

Engineering Standard

SAES-S-060

28 January 2004

Saudi Aramco Plumbing Code

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Saudi Aramco DeskTop Standards

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1 Scope

- 1.1 The Uniform Plumbing Code in its entirety, published by the International Association of Plumbing and Mechanical Officials (IAPMO), 2000 edition with supplements thereto, is hereby adopted as the Saudi Aramco Plumbing Code, which is hereafter referred to as "this Code".
- 1.2 All provisions of the Uniform Plumbing Code (UPC) apply, except as modified in this Code.
- 1.3 The provisions of this Code shall apply to the procurement, erection, installation, alteration, addition, repair, relocation, replacement, maintenance or use of any plumbing system in all Saudi Aramco-operated and/or maintained facilities.
- 1.4 This standard does not apply to building fire protection systems, including building standpipe and sprinkler systems.

2 Conflicts and Deviations

- 2.1 Any conflicts between this Code and other applicable Saudi Aramco Engineering Standards (SAESs), Materials System Specifications (SAMSSs), Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Consulting Services Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from this Code in writing to the Company or Buyer Representative, who shall follow internal company procedure SAEP-302 and forward such requests to the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

3 References

The selection of material and equipment, and the design, construction, maintenance, and repair of equipment and facilities covered by this Code shall comply with the latest edition of the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

SAEP-103

Metric Units of Weight and Measure

SAEP-302

Instructions for Obtaining a Waiver of a Saudi Aramco Engineering Requirement

<i>SAEP-321</i>	<i>Performance Qualification Testing of Saudi Aramco Welders</i>
<i>SAEP-322</i>	<i>Performance Qualification Testing of Saudi Aramco Brazers</i>
<i>SAEP-323</i>	<i>Performance Qualification Testing of Contract Welders and Brazers</i>
<i>SAEP-324</i>	<i>Certification Review and Reviewer of Project Welders and Brazers</i>

Saudi Aramco Engineering Standards

<i>SAES-B-017</i>	<i>Fire Water System Design</i>
<i>SAES-H-002</i>	<i>Internal and External Coatings for Steel Pipelines and Piping</i>
<i>SAES-K-002</i>	<i>Air Conditioning Systems for Essential Operating Facilities</i>
<i>SAES-L-008</i>	<i>Selection of Valves</i>
<i>SAES-L-132</i>	<i>Material Selection for Piping Systems</i>
<i>SAES-L-610</i>	<i>Nonmetallic Piping</i>
<i>SAES-S-010</i>	<i>Sanitary Sewers</i>
<i>SAES-S-020</i>	<i>Industrial Drainage and Sewers</i>
<i>SAES-S-040</i>	<i>Saudi Aramco Water Systems</i>
<i>SAES-S-070</i>	<i>Installation of Utility Piping Systems</i>
<i>SAES-X-600</i>	<i>Cathodic Protection of Plant Facilities</i>

Saudi Aramco Materials System Specifications

<i>01-SAMSS-029</i>	<i>RTR (Fiberglass) Sewer Pipe and Fittings for Gravity flow</i>
<i>01-SAMSS-034</i>	<i>RTR (Fiberglass) Pressure Pipe and Fittings</i>
<i>05-SAMSS-002</i>	<i>Automatic Electric Water Heaters</i>

Other Saudi Aramco Documents

<i>GI-0151.006</i>	<i>Saudi Aramco Sanitary Code</i>
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3.2 Industry Codes and Standards

American Society of Mechanical Engineers

ASME BPV SEC IX Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

American Society for Testing and Materials

ASTM A518 Corrosion Resistant High-Silicon Iron Castings

ASTM A861 High-Silicon Iron Pipe and Fittings

ASTM C1053 Borosilicate Glass Pipe and Fittings

ASTM D698 Compaction Characteristics of Soil

ASTM D2235 Solvent Cement for ABS Plastic Pipe and Fittings

ASTM D2564 Solvent Cement for PVC Plastic Pipe and Fittings

ASTM D3138 Solvent Cement for Transition Joints between ABS and PVC

ASTM F493 Solvent Cement for CPVC Plastic Pipe and Fittings

American Welding Society

AWS B2.1 Standard for Welding Procedure and Performance Qualification

AWS D10.9 Specification for Qualification of Welding Procedures and Welders for Piping and Tubing

International Association of Plumbing & Mechanical Officials

IAPMO IS 1 through 26 Installation Standard

Also refer to Table 14-1 Plumbing Material Standards, of UPC.

