

Engineering Standard

SAES-L-105

30 March 2005

Piping Material Specifications

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Saudi Aramco DeskTop Standards

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1 Scope

1.1 This standard covers the minimum mandatory requirements for the material specifications for piping, valves, and fittings for new piping for use in general, refining, and utility services, whose design is in accordance with either ASME B31.1, B31.3, B31.4, or B31.8 Codes.

1.2 The preamble section of this standard must be attached to the relevant selected piping class(es) for the specific project.

1.3 The standard consists of three parts.

Part I, supplements ASME B31.3 design Code and covers piping used in general hydrocarbon services in locations such as GOSPs, gas plants, pump stations, water treatment and water injection plants, etc., and includes transportation piping (both liquid and gas), and wellhead piping designed to B31.4/B31.8.

Part II supplements ASME B31.3 design Code and covers piping used for hydrocarbon refinery processing.

Part III covers utility piping used for all locations.

1.4 Provided the original specifications meet applicable code requirements and do not pose a safety hazard, materials, wall thickness, ratings, and valves required for maintaining or tie-ins to existing piping in ex-SAMAREC refineries in Jeddah, Riyadh and Yanbu, and Rabigh Refinery may be in accordance with the original specifications.

2 Conflicts and Deviations

2.1 Any conflicts between this standard 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 standard 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 standard shall comply with the latest edition of Saudi Aramco Mandatory Standards and the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

[SAEP-302](#) *Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement*

Saudi Aramco Engineering Standards

[SAES-A-301](#) *Materials Resistant to Sulfide Stress Corrosion Cracking*

[SAES-B-017](#) *Fire Water System Design*

[SAES-L-100](#) *Applicable Codes and Standards for Pressure Piping*

[SAES-L-101](#) *Regulated Vendor List for Pipes, Fittings and Gaskets*

[SAES-L-102](#) *Regulated Vendor List for Valves*

[SAES-L-108](#) *Selection of Valves*

[SAES-L-109](#) *Selection of Flanges, Stud Bolts and Gaskets*

[SAES-L-110](#) *Limitations on Piping Joints*

[SAES-L-130](#) *Materials For Low Temperature Services*

[SAES-L-131](#) *Fracture Control of Line Pipe*

[SAES-L-132](#) *Material Selection for Piping Systems*

[SAES-L-133](#) *Corrosion Protection Requirements for Pipelines/Piping*

[SAES-L-136](#) *Pipe Selection and Restrictions*

[SAES-L-310](#) *Design of Plant Piping*

[SAES-L-410](#) *Design of Pipelines*

[SAES-L-610](#) *Nonmetallic Piping Systems*

[SAES-L-810](#) *Design of Piping on Offshore Structures*

<u>SAES-M-100</u>	<i>Saudi Aramco Building Code</i>
<u>SAES-0-126</u>	<i>Blast Resistant Control Buildings</i>
<u>SAES-S-010</u>	<i>Sanitary Sewers</i>
<u>SAES-S-020</u>	<i>Industrial Drainage and Sewers</i>
<u>SAES-S-030</u>	<i>Storm Water Drainage Systems</i>
<u>SAES-S-050</u>	<i>Wet Sprinkler and Standpipe System Components in Buildings</i>
<u>SAES-S-060</u>	<i>Saudi Aramco Plumbing Code</i>
<u>SAES-W-011</u>	<i>Welding Requirements for On-Plot Piping</i>
<u>SAES-W-012</u>	<i>Welding Requirements for Pipelines</i>

Saudi Aramco Material System Specifications

<u>01-SAMSS-005</u>	<i>Shop Applied, Internal Cement Mortar Lining of Steel Pipe</i>
<u>01-SAMSS-016</u>	<i>Sour, Wet Service Line Pipe</i>
<u>01-SAMSS-029</u>	<i>Unrestrained Gasketed Joint RTR Sewer Pipe and Fittings</i>
<u>01-SAMSS-035</u>	<i>API Line Pipe</i>
<u>01-SAMSS-332</u>	<i>High Frequency Welded Line Pipe, Class B</i>
<u>01-SAMSS-333</u>	<i>High Frequency Welded Line Pipe, Class C</i>
<u>02-SAMSS-001</u>	<i>Piping Components for Low Temperature Service</i>
<u>02-SAMSS-005</u>	<i>Butt Welding Pipe Fittings</i>
<u>02-SAMSS-011</u>	<i>Forged Steel Weld Neck Flanges for Low and Intermediate Temperature Service</i>
<u>04-SAMSS-001</u>	<i>Gate Valves</i>
<u>04-SAMSS-002</u>	<i>Globe Valves</i>
<u>04-SAMSS-003</u>	<i>Additional Requirements for Low Temp. Valves</i>
<u>04-SAMSS-005</u>	<i>Check Valves, Swing Type</i>
<u>04-SAMSS-035</u>	<i>General Requirements for Valves</i>
<u>04-SAMSS-041</u>	<i>Expanding Plug Valves</i>
<u>04-SAMSS-050</u>	<i>Gate Valves, Through Conduit Type, API 6D</i>
<u>04-SAMSS-051</u>	<i>Ball Valves, API 6D</i>

