SECTION 22 00 00

MECHANICAL - GENERAL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. The General Conditions and other pertinent documents issued by the Engineer are a part of these Specifications and shall be complied with in every respect. In addition, the accompanying Architectural, Structural, Mechanical, Electrical and other Drawings shall be complied with in every respect. It shall be the responsibility of the Mechanical and Electrical Contractors to avail themselves of a complete set of Drawings and Specifications and be familiar with all parts thereof. Failure to do so shall not relieve any responsibility in the fulfillment of the Contract in any respect.

1.02 INTENT

A. The intent of the Mechanical and Electrical Drawings and Specifications is that the Contractor shall furnish all labor and materials, equipment and transportation necessary for the proper execution of the work. The work required as related to other trades is shown in it majority in the drawings, but thoroughly examine the Drawings and Specifications relating to other trades in order to include all necessary work. No additional compensation shall be considered for failure to properly interpret the responsibilities to other trades. The Contractor shall do all the work shown on the Drawings and described in the Specifications and all incidental work considered necessary to complete the project. The Engineer reserves the right to make any reasonable change in the locations indicated without additional compensation to the Contractor.

1.03 CONFLICT

A. If there is a conflicting variance between the Drawings and Specifications, the provisions of the most stringent shall control. In case of conflict between the General Provisions of the Contract or any modifications thereof, the Mechanical and Electrical Specifications shall control. The Drawings and Specifications are complementary and any work required by one, but not by the other, shall be performed as though required by both.

1.04 SCOPE

A. The work contemplated and included under this Section of the Specifications consists of the furnishing of all labor, materials and supervision necessary for the installation of complete mechanical and electrical systems, as specified herein or shown on the Drawings, together with all necessary auxiliaries and appurtenances for same.

B. Furnish and install all systems complete in every respect and ready to operate. Furnish all miscellaneous items and accessories required for such installation, whether or not each such item or accessory is shown on the Drawings or mentioned in these Specifications.

1.05 RELATED SECTIONS

A. Section 221113 - Plumbing
B. Section 260800 - Heating, Ventilation and Air Conditioning
C. Section 260000 - Electrical

1.06 INSPECTION OF SITE

A. The Contractor, before submitting his proposal, shall inspect the site of the proposed construction and become fully informed as to the facilities, difficulties and restrictions attending the execution of the work. No additional compensation will be granted for work or items omitted from his proposal due to his failure to inform himself of the conditions affecting the performance of the work included in the Contract, or necessary to carry on and satisfactorily complete the work included herein.

B. Locations and elevations of the various utilities included within the scope of this work are offered separate from the Contract Documents as a general safety guide only without guarantee as to accuracy.

1.07 CODES, STANDARDS AND REGULATIONS

A. All workmanship and materials herein specified shall meet in every respect the codes, standards and regulations having jurisdiction of the work. In case of difference between the various standards and other regulations, the matter will be brought to the attention of the Engineer and either the most stringent shall govern or the regulation or standard selected by the Engineer shall govern.

B. Should the Contractor perform any work that does not comply with the requirements of the applicable codes, standards and regulations, he shall bear all costs arising from the deficiencies.

C. The following codes, standards and regulations in effect on the date of bid invitation shall be considered a part of this Specification:

1. State Public Health Department Regulations
2. State Plumbing Code and HVACR Code
3. National Fire Protection Association
4. American Society of Mechanical Engineers
5. American Society for Testing Materials
6. Air Conditioning and Refrigeration Institute
7. National Electrical Code
8. National Electrical Safety Code
9. Local, City, State and Federal Codes and Standards
10. Underwriters' Laboratories
11. Local Utilities Requirements
12. National Electrical Manufacturers Association
13. OSHA - Occupational Safety and Health Standards

1.08 PERMITS AND FEES

A. Provide all necessary notices, obtain all permits, pay all taxes, file all necessary plans and obtain all necessary approvals in connection with the mechanical and electrical work required for the project.