4 General Requirements

- 4.1 The UPC is written using the US system of units, and all metric dimensions given therein for pipe diameters are based on equivalent nominal inside diameter (ID) The user shall exercise due caution in their use.
 - 4.2 Conversion to the Metric system (S.I. Units), if not already converted in UPC, shall be in accordance with Saudi Aramco Engineering Procedure SAEP-103.
 - 4.3 All drawings of plumbing systems within buildings shall be shown in US, nominal inside diameter (ID) pipe sizes as the primary dimension. Permitted metric size (S.I. Units) building sewer and water service lines shall be dimensioned in millimeters as nominal outside diameter (OD).
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5 Summary of Modifications

The Chapter numbers shown are those listed in UPC-2000 edition.

Saudi Aramco Plumbing Code Table of Contents

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6 Detailed Modifications

The Section numbers used Hereinafter for exceptions, additions and deletions, are those of UPC-2000 edition.

CHAPTER 1 - ADMINISTRATION

101.3 Plans Required. (Exception) The submission of plans, specifications and drawings for approval of work shall be in accordance with Saudi Aramco Engineering Procedures.

101.4.1 (Exception) Refer to Section 1 of this Code.

101.4.1.1.1 (Exception) Refer to Section 2 of this Code.

102.0 Organization and Enforcement

This section of the UPC is deleted. Refer to Administrative Authority definition in Paragraph 202.0 of this Code.

- 103.0 Permits and Inspection. (Exception) The entire section is deleted except the Section 103.5.
- 103.5.2 Operation of Plumbing Equipment (Deleted) This subsection is not applicable to this Code.
- 103.5.3.3 Water Piping (Exception)
- a) Upon completion of a section of the entire hot or cold water supply system, it shall be tested and proved tight under a water pressure of 1034 kPa (150 psig) for a period of not less than 4 hours.
 - b) Potable water containing no additives, shall be used for the tests.
- 103.5.5.1 Defective Systems (Exception)
- A low pressure air not exceeding 345 kPa (50 psig), and soap test shall be used in testing the condition of the sanitary drainage or plumbing system of any building premises when there is reason to believe that it has become defective. In buildings or premises found defective by the Administrative Authority or other authorized Saudi Aramco Department because of an unsanitary condition of the plumbing system or part thereof, the alterations in such system shall conform to the requirements of this Code.
- 103.5.6 Reinspections (Deleted)
- This section is not applicable to this Code.
- 103.5.6.1 Corrections: (Exception) Notices of correction and/or violation shall be written by the Chief Inspection Engineer in accordance with Saudi Aramco Inspection Procedures.
- 103.5.6.3 Approval (Exception)
- Upon satisfactory completion and final test of the plumbing system, a certificate of approval shall be issued by the Chief Inspection Engineer in accordance with Saudi Aramco Inspection Procedures.
- Table 1-1 Plumbing Permit Fees (Deleted)
- This section is not applicable to this Code.
- CHAPTER 2 - DEFINITIONS
- 202.0 Definition of Terms.
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Administrative Authority: (Exception)

Whenever this term is used in this Code, it shall be defined as follows or as noted otherwise in this Code.

- a) The Administrative Authority of waiver approval is vested in the Manager of Responsible Engineering Organization, as defined in SAEP-302.
- b) The Administrative Authority, regarding the technical aspects, applicability or clarification of this Code, rests with the Chairman of Plumbing and Utilities Standards Committee.
- c) The Administrative Authority, regarding the fire safety aspects of the requirements in this Code, is the Chief Fire Prevention Engineer of Loss Prevention Department.
- d) Approval of design or construction and inspection of plumbing systems and health related issues, covered by this Code, shall be performed by person designated for these tasks, in accordance with the current procedures of Saudi Aramco.

Building Supply: (Exception) The building supply is the pipe carrying potable water from discharge end of isolation valve installed on a branch of water distribution piping network, or other source of water supply to the building wall or other point of use or distribution on the premises. Building supply shall also mean water service. Refer SAES-S-040 for the definition of Isolation Valve and Water Distribution Piping Network.

Code: (Exception) The word "Code" or "this Code," when used alone, shall mean these regulations, and subsequent amendments thereto which the Administrative Authority may adopt under Saudi Aramco procedures.

CPVC: (Addition) Chlorinated Polyvinyl Chloride.

DWV: (Addition) Drain, Waste and Vent.

Holder of permit: (Addition) shall mean "contractor."

Health Officer and Health Department: (Addition) shall mean Saudi Aramco Medical Services Organization (SAMSO).

Person: (Addition) Whenever this term is used it shall mean Saudi Aramco and its employees, a Saudi Aramco contractor or subcontractor,

either directly or indirectly, engaged in a Saudi Aramco project or a project assigned to Saudi Aramco by others.