[09-SAMSS-107](#)

Application of Fluoropolymer Coatings to Fasteners

Saudi Aramco Standard Drawings

<i>AB-036865</i>	<i>Isolating Assemblies for carbon steel Raised Face Flanges</i>
<i>AB-036866</i>	<i>Isolating Assembly for Ring Joint Flanges</i>
<i>AC-036484</i>	<i>Carbon steel WN & Blind Flanges, Large Sizes-Class 300 RJ</i>
<i>AD-036630</i>	<i>Installation of Jack Screws for Flanged Joints</i>
<i>AD-036631</i>	<i>Spectacle Plates, Blinds and Spacers for Class 125 Cast Iron Flanges</i>
<i>AD-036633</i>	<i>Spectacle Plates, Blinds and Spacers for carbon steel Class 150 Raised Face Flanges</i>
<i>AD-036636</i>	<i>Spectacle Plates, Blinds and Spacers for carbon steel Class 600 Raised Face Flanges</i>
<i>AD-036731</i>	<i>Spectacle Plates, Blinds and Spacers for Class 250 Raised Face C/I and carbon steel Class 300 RF Flanges</i>
<i>AD-036735</i>	<i>Spectacle Plates, Blinds and Spacers for carbon steel Class 900 Octogonal Ring Joint Flanges</i>
<i>AD-036736</i>	<i>Spectacle Plates, Blinds and Spacers for carbon steel Class 1500 Octogonal Ring Joint Flanges</i>
<i>AE-036175</i>	<i>Details of carbon steel Welding Boss, Threaded Connections</i>
<i>AE-036643</i>	<i>Details of carbon steel Welding Boss, Socket-Weld Connections</i>
<u>AE-036768</u>	<i>External Welding Sleeve for Cement Lined Pipe</i>
<u>AB-036719</u>	<i>Reinforcement of welded Branch Connections</i>

3.2 Industry Codes and Standards

American Petroleum Institute

<i>API 5L</i>	<i>Specification for Line Pipe</i>
<i>API 6A</i>	<i>Specification for Wellhead Equipment</i>
<i>API 590</i>	<i>Steel Line Blanks</i>

<i>API 599</i>	<i>Steel and Ductile Iron Plug Valves</i>
<i>API 600</i>	<i>Steel Gate Valves-Flanged and Butt-Welding Ends</i>
<i>API 602</i>	<i>Compact Steel Gate Valves-Flanged, Threaded, Welding, and Extended-Body Ends</i>
<i>API 607</i>	<i>Fire Test for Soft-Seated Quarter-Turn Valves</i>
<i>API 941</i>	<i>Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants</i>

American Society of Mechanical Engineers

<i>ASME B31.1</i>	<i>Power Piping</i>
<i>ASME B31.3</i>	<i>Process Piping</i>
<i>ASME B31.4</i>	<i>Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols</i>
<i>ASME B31.8</i>	<i>Gas Transmission and Distribution Piping Systems</i>
<i>ASME B16.1</i>	<i>Cast Iron Pipe Flanges and Flanged Fittings</i>
<i>ASME B16.3</i>	<i>Malleable Iron Threaded Fittings</i>
<i>ASME B16.5</i>	<i>Pipe Flanges and Flanged Fittings</i>
<i>ASME B16.9</i>	<i>Factory-Made Wrought Steel Buttwelding Fittings</i>
<i>ASME B16.11</i>	<i>Forged Steel Fittings, Socket-Welding and Threaded</i>
<i>ASME B16.12</i>	<i>Cast Iron Threaded Drainage Fittings</i>
<i>ASME B16.21</i>	<i>Nonmetallic Gaskets for Pipe Flanges</i>
<i>ASME B16.22</i>	<i>Wrought Copper and Copper Alloy Solder Joint Pressure Fittings</i>
<i>ASME B16.28</i>	<i>Wrought Steel Buttwelding Short Radius Elbows and Returns</i>
<i>ASME B16.34</i>	<i>Steel Valves</i>
<i>ASME B16.39</i>	<i>Malleable Iron Threaded Pipe Unions</i>
<i>ASME B16.42</i>	<i>Ductile Iron Pipe Flanges and Flanged Fittings</i>
<i>ASME B16.47</i>	<i>Large Diameter Flanges</i>