1.09 CONTRACTOR DEFINITION

A. Where the word "Contractor" is used in connection with the work included under the Mechanical and Electrical Sections of these Specifications, reference is thereby made to the Contractor who is engaged to execute the work included under that Section of the Specifications only, notwithstanding the fact that this Contractor may be either the prime contractor, general contractor or his subcontractor.

1.10 DRAWINGS

A. The accompanying Mechanical and Electrical Drawings in general indicate approximately the locations of equipment and devices, except in those cases where specified notes appear. Exact locations of outlets and apparatus shall be determined by reference to the general plans and to detailed shop drawings, by measurements at the building and in cooperation with other contractors and the Engineer.

B. Exact locations are subject to approval by the Engineer and may differ a reasonable amount from the approximate locations shown on the Drawings without additional compensation to the Contractor.

C. Major changes resulting in a savings in labor or material shall be made only in accordance with a Change Order. Major deviations shall be made only where necessary to avoid interference and only after drawings showing the proposed deviations have been submitted to and approved by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide materials and equipment which are new and in perfect condition. Where the Underwriters' Laboratories have established standards and issued labels for a particular group, class or type of equipment, the Underwriters' label shall be required on all equipment in that category. Each component shall have a nameplate giving the name and address of the manufacturer, catalog number and designation.

B. Where the words "or equal" are used in the Specifications or on the Drawings, it shall be understood that the Engineer will be the sole judge in the matter. In all cases where more than one manufacturer or material is specified, the Contractor shall be permitted to furnish any of those specified, however, power equipment, panels, transformers and safety switches should be of the same manufacturer. It is not the intention to discriminate against any "equal" product of other manufacturers, but rather to definitely set a standard of quality and shall not be construed to limiting competition. Any proposed substitution will be assumed to be acceptable without specific authorization from the Engineer. Should a substitution be accepted and should the substitution prove defective or otherwise unsatisfactory for the intended service within the warranty period, the Contractor shall replace the substitution with the equipment or material originally specified, and on which the Specification required him to base his proposal, at no additional compensation.

2.02 TEMPORARY CONSTRUCTION POWER

A. Furnish and install temporary power, water, heating, gas and lighting as the needs require for construction and safety purposes. It shall be the responsibility of the General or Prime Contractor to obtain and be responsible for all utility charges.

PART 3 - EXECUTION

3.01 WORKMANSHIP - GENERAL

A. All work shall be installed in a neat, careful, safe and workmanlike manner by craftsmen skilled in the trade.

3.02 STANDARDS

A. Perform all work in such a manner that the many components will function as a complete workable system, including any accessories required to accomplish such installations. Perform all work in accordance with acceptable industry standards except where other standards or procedures are herein specified.

3.03 COORDINATION AND COOPERATION

A. Coordinate all mechanical and electrical work with general, structural and other grades to insure proper execution of the work and general progress for the entire project and to avoid delaying any other Contractor. Cooperate with all other trades so that the entire project will not be handicapped, hindered or delayed. Assist other trades in working out space conditions to permit all work to be installed satisfactorily. No extra compensation will be allowed the Contractor for any remedial work required to eliminate interferences due to lack of coordination and cooperation.

3.04 STORAGE OF MATERIALS

A. Protect all mechanical and electrical materials and apparatus to prevent any damage to them. Unless approved, no material or apparatus shall be stored outside or exposed to the elements. Cover apparatus with tarpaulins or other protective coverings, provide pallets or other methods to raise materials above the floor, and where directed, provide barriers or guard rails to protect the materials. Failure on the part of the Contractor to comply with the above to the complete satisfaction of the Engineer or his representative will be sufficient cause for rejection of the piece of apparatus in question.

3.05 DAMAGED AND DEFECTIVE WORK

A. Remove and replace damaged and defective work or materials as directed by the Engineer with no extra compensation. All repairs to the work shall be made with new materials or a complete new piece of equipment shall be provided as directed by the Engineer.