Potable Water: (Addition) Refer to SAES-S-040 for definition. Saudi Aramco water supply systems may consist of desalinated water specifically designated for drinking and certain washing facilities only, and chlorinated raw water that may be used as potable water. Provisions of this Code applying to potable water shall also apply to chlorinated raw water. All raw water not specifically designated as "untreated" shall be considered to be chlorinated raw water. Wherever in this Code the term "domestic water" is used, it shall be considered to be potable water as defined herein.

Public Sewers: (Addition) Refer to SAES-S-010 for definition. A public sewer is a common sewer directly controlled by Saudi Aramco.

Water Service: (Addition) Same as Building Supply.

Welder, Pipe: (Addition) A person who specializes in the welding of pipes and fittings, and holds a valid Saudi Aramco certificate of competency.

CHAPTER 3 - GENERAL REGULATIONS

301.1.3 Standards, (Addition)

- a) Valve material referred in this Code, shall conform to Table 1 of SAES-L-008.
- b) Metallic pipe and fittings referred in this Code shall conform to applicable Saudi Aramco Engineering Standards.

301.1.4 Existing Buildings. (Exception) In existing buildings or premises in which plumbing installations are to be altered, repaired or renovated, the Administrative Authority may permit deviation from the provisions of this Code, provided that a waiver request to deviate is first submitted in accordance with Section 2 of this Code, for proper determination in order that health and safety requirements, as they pertain to plumbing, shall be observed.

301.2.5 (Addition) Use of the following materials is prohibited and shall be disregarded if referred to in the text of UPC, unless specifically permitted in the text of this Code.

- a) Carbon steel pipe and fittings, black and hot-dipped, zinc-coated/galvanized welded and seamless, except:

- 1) as permitted for water lines. Such pipe and fittings shall be cement or fusion bonded epoxy (FBE) lined in accordance with SAES-H-002. Cement lining, however, is permissible only where the water quality is not detrimental to the lining.
 - 2) as permitted for gas piping and gas service piping.
- b) Wrought iron pipe and fittings, black and galvanized, except as permitted for gas piping and service piping.
 - c) Acrylonitrile-Butadiene-Styrene (ABS) building drain, waste and vent pipe and fittings, except as permitted in Section 701.1.6 of this Code,
 - d) Vitrified clay pipe and fittings,
 - e) Asbestos cement piping,
- 305.3 (Exception) In cities and/or provinces, where the installation of water supply systems and building sewers is under the jurisdiction of the city, province, or a Saudi Arabian ministry, the provisions of this Code need not apply unless said outside agency has no regulations or codes similar to this Code.
- 306.3 (Addition) Liquids at a temperature above 140°F (60°C) shall not be discharged directly into any drainage system or public sewer.
- 308.0 Location: (Deleted) This section is not applicable to this Code.
- 311.1 (Addition) Use of the following fittings are also prohibited.
- Double sanitary tees in which branch inlets are less than two pipe sizes smaller than the run of the tee,
 - Side inlet fittings to sanitary tees smaller than 3 in (90 mm OD) in diameter,
 - Sanitary tees with slip joint inlets,
 - Sanitary tees with slip joint wyes,
 - Closet bends with auxiliary inlets,
 - Three-way elbows, and
 - Two-way cleanout tees.
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- 311.6 (Exception) Where intermembering or mixing of dissimilar metals occur, including at valves, the point of connection shall be confined to exposed or readily accessible locations. The connections of dissimilar metals shall be protected by the use of a dielectric union/coupling or dielectric flange set.
- 313.6 (Addition) New water, drainage and vent systems shall not have pipes of 5 in (140 mm OD) nominal diameter, except if the equipment or appliance to which the piping is to be connected is specifically made for this pipe size. Adapter reducers may also be used in such cases.
- 313.9 (Addition)
- a) All open pipe ends or fitting openings shall be plugged or capped immediately during construction.
 - b) All piping within buildings shall be concealed unless otherwise indicated on the drawings. Piping shall not be embedded in structure walls, floors and ceilings.
 - c) No portion of the drainage system underground or below a floor slab, basement or cellar shall be less than 2 in (50 mm OD) nominal diameter.
 - d) Steel pipe and fittings in contact with a corrosive atmosphere, or buried underground and its extension to 6 in (150 mm) above grade shall be coated against exterior surface corrosion in accordance with SAES-H-002.
- 314.1 Table 3-2 (Exception)
- a) Plastic pipe shall be supported at each story or at a maximum interval of 10 ft (3.0 m), and on either side of a tee or wye at horizontal takeoff points. Pressure piping shall be adequately blocked to prevent horizontal displacement from the vertical.
 - b) CPVC pressure pipe shall be suspended on hangers or supported on fixed brackets. Such supports shall permit longitudinal pipe movement in expansion and contraction without abrasion, cutting, or restriction. Fixed brackets shall be used at changes in direction or piping size to prevent pipe movement in response to thrust from internal pressure.
 - c) Metallic pipe supported by metallic hangers of different type shall be electrically insulated.
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- 314.4 (Addition) Hangers and anchors shall be of metal of sufficient strength to maintain their proportional share of the weight of pipe and contents. Plumber's strap or equal stainless steel strap may be used as residential straps and hangers. The minimum hanger width for plastic pipe shall be 2 in (50 mm). Wire or banding material is prohibited.
- 314.8 (Addition)
- a) RTR (Fiberglass) pressure pipe as per 01-SAMSS-034 shall be supported in accordance with the manufacturers' recommendations.
 - b) Valves and similar appurtenances shall be supported independently of the nonmetallic piping system.
 - c) Other approved nonmetallic pipe shall be supported per the Manufacturers' recommendations, or as may be determined by the Chairman of Plumbing and Utilities Standards Committee.
- 315.0 (Exception) Excavation, trenching and backfilling shall conform to the appropriate Saudi Aramco Engineering Standards for the material in use. All excavations shall be backfilled immediately after successful testing and inspection.
- 316.1.1 Threaded Joints (Addition)
- a) Plastic threaded joints, except pipe union threads, shall be solvent seal welded as part of the joining process.
 - b) Plastic threaded joints in a pressure piping system shall be at unions or at the point of connection to a fixture or appliance.
 - c) Plastic female socket/male threaded fittings may be used with metallic female threaded fittings where alternative joining methods are impractical.
- 316.1.6 Solvent Cement Plastic Pipe Joints (Addition)
- a) All solvent cements, primers and cleaning solutions used in joining ABS, PVC and CPVC pipes, shall have the ASTM designation and shall be mutually compatible.
 - b) Containers of solvent cements, primers and cleaning solutions shall have the date of manufacture on the label.
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- c) Solvent cements shall not be used past the manufacturers' expiry dates on the label, or 1 year past the date of manufacture if there is no expiry date specified.
- d) Solvent cements shall be stored in air-conditioned areas.
- e) Solvent cements shall conform to the following ASTM Designations:
 - ASTM D2564 : PVC to PVC
 - ASTM F493 : CPVC to CPVC or PVC
 - ASTM D2235 : ABS to ABS
 - ASTM D3138 : ABS to PVC