American Society for Testing and Materials

<i>ASTM A36</i>	<i>Structural Steel</i>
<i>ASTM A53</i>	<i>Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless</i>
<i>ASTM A74</i>	<i>Cast Iron Soil Pipe and Fittings</i>
<i>ASTM A105</i>	<i>Forgings, Carbon Steel, for Piping Components</i>
<i>ASTM A106</i>	<i>Seamless Carbon Steel Pipe for High Temperature Service</i>
<i>ASTM A126</i>	<i>Gray Iron Castings for Valves, Flanges, and Pipe Fittings</i>
<i>ASTM A182</i>	<i>Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves, and Parts for High Temperature Service</i>
<i>ASTM A193</i>	<i>Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service</i>
<i>ASTM A194</i>	<i>Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High Temperature Service</i>
<i>ASTM A216</i>	<i>Steel Casting, Carbon, Suitable for Fusion Welding for High Temperature Service</i>
<i>ASTM A217</i>	<i>Steel Casting, Martensitic Stainless and Alloy, for Pressure-Containing Parts Suitable for High Temperature Service</i>
<i>ASTM A234</i>	<i>Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures</i>
<i>ASTM A240</i>	<i>Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels</i>
<i>ASTM A269</i>	<i>Seamless and Welded Austenitic Stainless Steel Tubing for General Service</i>
<i>ASTM A307</i>	<i>Carbon Steel Bolts and Studs, 60,000 psi Tensile</i>
<i>ASTM A312</i>	<i>Seamless and Welded Austenitic Stainless Steel Pipe</i>
<i>ASTM A335</i>	<i>Seamless Ferritic Alloy Steel for High-Temperature Service</i>
<i>ASTM A350</i>	<i>Forgings, Carbon and Low-Alloy Steel Requiring Notch Toughness Testing for Piping Components</i>

<i>ASTM A351</i>	<i>Steel Castings, Austenitic, for High-Temperature Service</i>
<i>ASTM A395</i>	<i>Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures</i>
<i>ASTM A403</i>	<i>Wrought Austenitic Stainless Steel Piping Fittings</i>
<i>ASTM A494</i>	<i>Castings, Nickel and Nickel Alloy</i>
<i>ASTM A563</i>	<i>Carbon and Alloy Steel Nuts</i>
<i>ASTM A789/A789M</i>	<i>Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service</i>
<i>ASTM A790/A790M</i>	<i>Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe</i>
<i>ASTM B61</i>	<i>Steam or Valve Bronze Castings</i>
<i>ASTM B62</i>	<i>Composition Bronze or Ounce Metal Castings</i>
<i>ASTM B88</i>	<i>Seamless Copper Water Tube</i>
<i>ASTM B165</i>	<i>Nickel-Copper Alloy Seamless Pipe and Tube</i>
<i>ASTM B169</i>	<i>Aluminum-Bronze Plate, Sheet, Strip, and Rolled Bar (UNS C61400)</i>
<i>ASTM B366</i>	<i>Factory-Made Wrought Nickel-Alloy Welding Fittings</i>
<i>ASTM B407</i>	<i>Nickel-Iron-Chromium Alloy Seamless Pipe and Tube</i>
<i>ASTM B409</i>	<i>Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip</i>
<i>ASTM B462</i>	<i>Forged or Rolled UNS N08020, UNS N08024, UNS N08026, and UNS N08367 Alloy Pipe Fittings, and Valves and Parts for Corrosive High-Temperature Service</i>
<i>ASTM B463</i>	<i>Forged or Rolled UNS N08020, UNS N08024, UNS N08026 Alloy Plate, Sheet, and Strip</i>
<i>ASTM B464</i>	<i>Welded Chromium-Nickel-Iron-Molybdenum-Copper-Columbium Stabilized Alloy (UNS N08020)Pipe</i>
<i>ASTM B466</i>	<i>Seamless Copper-Nickel Pipe and Tube (UNS C70610)</i>
<i>ASTM B467</i>	<i>Welded Copper-Nickel Pipe (UNS C71500)</i>