3.06 ACCESSIBILITY

A. Install all equipment and devices in an accessible location or in a location where they can be made accessible with removable panels. Provide Milcor or approved equal access panels as required for access to concealed equipment which requires servicing and testing. Equipment and devices shall be "readily accessible" where required by the National Electrical Code. In non-removable ceilings, the removal of a lighting fixture or air device is not an approved access panel.

3.07 SAFETY

A. Provide necessary precautions for the safety of life or property. All construction work shall conform to the standards of the Occupational Safety and Health Act. Provide approved ground fault interrupter devices on all electrical construction devices consuming power and including temporary lighting systems.

3.08 CLEAN-UP

A. The Contractor shall keep his work area clean at all times. Upon completion of work in any area, remove all equipment, excess materials and debris from the area and leave area broom clean. Protect all equipment during operations of painting, plastering, cutting or drilling and any like operation which might damage the equipment. Upon completion of the project, remove all equipment, excess material, scrap and debris from the job site. The job site shall be left clean and finished.

3.09 CONTRACTOR FURNISHED DATA

A. Submit to the Engineer shop drawings for all equipment and materials to be installed on the project. No equipment or materials shall be installed until the shop drawings have been approved, even if the material submitted is identical to that originally specified. Consideration for substitution of materials will not be allowed if shop drawings are not received within 30 days after award of Construction Contract.

B. Rough-in materials including pipe, wire, conduits, connectors and boxes may be submitted in a list form including the names of manufacturers and catalog type or number. All other equipment and materials shall be submitted with detailed prints or drawings. Prints or drawings shall be permanent reproductions and not Thermofax copies. The total number of shop drawings and lists shall be not less than six.

C. Should the Contractor propose to submit items other than those specified, he shall include cuts of both the specified item and the proposed "equal item" in the brochures. The "originally specified product" and the "proposed substitution" shall be clearly marked.

D. Where the Specifications or Drawings call for the work to be installed in accordance with the manufacturer's specifications, recommendations or directions, copies of the same shall be submitted to the Engineer for review and surveillance.

E. Provide the Engineer four (4) copies of hard bound manuals for the project ten (10) days prior to final acceptance of the completion of the project. The manuals shall include copies of all corrected and approved shop drawings, schedules, catalog data, illustrations, performance curves and rating data, wiring and control diagrams, manufacturer's recommendations, operating and maintenance instructions, including safe operating procedures and requirements, spare parts lists and other pertinent information for the specified equipment and systems. The manual shall include a typewritten schedule of each motor, giving nameplate data, switch and fuse or breaker sizes and voltage and phase at motor terminals.

3.10 TESTS

A. Test and demonstrate each and every system in the presence of and to the complete satisfaction of a representative of the Engineer. Prior to demonstration, start all equipment and make necessary tests and adjustments to place the system in first class operating conditions.

B. Furnish all services, instruments, equipment and personnel required for the tests; in addition, submit a typewritten test report, where applicable and recorded data is taken or required for approval prior to final acceptance.

C. Test all electrical conductors after installation but prior to termination with a 500 volt meggar. Conductors shall test free of grounds and shorts, and their insulation resistance shall be recorded for all feeders and circuits where the conductor size is size 8 and larger.

D. No piping work, fixtures or equipment shall be concealed or covered until they have been inspected and approved. Engineer's representative shall be notified one week prior to when the work is ready for inspection. All work shall be completely installed, tested as required by the Section and the State Ordinances and State Safety Orders, and shall be leak-tight before inspection if requested. All tests shall be repeated upon request to the complete satisfaction of those making the inspection.

E. All domestic water piping shall be flushed out, tested and shall be left under pressure of supply main or a minimum of 40 psi for the balance of the construction period.

3.11 AS-BUILT DRAWINGS

A. Before the project will be finally accepted, a set of permanent as-built drawings must be submitted to the Engineer. The Contractor must certify accuracy by endorsement. The as-built drawings must be correct in every detail so that the Owner can properly operate, maintain and repair exposed and concealed work.