316.1.7 Brazing and Welding (Exception)

- a) Welding procedures shall be qualified in accordance with either one of the following standards:
 - 1) ASME BPV SEC IX.
 - 2) AWS D10.9, using either Level AR-1 or AR-3.

Standard welding procedure specifications (WPS) in accordance with AWS B2.1 or the Saudi Aramco Welding Manual may be used without additional qualification, provided that the contractor accepts full responsibility for the use of the WPS, and the WPS is used without modification.

- b) Brazing shall be performed in accordance with the procedures and techniques specified in either the Copper Tube Handbook of the Copper Development Association, or IAPMO IS 3-93. For other materials and applications, procedures shall be qualified in accordance with ASME BPV SEC IX. Standard brazing procedure specifications in accordance with the Saudi Aramco Welding Manual may be used without additional qualification, provided that the contractor accepts full responsibility for the use of the WPS, and the WPS is used without modification
- c) Welder and brazers shall be certified in accordance with SAEP-321, SAEP-322, SAEP-323 or SAEP-324, as applicable.

CHAPTER 4 - PLUMBING FIXTURES

- 412.2.1 (Exception) Toilet rooms in all buildings, except single-family residence, shall be provided with floor drains. The floor shall slope toward the floor drains.
- 413.0 (Addition) Each building shall be provided with sanitary facilities as prescribed by the Saudi Aramco Building Code and the Saudi Aramco Sanitary Code GI-0151.006.

CHAPTER 5 - WATER HEATERS

- 501.0 General (Addition) Requirements pertaining to gas water heaters, except for venting shall also apply to electric water heaters. Electric water heaters shall conform to 05-SAMSS-002.
- 503.0 Permit (Deleted) This subsection is not applicable to this Code.
- 509.0 (Addition) Water heaters shall not be installed in hammams, toilets offices, public places and outside buildings.