<i>ASTM B474</i>	<i>Electric Fusion Welded UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Pipe</i>
<i>ASTM B530</i>	<i>Method for Measurement of Coating Thicknesses by Magnetic Method, Electrodeposited Nickel Coatings on Magnetic and Non-Magnetic Substrates</i>
<i>ASTM B564</i>	<i>Nickel Alloy Forgings</i>
<i>ASTM D1784</i>	<i>Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds</i>
<i>ASTM D1785</i>	<i>Poly(Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120</i>
<i>ASTM D2467</i>	<i>Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80</i>
<i>ASTM D2564</i>	<i>Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings</i>
<i>ASTM D2665</i>	<i>Practice for Operating Xenon Arc-Type Light Exposure Apparatus With and Without Water for Exposure of Plastics</i>
<i>ASTM D3034</i>	<i>Type PSM Poly(Vinyl Chloride)(PVC) Sewer Pipe and Fittings</i>
<i>ASTM D3311</i>	<i>Drain, Waste, and Vent (DWV) Plastic Fittings Patterns</i>
<i>ASTM F437</i>	<i>Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80</i>
<i>ASTM F439</i>	<i>Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings</i>
<i>ASTM F441</i>	<i>Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80</i>
<i>ASTM F493</i>	<i>Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings</i>

Chlorine Institute

Chlorine Institute Pamphlet 6

Manufacturers Standardization Society

MSS SP-44 Steel Pipe Line Flanges

MSS SP-83

Steel Pipe Unions, Socket-Welding and Threaded

4 Definitions and Abbreviations

4.1 Definitions

Amine Services: All amine solutions including: MEA, DGA and ADIP.

Caustic Services: All sodium hydroxide solutions.

General Services: Includes piping classes required for GOSP's, WIP's, gas plants, pump stations, water treatment, and water injection plants and refers to both normal fluid services and Category D fluid service as defined in B31.3.

Hydrocarbon Services: Process streams of liquid or gaseous hydrocarbon materials, including two and three phase hydrocarbon materials.

Hydrogen Services: Process streams containing relatively pure hydrogen and component streams containing hydrogen with a partial pressure of 350 Kpa (abs) and higher.

NPS: This means Nominal Pipe Size.

Sour-Wet Services: For definition, refer to [SAES-L-133](#).

Steam Services: All steam and condensate at operating pressures above 100 kPag.

4.2 Abbreviations

The following abbreviations are used in this standard for valve descriptions;-

BB	Bolted Bonnet
BC	Bolted Cover
CS	Carbon Steel
ISNRS	Inside Screw Non-Rising Stem
ISRS	Inside Screw Rising Stem
OS&Y	Outside Screw and Yoke
PSB	Pressure Seal Bonnet
WB	Welded Bonnet
TRIM	Stem, body seating surface, disc and gate seating surface, Backseat, ball, plug, etc., and all other parts in contact with line fluid. Refer to Table 1 for trim designation numbers. Whenever "full" is used, it

means that all parts shall be made from the material specified and not just the surface mating material

HF Hard Faced (Stellite No.6)

Table 1 – Simplified Trim Number Designations

TRIM NO.	BODY SEAT SURFACE MATERIAL	CLOSURE MEMBER SURFACE MATERIAL
1	13 CR	13 CR
2	SS 304	SS 304
3	SS 310	SS 310
4	13 CR Hardened	13 CR Hardened
5	Stellite 6 hardfacing	Stellite 6 hardfacing
5A	NI-CR hardfacing	NI-CR hardfacing
6	13 CR	CU-NI
7	13 CR hardened	13 CR
8	Stellite 6 hardfacing	13 CR
8A	NI-CR hardfacing	13 CR
9	Monel	Monel
10	SS 316	SS 316
11	Monel	NI-CR or Stellite 6 hardfacing
12	SS 316	NI-CR or Stellite 6 hardfacing
13	Alloy 20	Alloy 20
14	Alloy 20	NI-CR or Stellite 6 hardfacing

Notes:

- This table is a simplified version of Table 3 in API 600. It's only purpose is to aid in understanding the trim number designations listed in the Piping Material Classes
- Trim selection and acceptable alternatives are governed by SAES-L-008 and the applicable SAMSS
- When a combination trim is shown (Trim No.'s 6, 7, 8, 8A, 11, 12, or 14), the seating surface materials of the seat and closure member may be interchanged

5 Design

5.1 General

- 5.1.1 All piping shall be designed in accordance with the applicable ASME B31 Code as specified in the individual line classes as supplemented by: [SAES-L-100](#), [SAES-L-109](#), [SAES-L-110](#), [SAES-L-310](#), [SAES-L-410](#), [SAES-L-610](#) and [SAES-L-810](#).