B. All underground work shall be dimensioned. All change orders, field changes, equipment, circuit numbers, motors, feeders, breakers and starters shall be clearly indicated on the drawings. As-built drawings shall be submitted on tracings or other reproducible forms.

3.12 GUARANTEE

A. Furnish to the Engineer a typewritten guarantee, countersigned by the General Contractor, to the effect that all work or equipment installed by him under this Contract shall be free from any or all mechanical and electrical defects for a period of one (1) year from the date of final acceptance. Should any mechanical or electrical defect develop in any of the systems or equipment within the period, due to faulty equipment, poor installation or workmanship, this Contractor shall agree to repair or replace same with new and like material without additional compensation. Lamps in all fixtures shall be guaranteed for 100 percent of manufacturer's published life data.

3.13 GENERAL CONSTRUCTION WORK FOR MECHANICAL AND ELECTRICAL FACILITIES - SLEEVES

A. Provide 22 gauge galvanized sheet iron sleeves where pipes and conduits pass through interior masonry walls. Sleeves shall be trimmed flush with each finished surface. Sleeves shall be sufficient size to allow insertion of pipe or conduit passing through concrete beams and walls, masonry exterior walls and all floors. Sleeves shall be sized at least 1/2 inch greater than the outside diameters of the pipes or conduits. Floor sleeves shall extend 1 inch above floors. After conduits/pipes are installed, seal the space between the conduits/pipes and sleeves with a filler to provide a non-runable watertight joint.

3.14 ROOF FLASHING

A. Provide complete watertight flashing and counter-flashing for all roof penetrations. All flashings shall be made to the complete satisfaction of the Engineer.

3.15 PAINTING

A. All exposed mechanical and electrical equipment in finished areas shall be painted.

B. Provide a prime coat to all unfinished equipment or material and all ferrous metal subject to rusting and corrosion during construction.

C. All duct work visible through registers, grilles and diffuser openings shall be given two coats of dull black paint.

3.16 FASTENING DEVICES AND METHODS

A. Provide fastening devices which are permanent, non-corroding, high strength type using threads or tightening. Minimum size bolt shall be 3/16 inch, and medium size screw shall be No. 10. Cement or glue type fasteners shall not be used. Driven studs may be used for fastening only in steel.

B. In concrete and solid masonry, use threaded inserts secured in drilled holes or cast into the concrete. Conduits 1 inch and larger, junction boxes 12 inches and larger, and all equipment subject to motion, operation or vibration shall be fastened with lead tamped or wedge type expanding shield secured threaded inserts.

C. In hollow masonry, plaster or plaster board, toggle bolts or expanding lag anchors shall be used with excess hole area covered with washers. Whenever possible, fastening in plaster or plaster board shall be into studs or structural supports.

D. In wood construction, wood screws and lag bolts may be used. Screws shall not be hammered into wood.

E. In steel construction, driven threaded studs, welded threaded studs, drilled threaded or through holes, or threaded clamps shall be used.

F. In light weight applications on sheet metal, self-threading screws or bolts may be used.

3.17 PIPING

A. Cut pipe accurately to measurements established at the site, work into place, without springing or facing and clear all windows, doors and other openings. Ream all piping to remove burrs and install so as to permit free expansion and contraction without causing damage. Make all changes in direction with fittings.

B. Provide, whether shown or not, sufficient awing joints, expansion loops and devices necessary for a flexible piping system. Provide union shut off valves suitable located to facilitate maintenance and removal of all equipment or apparatus. Install drain valves at all low points of each system to enable complete drainage, and air vents at all high points in the piping system to enable complete air venting.

C. Pipe all drains from condensate pans, and relief valves, to spill over an open sight drain, floor drain or other acceptable discharge points, and terminate with a plain end (unthreaded pipe) 6 inches above the drain. Rigidly support all drains.

D. Weld-O-Let type fittings may be used for branch take offs where size of take off does not exceed 3 inch IPS and the take off is at least two standard pipe sizes smaller than the main size. Standard welding steel shall be used in all other locations. Copper piping shall have soldered joints with 95-5 solder. Galvanized piping shall have screwed joints.