CHAPTER 6 - WATER SUPPLY AND DISTRIBUTION

- 602.4 (Exception) No non-Saudi Aramco water supply system shall be connected to any Saudi Aramco owned, operated or maintained water supply system without the approval of the Chairman of Plumbing and Utilities Standards Committee and the Saudi Aramco Medical Services Organization (SAMSO). Such approved connections shall have lockable isolation valves and approved backflow prevention devices between the two water supply systems.
- 602.5 (Addition)
- a) No person shall make a connection, or allow one to exist, of a drinking water line to a line intended to carry chlorinated raw water.
 - b) No person shall make a connection, or allow one to exist, of a water line to a dedicated firewater system unless the water line in question is a continuation of the dedicated firewater system.
 - c) Any connection from a Saudi Aramco-owned water supply system to a building or building area not under the direct control of Saudi Aramco shall be provided with an approved backflow prevention device.
- 603.4.23 (Addition)
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- a) A pressure-type anti-siphon valve shall be used on all water piping directly connected to any mosque or musallah ablation station. The valve shall be located not less than 6 in (150 mm) above the overflow or flood level rim of the highest fixture or tank that it serves.
- b) A pressure-type anti-siphon valve shall be used on each hose connection such as hammam ablation hoses, gardening hoses, etc.

604.1 (Exception)

- a) Except as may be allowed hereinafter, the following piping material shall be used for all water-distribution piping and fittings and water supply system.
 - Cement lined carbon steel,
 - Type K or L copper,
 - Schedule 80 PVC, for cold water distribution systems outside buildings only such as for building supply lines as defined in Section 202.
 - Schedule 80 CPVC
 - RTR (Fiberglass) pipe in accordance with 01-SAMSS-034.
- b) Schedule 80 PVC pipe and fittings shall be used for cold water distribution systems outside a building; and shall not be used for water above 120°F (49°C).
- c) CPVC pipe and fittings are permitted for use in hot water service where the maximum hot water temperature does not exceed 160°F (71°C).
- d) Pipe for irrigation systems downstream of the backflow preventor and pressure-regulating valve (if provided) shall be in accordance with SAES-S-040.
- e) Fittings used with plastic pipe shall be of the material and weight to match the pipe, except that CPVC fittings may be used with PVC pipe.
- f) Thermoplastic pipes such as PVC, UPVC, CPVC and HDPE are not permitted for buried building-supply-lines (as defined in Section 202.) in hydrocarbon handling areas unless prior approval

is obtained from the Chairman of Plumbing and Utilities Standard Committee.

604.2 (Exception) Copper tube for water piping shall have a weight of not less than Type L.

604.5 (Exception) Buried carbon steel piping shall be coated in accordance with SAES-H-002.

604.11.2 (Exception)

- a) Water heaters shall be connected in a manner to permit observation, maintenance and servicing.
- b) Connections between dissimilar metals shall be by means of a dielectric or insulating union.

604.13 (Addition)

- a) Plastic pressure piping systems within buildings shall be provided with expansion loops, bends or offsets to accommodate movements in the amount of 3 inches per 100 feet (0.002 meters per meter) in cold water distribution CPVC systems, or 6 inches per 100 feet (0.005 meters per meter) in hot water distribution CPVC systems.
- b) Plastic pressure piping systems shall not be installed under any building floor slab, basement or cellar, unless the piping is fully encased in concrete or protected by steel sleeve.

605.8 (Addition)

- a) Plastic valves are not approved for general usage in water distribution systems within buildings. However it may be used for specific projects upon approval of the Chairman of Plumbing and Utilities Standards Committee. Such plastic valves shall have union connections at both ends; shall be in an exposed location; and shall conform to SAES-L-008 and SAES-L-610.
- b) A union shall be installed adjacent to each threaded valve in metallic systems.
- c) Section service shut off valves shall be provided for each grouping of three or more fixtures in any plumbing installation.

606.2.2 (Exception) PVC and CPVC Pressure Pipe: Except where threaded joints are necessary, all joints above ground shall be as provided in

- Section 316.1.6 of this Code. Threaded joints shall be as provided in Section 316.1.1 of this Code.
- 608.3 (Addition) Combination pressure and temperature relief valves on water heaters shall have the following settings.
- a) The pressure relief elements of combination pressure and temperature relief valves shall be set to open at not less than 25 psig (172 kPa) in excess of available working pressure. The setting shall not exceed the water heater tank rated maximum allowable working pressure. The pressure relief element shall have a capacity capable of limiting pressure rise not to exceed 10% above its set pressure.
 - b) The temperature relief elements of combination pressure and temperature relief valves shall be of adequate relief rating, expressed in BTU/hr (watts), for the equipment served. The valve shall be set to open when the stored water temperature is 210°F (100°C), or other lower temperature as selected.
- 609.1 (Exception) All requirements apply except the minimum cover requirements. Minimum cover over a buried pipe shall be in accordance with the following requirements.
- a) All water supply piping shall have a minimum cover of 24 in (610 mm) for all pipes 3 in (90 mm OD) diameter and larger; and 12 in minimum cover (305 mm) for smaller than 3 in (90 mm OD) pipes.
 - b) Underground parallel water supply and firewater piping shall have a minimum horizontal clear distance of 12 in (305 mm).
- 609.2,
609.2.1 and
609.2.2 (Exception) See Section 720 of this Code.
- 610.4 (Exception) Water supply and water-distribution piping shall be sized in accordance with Section 610.5 with the procedure set forth in Appendix A of this Code.
- 610.8 (Exception) The minimum size water meter shall be ¾ in (25 mm OD) inlet and outlet nominal diameter. The minimum building supply pipe shall be ¾ in (25 mm OD) nominal diameter.
- 610.12 (Addition) Dedicated firewater systems subject only to occasional water flow, may be sized for a maximum of double the maximum velocity
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listed in Table 1 of SAES-L-132 for the material of the pipe, or as required by SAES-B-017, whichever results the greater pipe size.