5.1.2 Piping immediately attached to boiler components shall be designed in accordance with ASME Section I, Fig. PG-58.3.1.

5.1.3 Feedwater piping upstream and steam piping downstream of ASME Section I shall be designed in accordance with ASME B31.3. Boiler utility P&ID's shall show these Code breaks.

5.2 Corrosion Allowance

5.2.1 The individual piping classes specify the amount of corrosion allowance included in the pipe wall and fitting schedules.

5.2.1 Where services require additional corrosion allowance they shall be determined based on the criteria specified in [SAES-L-133](#).

5.3 Design Conditions

Design conditions shall be determined in accordance with the applicable ASME B31 Code as supplemented by [SAES-L-100](#), [SAES-L-310](#), [SAES-L-410](#), [SAES-L-610](#), and/or [SAES-L-810](#) as applicable.

5.4 Pipe

5.4.1 Limitations on pipe sizes per the applicable [SAES-L-310](#) or [SAES-L-410](#) shall apply.

The minimum pipe size shall be ½" NPS (Nominal Pipe Size) except tubing and piping used in Category D Fluid, individual instrument leads, pump and compressor auxiliary piping, steam tracing, and for reduction at instruments or other equipment having connections smaller than ½" NPS.

5.4.2 Pipe sizes: 1¼", 2½", 3½" and 5" shall not be used except for connections to equipment requiring these sizes.

5.4.3 Carbon steel piping materials in Part II line classes specify low yield strength materials, such as grade B. For repairs and maintenance when low yield strength materials are not available, high yield strength materials: X42 through X60, as listed in ASME B31.3 may be substituted.

5.4.4 Seamless or submerged-arc, straight or spiral seam-welded pipes shall be used within plant limits for piping designed to the ASME B31.3 code.

5.4.5 Electrical Resistance Welded (ERW) and high frequency induction welded pipe in addition to seamless and welded pipe with straight or

spiral seam are permitted outside process plant limits for piping designed to ASME B31.4 and B31.8 codes.

5.5 Joints, Flanges, and Fittings

5.5.1 The type of joints flanges, and fittings shall be in accordance with the individual piping classes.

5.5.2 Locknuts, street elbows (one end with female threads and the other end with male threads), street tees and reducing elbows are not permitted.

5.5.3 Forged welding outlets conforming to ASME B16.11 fitting pressure class 3000 or 6000 may be used in lieu of SASD's AE-036175 and AE-036643.

5.5.4 Welding neck flanges, blind flanges, spectacle plates, spacers, and jack screws for carbon steel piping shall be in accordance with the SASD's listed in the reference section of this standard.

5.5.5 Plugs shall be round headed type.

5.6 Flange Stud Bolts and Nuts

5.6.1 Stud bolts and nuts shall be purchased in accordance with the specific ASTM number per individual piping class.

5.6.2 For offshore and underground piping, ASTM A193-B7/ASTM A194-2H with ceramic-fluoropolymer coating per [09-SAMSS-107](#) or DURABOLT (by Saudi Conduit Coating Company; Al Khobar, KSA) shall be used.

5.6.3 If DURABOLT is not available, the following alternatives may be used:

- a) corrosion-resistant alloys,
- b) painting the exposed portions of the bolts and sealing the gap between flange faces,
- c) encapsulating the bolted flange connection with heat shrinkable tubing.

5.7 Insulating Gaskets/Kits

5.7.1 For dissimilar metals connections; examples: a stainless steel flange to carbon steel flange, or a Cu-Ni flange to carbon steel flange, the potential for galvanic corrosion shall be determined in consultation with the Materials Engineering Unit of Consulting Services Department.