E. Joints in copper tubing shall be made using sweat fittings and tin-antimony solder and non-corrosive flux. For soldered joints, the outside surface at end of pipe and inside surface of fitting shall be thoroughly cleaned with steel wool or emery cloth and all burrs shall be removed. After cleaning, surfaces to be joined shall be evenly and completely covered with flux. Solder joints shall be well supported during the heating process and shall not be strained during the cooling period. Excess solder shall be removed while in a plastic state, leaving a fillet around the cup of the fitting as it cools.

F. All pipe and fittings with screwed ends shall have its threads cut clean and true and in conformance with the ASA Specification B2-1 for taper threads. Screwed pipe and fitting of brass shall be made up without marring or damaging pipe and fitting surfaces. All screwed pipe joints, except where specified otherwise, shall be made up with non-soluble, non-toxic, approved thread compound, applied to male threads only.

G. Connections between pipe fittings, hangers and equipment of dissimilar metals shall be avoided wherever practical. Wherever such connections are unavoidable, they shall be insulated against direct contact, using a high grade dielectric insulating material of Teflon, Milarta, asbestos fiber, neoprene, or equal.

H. Hangers: Furnish and install suitable hangers and supports for all horizontal lines. Hangers and supports shall be Grinnel, Fee and Mason, or equal. Heavy pipes shall be carried by pipe hangers supported by rods secured to slab or by approved design. No piping shall be hung from other piping. In no case shall hangers be supported by means of vertical expansion bolts.

I. Horizontal steel piping shall be supported in accordance with the following schedule:

PIPE SIZE	MAX. HANGER SPACING	ROD SIZE
1" & smaller	6 ft. 0 inches	3/8 inch
1 1/2" to 2"	9 ft. 0 inches	3/8 inch
2 1/2" to 4"	10 ft. 0 inches	1/2 inch
Larger than 4"	12 ft. 0 inches	1/2 inch

J. All lines of copper tubing shall be supported by approved type hangers. Hangers for uncovered lines shall be especially designed for copper tubing. Hangers for covered tubing shall have broad scraps fitting outside of covering with insulation protection. Horizontal copper tubing shall be installed in accordance with the following schedule.

PIPE SIZE	HANGER HORIZONTAL SPACING	ROD SIZE
½"	6'	3/8 inch
3/4" & 1"	8'	3/8 inch
1 1/4" & Larger	10'	3/8 inch

3.18 ESCUTCHEONS

A. Escutcheons shall be installed on pipes and conduits wherever they pass through floors, ceilings, walls or partitions in finished areas.

B. Escutcheons shall be chrome plated brass.

3.19 RELOCATION OF GAS LINE

A. Trenches for gas line shall be excavated to the required depth.

B. The bottom of the trenches shall be tamped hard and graded to secure all available fill. Bell holes shall be excavated to ensure pipe resting for its entire length on solid ground. If rock is encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel and shall be well tamped. No extra compensation will be made for rock excavation.

C. After the gas line has been tested, inspected and approved by the Engineer and utility company representative, the trenches shall be backfilled with approved fill material, in 12 inch layers, firmly compacted, flooded if necessary, and thoroughly tamped.

3.20 NAMEPLATES AND IDENTIFICATION

A. Provide nameplates and identification on all major mechanical and electrical equipment.

B. Exposed or surface mounted panel boards, cabinets, starters, contactors, time clocks, fans, motors, air handling units, shall be coded and painted with one inch high stenciled black letters across the front.

C. The above equipment where flush mounted, shall be coded on the inside of the cover.

D. Stencils shall be made from heavy waxed cardboard with all letters in capitals and of the same size. At the completion of the project, the stencils shall be turned over to the Owner.

E. In lieu of stencils, engraved bakelite nameplates may be used; nameplates shall be minimum one inch high with 1/4 inch high capital letters permanently fastened to equipment.