- 612.0 (Addition) Hot water supply systems in buildings shall be of the return circulation type where the developed length of hot water piping from the hot water source to the farthest fixture exceeds 100 ft (30 m).
- 613.0 (Addition) Protection and Disinfection of Domestic Water Piping: All newly constructed and existing repaired or modified domestic water piping shall be protected from contamination during installation, and shall be disinfected in accordance with the requirements of Section SASC-S-17 of Saudi Aramco Sanitary Code, GI-0151.006.

CHAPTER 7 - SANITARY DRAINAGE

PART I - DRAINAGE SYSTEM

- 701.1 (Exception) Except as may be allowed hereinafter, the following piping material shall be used for Building Drainage Systems.
- Schedule 40 PVC DWV
 - copper with DWV fittings,
 - Cast iron with DWV fittings,
- 701.1.1 (Exception) Refer to Section 313.9 of this Standard.
- 701.1.5 (Addition) ABS drainage pipe and fittings are prohibited in new construction. ABS pipes and fittings may be used to repair or modify existing sanitary systems in existing buildings. In the absence of ABS material, use Schedule 40 PVC DWV pipe and fittings for repairs. Interconnections of ABS and PVC shall be made with ASTM D3138 solvent cement.
- 701.2 (Exception) Refer to Para 701.1 for drainage fittings' material. The drainage fittings shall have interior waterway of the same diameter as the piping served and all such fittings shall be compatible with the type of pipe used.
- 701.2.4 (Addition) Fittings used with plastic pipe shall be of the material and weight to match the pipe, except that CPVC DWV fittings may be used with PVC DWV pipe.

**Table 7-3 - (Exception)
 Minimum - Trap & Trap Arm Size**

Kind of Fixture	Inches (mm)	Units
Floor Drains	3 (90 mm OD)	4
Interceptors for Grease, Oil, Solids, etc.	3 (90 mm OD)	4
Showers, Gang (one unit per head)	3 (90 mm OD)	
Water Closet, Eastern Squatting Type (trap arm only)	4 (110 mm OD)	6
Musallah Ablution Stations	3 (90 MM OD)	4

Table 7-5 (Exception)

- a) "Size of Pipe" columns headed by "1-1/4", "2-1/2" and "5" drainage and vent sizes are prohibited for new construction.
- b) "Note 5" shall apply to pipes 4 in (110 mm OD) and larger only.

705.1.10 (Addition) PVC DWV Pipe: Except where threaded joints are necessary, all joints shall be as provided in Section 316.1.6 of this Code. Threaded joints shall be as provided in of Section 316.1.1 of this Code.

705.3.1 Slip Joints (Exception): Slip joints are prohibited in water distribution piping systems.

705.3.2 Provisions for Expansion in Plastic Pipe (Addition)

Provisions shall be made for movement in plastic drainage piping in the amount of 2-1/2 inches per 100 feet (0.002 m per meter) of active PVC pipe and 5 inches per 100 feet (0.004 meters per meter) of active ABS pipe.

707.4 (4) (Exception) Two-way cleanout fittings are prohibited.

707.15 (Addition)

- a) No 90° bend shall be more than 50 ft (15.2 m) from the cleanout provided for it.
- b) In buildings 3 or more stories in height, test points shall be provided at the base of each stack for testing purposes.

711.0 (Addition) Storm drains shall not discharge into any sanitary sewer.

712.2 (Addition) The system shall be tight at all points for a period of 4 hours.

712.3 (Exception) Air-testing, except as specified in Section 103.5.5.1 - "Defective Systems" of this Code, is prohibited.

PART II - BUILDING SEWERS

713.5 (Deleted) This subsection is not applicable to this Code.

