.14 CORROSION

- A. Make provisions to prevent corrosion due to contact of metallic pipe and equipment with moisture or dissimilar materials.
- B. When joining a pipe with another pipe, valve, fitting, or piece of equipment constructed of dissimilar metal install an insulated joint to prevent formation of galvanic couple.
- C. Pipe hangers and supports of dissimilar metal shall be isolated from contact with pipe.
- D. Metal pipe and equipment shall be isolated from direct contact with concrete or other corrosive materials and soils.

3.15 TESTS

- A. Test all materials, equipment, and systems that require testing by these specifications or by any applicable regulation or code, in the presence of owner or authority having jurisdiction.
 1. Test all items requiring pressure or leakage tests before concealing from view.
 2. Rectify all defects disclosed by tests and the repeat the tests.
 - a. Continue process until installation passes all required test.
 3. The Contractor shall provide all labor, materials, and equipment used in tests.
- B. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.
 1. Refer to Section 01 91 00, Commissioning, for further details.

3.16 COMPLETION OF WORK

- A. Prior to acceptance of the installation and final payment of the Contract, the Contractor shall provide and complete the following:
- B. CLEANING: as required by Special Conditions applicable to this Division of the work.
 1. At the conclusion of the construction, the site and structure shall be cleaned thoroughly of all debris and unused materials remaining from the plumbing construction.
 - a. Clean all areas and temporary storage spaces of all packing boxes, wood frame members and other waste materials used in the plumbing construction.
 2. Clean the entire piping system and equipment internally.
 3. Drain all tanks fixtures and pumps and prove free of sludge and accumulated matter.
 4. Remove all temporary labels, stickers, etc. from all fixtures and equipment.
 - a. (Do not remove permanent nameplates, equipment model numbers, ratings, etc.).
- C. OPERATION AND MAINTENANCE MANUALS
 1. Refer to Section 01 91 00 – Commissioning for Operations and Maintenance Data requirements.
- D. AS-BUILT PRINTS:

1. Requirements and methods of preparing and procedure for submitting project record as-built prints shall be in accordance with Division 1.
2. Contractor shall keep day-to-day records of all changes (redline drawings), and upon completion of the work, shall submit the redline drawings to the A/E to incorporate these changes into the original ACAD drawing files in order to create the record drawings (as-built drawings).
 - a. Provide copies of all as-built drawing files in both ACAD and PDF format to the Owner at the date of substantial completion.
3. The drawings shall show:
 - a. All equipment and piping (including underground).
 - b. The fire protection sprinkler system layout with dimensions and reference points.
 - c. All other concealed non-accessible work,
 - i) Branching arrangement and valve location for piping systems.
 - ii) The locations of all water hammer arrestors and potable water shutoff valves in system.
 - iii) The locations of control system sensors and other control devices.
 - iv) Work of change orders not shown on contract documents.

E. WARRANTY

1. The warranty for all plumbing equipment (whether manufacturer's or contractor's warranty) shall comply with Section 01 78 00.
2. All equipment and systems, unless specified otherwise, shall have a manufacturer's warranty for a period of one year from the date of substantial completion.
 - a. This warranty shall be against defective materials, design, and workmanship.
3. The plumbing contractor shall repair or replace any component of the Division 22 work under warranty, which proves to be defective, at no cost to the Owner.
4. The Contractor upon receipt of notice from the Owner of a failure during the warranty period shall respond the same day and complete warranty service work in a timely manner.
5. During warranty period, document all responses to warranty calls made by the Contractor by leaving a copy of the mechanics service ticket with the school Principal upon completion of the warranty work, prior to leaving the site.
 - a. Without proper documentation, the Owner cannot acknowledge repairs are complete.
6. Required optional extended manufacturer or vendor warranties for specific items, their performance, or expected durability will be explicitly included in Division 22 Specifications.
 - a. Manufacturer or vendor shall repair or replace any defective component under extended warranty at no cost to the Owner.

3.17 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
- B. Provide competent, factory-authorized personnel to provide instruction to Facilities Service personnel concerning the location, operation, and troubleshooting of the installed systems.
- C. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
- D. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.

END OF SECTION