3.21 PIPE VIBRATION AND NOISE ISOLATION

A. Insert 1 inch strip of hair felt to isolate all piping, conveying fluids, from direct contact with building walls, framing and sleeves. Pipe isolation shall be installed at all ring hangers consisting of 1 inch felt. Separate cold and hot water piping by 6 inches.

B. All rotating equipment, piping, hangers, supports and tank connections to rotating equipment shall be vibration isolated from beams, columns, floors, ceilings, joists and walls using isolation equipment as specified in other sections of this specification or as shown on the Drawings.

3.22 CONTROL WIRING

A. The Electrical Contractor shall furnish and install all control and interlock wiring for electrical equipment furnished. All wiring shall be in conduit and shall be in conformance with Section 16. Where control voltage is greater than 48 volts, wire shall be minimum 14 gauge AWG and shall have 600 volt insulation. Motors, starters, heaters, thermostats, and other control devices shall be furnished and delivered from the Mechanical Contractor to the Electrical Contractor for installation by the Electrical Contractor. The Mechanical Contractor shall furnish complete wiring diagrams to the Electrical Contractor for each and every piece of equipment to be installed and inter-connected if necessary. The Mechanical Contractor shall notify the Electrical Contractor concerning any changes in the electrical requirements due to substitution of equipment or variations in the equipment. Control raceways and boxes exposed to the elements shall be NEMA 3R or weatherproof.

END OF SECTION

SECTION 22 11 13

PLUMBING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. Furnish all labor, materials, equipment and services to complete the plumbing work as shown on the drawings or as specified. Refer to the General Conditions, Supplemental General Conditions, Mechanical, Electrical, and other sections as they apply.

1.02 RELATED SECTIONS

A. Section 22 00 00 – Mechanical - General

1.03 SCOPE

A. Furnish and install all plumbing systems complete in every respect and ready to operate. Furnish all miscellaneous items and accessories required for such installation, whether or not each item or accessory is shown on the drawings or mentioned in these specifications.

B. The work shall consist of, but is not limited to the following general items.

1. Plumbing fixtures and related drainage and water supply systems.
2. Hot water heater system.
3. Floor drains, cleanouts and hose bibbs.
4. Gas piping system.

1.04 SUBMITTALS

A. Submit shop drawings for:

1. Fixtures.
2. Water heaters.
3. Drains, cleanouts, and hose bibbs.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fixtures: As scheduled on Drawings and as manufactured by American Standard, Kohler, Crane, Bradley, or equal.

B. Trim as for fixtures, plus Delta Faucet, or equal.

C. Seats: Olsonite or Church.

D. Hot water heater system: Refer to Plumbing Fixture Schedule on Drawings for manufacturer and model number.

E. Hose bibbs: Josam, Chicago Faucet, Speakman, Zurn, or equal, with vacuum breaker. Material rough brass outside, chrome plated brass inside.

F. Floor drains and cleanouts: Josam, Zurn or Wade.

2.02 PIPE AND FITTINGS

A. Hot and cold water piping above slab shall be Schedule 40 galvanized steel with galvanized M.I. fittings or Type "L" copper with wrought copper fittings, or equal. Piping below slab shall be Type "K" copper tubing. Exterior piping shall be Schedule 40 galvanized steel, Type "K" or "L" copper, or Class 150 cast iron.

B. Soil and storm drainage piping shall be Schedule 40 PVC, or Schedule 40 ABS DWV plastic pipe, or service weight cast iron with service weight fittings or no hub. Pipe and fittings to be coated with hot coal tar pitch inside and out.

C. Vent piping 2 1/2 inch and under may be Schedule 40 galvanized steel pipe with banded cast iron fittings or galvanized victaulic couplings and fittings. Three inch and larger pipe shall be service weight cast iron, no hub. Copper DWV with copper drainage fittings may be used for all size vent piping. Vent pipe may be Schedule 40 PVC or ABS DWV plastic pipe.