- 5.7.2 Where potential galvanic corrosion exists, the types of joints are restricted as follows:
- 1) For flanged joints of dissimilar metals, insulating gaskets, stud bolt sleeves and washers such as PIKOTEK, or approved equal.
 - 2) For non-flanged mechanical joints of dissimilar metals, a dielectric union.
 - 3) Welded joints of dissimilar metals are not permitted.

5.7.3 Where potential galvanic corrosion does not exist, standard joints and welds are acceptable, except that welded joints have some additional restrictions as specified in [SAES-W-011](#) and 012.

5.8 Flange Gaskets

5.8.1 The type of gasket shall be selected based on the requirements of [SAES-L-109](#) and this standard.

5.8.2 Spiral-wound gaskets shall be specified with inner rings for vacuum and catalyst services.

5.9 Valves

The types of valves and valve trims to be used are to be in accordance with the individual line classes based on the service conditions and the limitations detailed in [SAES-L-108](#).

5.10 Branch Connection

Branch connections for new construction of metallic piping shall be made in accordance with [SAES-L-110](#).

6 Materials

6.1 General

6.1.1 The piping material specifications (line classes) in this standard are the basic material descriptions for: pipe, valves and fittings which have been selected for specific services.

6.1.2 Alternative carbon steel materials are acceptable provided they meet the requirements of [SAES-L-132](#).

6.1.3 Materials containing asbestos are prohibited.

- 6.1.4 Materials for piping, fittings and valves in hydrogen service shall be selected in accordance with API 941 and within the maximum temperatures specified per individual line class.
 - 6.1.5 Use of Duplex stainless steel shall be limited to water service, containing a maximum of 2 kPa partial pressure H₂S.
 - 6.2 Impact Testing (pipe and fittings)
 - 6.2.1 The requirements for impact testing are to be based on application of materials and in accordance with ASME B31.3, paragraph 323.3.
 - 6.2.2 Impact test may be required per ASME B31.3 Fig. 323.2.2, Curve B for A106 and API Grade B and API 5L X-grade pipe materials normalized or quenched and tempered, having a wall thickness greater than 15 mm at design temperature at minus 18°C and lower.
 - 6.3 Postweld Heat Treatment (pipe and fittings)
 - 6.3.1 Postweld heat treatment (PWHT) shall be specified when required by the applicable Code or for service conditions per this standard.
 - 6.3.2 For carbon steel piping, the following services require PWHT. Note, other process conditions may also require PWHT as determined during project design or as specified by the Materials Engineering Unit (MEU) of Consulting Services Department.
 - 1) All caustic soda solutions at all temperatures.
 - 2) All monethanolamine (MEA) solutions at all temperatures.
 - 3) All diglycol amine (DGA) solutions above 140°C design temperature.
 - 4) All rich amino diisopropanol (ADIP) solutions above 90°C design temperature.
 - 5) All lean ADIP solutions above 60°C design temperature.
 - 6.4 Flanges (loose)

Materials for forged carbon steel weld neck flanges for use from minus 50 to plus 425°C shall conform and purchased to the requirements of this standard and [02-SAMSS-011](#).
 - 6.5 Low-Temperature Components (pipe and fittings)

The materials and purchasing requirements of carbon steel piping components for low-temperature services shall conform to the requirements of this standard
-

and [02-SAMSS-001](#).

6.6 Pipe

The materials and purchasing requirements of API and carbon steel ASTM pipe materials both welded and seamless shall conform to the requirements of this standard and the following SAMSS's:

- 1) [01-SAMSS-016](#) for pipe in sour wet services.
- 2) [01-SAMSS-035](#), for API Line Pipe.
- 3) [SAES-L-130](#), for services with minimum design temperatures between 0°C and -46°C.
- 4) [01-SAMSS-332](#), for API 5L ERW pipe.
- 5) [01-SAMSS-333](#), for API 5L ERW pipe.

6.7 Buttweld Fittings

The materials and purchasing requirements of carbon steel buttweld fittings to: ASTM A234 Grade WPB and MSS SP-75 shall conform to the requirements of this standard and [02-SAMSS-005](#).

6.8 Valves

All valves shall be specified in accordance with the generic descriptions detailed in the individual line classes and the additional requirements of the 04-SAMSS's as applicable.

6.9 Requirements for sour service (valves)

When a particular service is sour, [SAES-A-301](#) shall be specified for all the valves listed in the class.

7 Line Class Designator System

The following system establishes procedures used for identifying new line classes.