714.6 (Addition) The connection of building sewer into the public sewer shall be made at a provided house or wye connection, or at a manhole. If the public sewer does not have a house or wye connection available, a pipe section with an integral wye connection shall be installed in the public sewer at the location specified. Wye shall be set at an angle of 45 degrees to the vertical. The use of "cut-in" wye connection is prohibited.

715.1 (Exception) The building sewer as defined in Chapter 2 of UPC-2000, shall be of the material listed in section 701.0 of this Code. RTR pipe with DWV fittings per 01-SAMSS-029 may be used for building sewers. |||

719.6 (Exception) Administrative Authority in this subsection means the Chairman of Plumbing and Utilities Standards Committee.

719.7 (Addition) Inspection chambers are prohibited within Saudi Aramco facilities.

720.0 Sewer and Water Pipes (Exception)

- a) Parallel building sewer and water service lines shall be located at least 10 ft (3.0 m) apart horizontally.
 - b) Parallel building sewers and water service lines, if necessary, may be laid in a common trench provided that all of the following requirements are met:
 - 1) The bottom of the water pipe(s), at all points, shall be at least 12 in (305 mm) above the top of the sewer line.
 - 2) The side(s) of the water pipe(s), at all points, shall be at least 12 in (305 mm) clear horizontally from the side of the sewer line.
 - 3) The water pipe(s) shall be placed on a solid shelf of the common trench, or the water line shelf be of select backfill compacted to a minimum of 95% density as per ASTM D698.
 - c) Where it is necessary for buried water and sewer lines to cross, the separation between water and sanitary sewer shall be in accordance
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with SAES-S-010; and the separation between water and industrial sewer shall be in accordance with SAES-S-020.

- d) Drainage pipes and water lines buried under building slab shall be installed such a way that water lines shall always run above drainage pipes and shall maintain minimum 12 inches vertical distance.
- e) Where it is physically impossible to place the water line over the sewer, then the overlying sewer shall be encased either in concrete not less than 6 in (150 mm) thick, or in a steel sleeve with external protective coating as per SAES-H-002, for a minimum distance of 10 ft (3 m) in both directions beyond the crossing point.

721.1 (Exception) No building sewer shall be located at any point having less than the minimum distances indicated in Table 7-7.

Table 7-7 (Exception) NOTE 3 - The location shall be approved by the Saudi Aramco Medical Services Organization (SAMSO).

NOTE: 4 and 6 - See Section 720 of this Code for sewer and water parallel clearances, and for water and sewer crossing clearances.

723.0 (Exception)

- a) Building sewers and appurtenances thereto those have not been backfilled shall be tested and proved watertight under a 10 ft (3 m) head of water for not less than 4 hours.
- b) Building sewers and appurtenances thereto those have been backfilled shall be tested and proved watertight under a 10 ft (3 m) head of water for not less than 24 hours.

724.0 (Addition) All plans and specifications for building sewers and private sewage disposal systems shall be approved and certified in accordance with Saudi Aramco procedures.

CHAPTER 8 - INDIRECT AND SPECIAL WASTES

807.2 (Exception) Drain piping for condensate waste from air conditioning cooling coils shall be indirectly connected to a floor drain, or shall be indirectly connected into the inlet side of a P-trap.

- 809.0 Drinking Fountain (Exception) Drinking water fountains that are not manufactured with an internal air gap drain, shall be installed with an indirect waste connection.
- 811.2 (Exception) Each fixture, waste pipe and fitting receiving, or intended to receive, any acid or corrosive chemical, and each vent pipe connected thereto, shall be constructed of the following chemical resistant material:
- a) Chemical resistant Borosilicate Glass pipe and fittings DWV, ASTM C1053 - 90,
 - b) Corrosion Resistant High Silicon Iron pipe and fittings DWV, ASTM A861 and ASTM A518 (for example Duriron Silicon Pipe),
 - c) Other corrosion resistant materials such as Schedule 40 PVC DWV, where no hydrocarbon or solvent wastes are present, and the temperature of the waste does not exceed 50°C (120°F) and Schedule 40 Polypropylene DWV, where temperature of the waste does not exceed 50°C (120°F) may be used upon written approval of the Chairman of Plumbing and Utilities Standards Committee prior to purchase of the material in question.
- 811.5 (Exception) The Contractor shall make and submit to Saudi Aramco proponent a permanent record of all piping and venting carrying chemical wastes.
- 811.7 (Exception) No acid or chemical wastes shall be discharged into the ground or local sewer without approval of the Chairman of Plumbing and Utilities Standards Committee. In remote areas where no sewer or drainage lines are close by, the waste system shall have primed traps and piped to a dry sump. The system shall be vented.
- 811.8 (Addition) Approval of the Chairman of Plumbing and Utilities Standards Committee is required before using this provision.
- 811.9 (Addition)
- a) Battery room drainage system: Battery rooms with acid filled batteries shall have the following requirements.
 - 1) Battery rooms shall be provided with a trapped and vented floor drain to serve eyewash facilities and washdown of electrolyte spills.
 - 2) Spreading of electrolyte spill to other areas shall be prevented.
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- 3) Schedule 40 PVC DWV, RTR pipe in accordance with 01-SAMSS-029, or approved acid resistant pipes are also permitted for battery drain, waste and vent lines.
- b) Chemical laboratories and analyzer rooms shall be provided with trapped and vented, chemical resistant sinks, floor drains and funnels for the collection of chemical wastes.
- c) Except as may be permitted in Section 811.7 of this Code, a neutralization tank is required on all acid drainage systems. The tank shall be made of, or shall be coated with, acid resistant material. The tank shall be sized for the expected waste acid flow and dilution or washdown water. The tank shall be in a readily accessible location, and shall be vented to the outside. The minimum vent size shall be 2 in (63 mm OD). Discharge piping from the neutralization tank need not be acid resistant.