D. Gas piping shall be Schedule 40 black steel assembled with M.I. or welded fittings. Piping below grade coated and wrapped. Straight lengths furnished with factory coating. Fittings and damaged coatings shall be wrapped with tape-coat applied according to manufacturer's instructions.

2.03 VALVES AND STRAINERS

A. Gate and globe valves shall be bronze with a steam working pressure of 125 psi as manufactured by Jenkins, Stockham or Wellworth, or equal.

B. Valves 2" and smaller shall have screwed ends. Valves 2 1/2" and larger shall be iron body bronze mounted 125 psi ASA flanged.

C. Strainer shall be "Y" pattern Sarco, or equal, and furnished with stainless steel baskets.

D. Ball valves shall be full flow round port with teflon seats and seals.

E. Pet cocks shall be brass and rated 125 lb. W.P.

F. Check valves shall be all brass, swing check, screwed ends and suitable for 150 lb. W.P.

G. Gas cocks 1" and below - Crane No. 272 low pressure, 1 1/4" and above and all medium pressure, Rockwell No. 114 or 116.

H. Under water service valves shall be Mueller H-15200 curb stop with cast iron curb box with lid, plug and footpiece for sizes 1 1/2" and smaller, and Mueller A-2380-5, 200 psi, AWWA, iron body, non-rising stem gate valve with H-10360 cast iron valve box for sizes 2" and larger. Four 12" x 12" x 6" thick concrete pads around each box. Furnish key for each valve size.

2.04 BACKFLOW PREVENTERS

A. Connections not permitted between potable water and a non-potable water or waste sources.

B. Air gaps or approved backflow preventers shall always be used when required by code or as necessary to prevent backflow.

C. Backflow preventers shall be installed with any supply fixture when the outlet end may at times be submerged, such as hoses, sprays, direct flushing valves, aspirators and under-rim connections to a fixture in which the surface of water in the fixture is exposed at all times to atmospheric pressure.

PART 3 - EXECUTION

3.01 INSULATION

A. All cold and hot water supply and return piping except exposed connections to plumbing fixtures, flanges and unions shall be insulated with 3/4" wall thickness Gustin-Bacon "snap-on," Owens-Corning "PF," or standard thick 85% magnesia.

B. All exposed piping shall have a fire retardant jacket applied.

C. Fittings and valves shall be insulated with insulating cement. In exposed areas a fire retardant jacket shall be applied.

D. Cold water piping shall have a vapor barrier jacket applied.

E. Hot water piping under floors, 1" foamglas covered with glass cloth and mastic.

F. Pipe insulation shall have a protective shield of 14 gauge galvanized steel placed centrally between the insert section at all hangers. Shield shall cover one-half of the insulation.

3.02 ROOF FLASHING

A. A waterproof flashing shall be provided for each pipe or vent passing through the roof.

B. Flashing shall be one piece 26 gauge FHA flashing assembly with the joint between flashing and pipe sealed with waterproof compound.

C. Approved equal 3 pound lead, copper or Semco assembly may be used in lieu of FHA flashing.

3.03 STERILIZING WATER SUPPLY PIPES

A. After the hot and cold water systems are complete, they shall be flushed out completely and filled with water and a solution of sodium hypochlorite added to the system. The solution shall consist of 1 gallon of 5% sodium hypochlorite, Purex or other bleach to 200 gallons of water. Check residual chlorine by orthotolidin test. Allow solution to remain in the system for 24 hours, after which the entire system shall be flushed.

B. The Engineer shall be notified 24 hours prior to testing so his representative can witness test.

3.04 WATER HAMMER ARRESTERS

A. Water hammer arresters shall be provided on all supply piping, both hot and cold, where indicated on the Drawings.

3.05 LAYING SUPPLY LINES

A. Exterior water supply lines shall be laid with a minimum cover of 36". Installation shall be in accordance with Arkansas Department of Health Regulations and local codes and ordinances.

3.06 T & P VALVE

A. The T & P valve on the water heater shall be run to outside of building.

END OF SECTION