Commentary Notes:

1. *The system is based on Process Industry Practices (PIP) to provide a uniform standard consistent with industry practices and specific Saudi Aramco requirements.*
2. *Line designations used on existing piping in ex-SAMAREC refineries in Jeddah, Riyadh and Yanbu, and Rabigh Refinery may be in accordance with the original specifications.*

7.1 Field Definitions and Examples

The base piping line class designator system consists of four alpha-numeric fields containing one or two characters each. Each field describes various features of the piping line class. Exceptions, modification, or additions may be made to the base specification, by adding a numeric character after the fourth field to indicate the changes made. Refer to paragraph 7.1.6.

7.1.1 First Field

The first field defines the pressure rating and consists of one or two numeric characters. Refer to paragraph 7.2.1.

7.1.2 Second Field

The second field defines the pipe material and consists of two alpha characters. Refer to paragraph 7.2.2.

7.1.3 Third Field

The third field defines the corrosion or erosion allowance and consists of one numeric character. Refer to paragraph 7.2.3.

7.1.4 Fourth Field

The fourth field defines the service and consists of one alpha character. Refer to paragraph 7.2.4.

7.1.5 An example of a complete piping line class designator is "3CS1P". This designator specifies an ASME pressure class 300, carbon steel piping system with 1.6 mm corrosion allowance designed for general process service with no changes to the base piping line class material specification.

7.1.6 Modification Suffix

A base individual line class material specification may have modifications/additions by adding a numeric character to the base line class designator.

Example: line class 1CS1P1 is based on 1CS9P. The modification in this case is 1CS1P1 designed to B31.4 and ERW and X65 pipes permitted.

A base individual line class can have more than one modification/addition, e.g. 6CS1P1, 6CS1P2.

7.2 Field Definition Tables

7.2.1 Pressure Rating

Symbol	Nominal Pressure Rating Or Class (ASME B16.5/B16.47 Flange Class)
1	150
3	300
4	400
6	600
9	900
15	1500
25	2500
	(ASME B16.1 Cast Iron Flange Class)
12	125
13	250
	(Specific Rating Designations)
80	Non-pressure
85	Pressure Class 75/150 RF
90	Class 3000, API 6A
95	Class 10000, API 6A

7.2.2 Line Material

Symbol	Material
CA	Impact Tested Carbon Steel
CB	Killed Carbon Steel
CC	Low Carbon Steel
CS	Carbon Steel
CG	Galvanized Carbon Steel
CJ	1-1/4 Cr-1/2 Mo Alloy Steel
CK	2-1/4 Cr-1 Mo Alloy Steel
CL	5 Cr-1/2 Mo Alloy Steel
CM	9 Cr-1 Mo Alloy Steel
BC	Copper Tubing
BD	90-10 Cu-Ni
DC	Cast Iron, Grey
FE	Glass Fiber Reinforced Epoxy
LC	Cement-lined Carbon Steel
LE	Epoxy-lined Carbon Steel
LP	Polypropylene-lined Carbon Steel
NM	Monel 400
NR	Incoloy 800
NT	Carpenter 20 (Alloy 20)
PU	CPVC(Chlorinated PVC)
PV	PVC(PolyVinyl Chloride)
SC	304H Stainless Steel

SD	Type 316/316L Stainless Steel
SJ	321 Stainless Steel
SX	Duplex Stainless Steel

7.2.3 Corrosion Allowance

Symbol	Corrosion Allowance
0	Zero corrosion allowance
1	1.6 mm
2	3.2 mm
3	4.8 mm
4	6.4 mm
9	Corrosion allowance as noted. Refer to SAES-L-033 for specific corrosion protection requirements.

7.2.4 Service

Symbol	Service
A	Acid
C	Caustic
D	Drain/Sewer
H	Hydrogen
P	Process (General Hydrocarbon)
Q	Chlorination Gas (Owner designator)
T	Wellhead Piping (Owner designator)
U	Utility
W	Water (Owner designator)
Y	Chlorine Gas (Owner designator)

7.2.5 Saudi Aramco Service Codes

Saudi Aramco service codes listed below shall be included in conjunction with the line class designators on P&ID's and other drawings.

Example: 6"-FG-123-1CS9P is a 6-inch fuel gas line number 123 and material specification 1CS9P.