CHAPTER 9 - VENTS

- 903.1.1 (Exception) Refer to Section 313.9 of this Standard.
- 903.1.2 (Exception) PVC DWV piping installations shall be limited to those structures where combustible construction is allowed.
- 905.7 (Addition) Vents from chemical and acid waste systems, including the neutralization tank vent, shall not be connected to any waste venting system except a dedicated system constructed in accordance with Section 811.2 (Exception) of this Code.
- 910.8 (Addition) Wet-vented mobile home park drainage systems are prohibited.

CHAPTER 10 - TRAPS

- 1005.0 Trap Seals (Addition) Traps used in pressurized buildings as described in SAES-K-002, shall have a minimum trap seal of 4 in (110 mm).

CHAPTER 12 - FUEL GAS PIPING

- 1202.9 Service Piping (Exception) The service piping is the pipe carrying gas from discharge end of isolation valve installed on a branch of gas distribution piping network, or other source of gas supply, to the gas piping system inlet or other point of use or distribution on the premises.
- 1202.11 Gas Supplier (Addition) Gas supplier means the department within Saudi Aramco having jurisdiction on the operating and maintenance of
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the gas distribution system including gas piping, service piping and LPG and other gas source facilities.

1204.3.2 (Exception)

- a) Pipe and pipe joints including welds shall not be covered or concealed before the gas piping has passed the testing requirements of this Code.
- b) The test medium shall be air, nitrogen, or carbon dioxide. Oxygen shall never be used.
- c) The test pressure shall not be less than 1-½ times the maximum working pressure, but not less than sixty (60) pounds per square inch (413.4 kPa) for a period of not less than thirty (30) minutes.

1204.4 (Exception)

- a) In the event repairs or additions are made following the pressure test, the affected piping shall be retested.
- b) Tie in connections to appliances may be tested at maximum working pressure.

1204.5 (Addition) In any piping where pyrophoric iron sulfide can form, lines shall be purged with inert gas regardless of length

1205.0,
1206.0 and
1208.0

(Deleted) These sections are not applicable to this Code.

1210.1 (Exception) Use of plastic materials is prohibited for gas distribution above or below ground. ||

1211.5 (Exception)

- a) Refer to Section 313.9(d) of this Standard.
- b) Gas piping installed underground shall have at least 450 mm (18 in) of earth cover or equivalent protection.
- c) Brass pipe shall not be used underground.

1211.7 (Addition) Gas piping exposed exterior location shall be protected from corrosion in accordance with SAES-H-002. ||

- 1211.18 (Addition) The gas pipe serving gas appliances in a school classroom shall be isolated from the gas distribution system by an emergency-type isolation valve, which shall be readily accessible to the instructor. The emergency shutoff shall be in an open recess in the wall and shall be clearly marked "Emergency Gas Shutoff" in Arabic and English.
- 1212.0 (Addition) Unlisted gas appliances are prohibited.
- 1216.1 (Addition) Approved gas pressure regulators shall be installed where the gas supply pressure is higher than that at which the branch supply line or gas utilization equipment is designed to operate, or varies beyond design pressure limits. Such regulators shall be located at approved locations and shall be accessible for servicing. Each regulator shall have a separate vent to the outside.

APPENDICES

Appendices "A" through "L", except where made mandatory by wording within this Code, are advisory only and are not a part of this Code. In the event of a conflict between an IAPMO Installation Standards and a Saudi Aramco Engineering Standard (SAES), the SAES shall prevail.

Revision Summary

28 January 2004 Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with minor changes.