Code	Service	Code	Service
A	Air	MO	Mist Oil
AH	Acid Hydrocarbon	N	Nitrogen
AS	Acid Sewer	NG	Natural Gas
BBD	Boiler Blowdown	OS	Oily Sludge
BD	Blowdown	OW	Oily Water
BFW	Boiler Feed Water	OWS	Oily Water Sewer
BS	Bio-Sludge	P	Oil & Oil Products

C	Chemical	PA	Process Air
CA	Caustic	PE	Pond Effluent
CAS	Caustic Sewer	PG	Purge Gas
CAT	Catalyst	PO	Pump Out
CS	Chemical Sewer	PT	Pump Trims
CW	Chilled Water	PW	Process Water
CWR	Cooling Water Return	R	Refrigerants
CWS	Cooling Water Supply	RL	Relief Line
DGA	Diglycolamine	RLC	Cold Relief Line
DFW	Deaerator Feed Water	RLW	Warm Relief Line
DMW	Demineralized Water	RW	Raw Water
DSW	Distilled Water	S	Steam
DT	Duct Trims	SA	Sulfuric Acid
DW	Drinking Water	SC	Steam Condensate
E	Exhaust Steam	SCA	Spent Caustic
EIA	Emergency Instrument Air	SF	Sulfur
FG	Fuel Gas	SO	Seal Oil
FGH	High Pressure Fuel Gas	SOW	Sour Water
FGL	Low Pressure Fuel Gas	SPO	Slop Oil
FLO	Flushing Oil	SR	Sewer (Storm)
FO	Fuel Oil	SW	Salt Water
FW	Fire Water	SWS	Sanitary Sewer
GG	Gart Gas	TPW	Tempered Water
H	Hydrogen	TW	Treated Water
HCL	Hydrochloric Acid	UA	Utility Air
HO	Hydraulic Oil	UW	Utility Water
HSG	Hydrogen Sulfide Gas	VG	Vent Gas
IA	Instrument Air	VT	Vessel Trim
LO	Lube Oil	W	Water
ME	Methanol	WW	Waste Water
600C	600 psig H.P. Condensate		
150C	150 psig M.P. Condensate		
60C	60 psig L.P. Condensate		
15C	15 psig L.P. Condensate		
600S	600 psig H.P. Steam		
150S	150 psig M.P. Steam		
60S	60 psig L.P. Steam		
15S	15 psig L.P. Steam		

8 Material Procurement

- 8.1 Limitation on procurement of pipes, flanges, pipe fittings and gaskets per [SAES-L-101](#) shall apply.
- 8.2 Limitation on procurement of valves per [SAES-L-101](#) shall apply.

9 Line Class Index and Cross-Reference - Part I (General Hydrocarbon)

Table 1 provides the line class index which summarizes: the pressure rating, primary materials, corrosion allowance, and service applications for general services together with a cross-reference between the new and former line class.

Table 1

New Saudi Aramco Line Class	Former Saudi Aramco Line Class	ASME Pressure Class and Flange Facing	Primary Material	Cor. Allow	Design Code Temperature Limits and Service
1CA9P	1L1	150RF	Impact tested Carbon steel	1.6 mm	ASME B31.3 minus 45 to 345°C Low temperature Hydrocarbons NGL, LPG Note (1)
3CA9P	3L1	300RF			
6CA9P	None	600RF			
1CS9P	1A1	150RF	Carbon steel	1.6 mm	ASME B31.3 minus 18 to 345°C Hydrocarbons Boiler feed Water Steam & steam Condensate Air
3CS9P	3A1	300RF			
6CS9P	6A1	600RF			
9CS9P	9A2	900RJ			
15CS9P	15A2	1500RJ			
1SD0P	None	150RF	Stainless st. Type 316/316L	None	ASME B31.3 minus 29 to 205°C Corrosive services Note (3)
3SD0P	None	300RF			
3CA1P1	None	300RF	Impact tested Carbon steel, ERW and X65 are permitted	1.6 mm	ASME B31.4 minus 45 to 345°C Low temperature hydrocarbons NGL, LPG Notes (1) & (2)

Table 1 (Continued)

New Saudi Aramco Line Class	Former Saudi Aramco Line Class	ASME Pressure Class and Flange Facing	Primary Material	Cor. Allow	Design Code Temperature Limits and Service
1CS1P1	1A1B	150RF	Carbon steel ERW and X65 are permitted	1.6 mm	ASME B31.4 minus 18 to 121°C Crude oil Inhibited produced water Treated seawater Note (2)
3CS1P1	3A1B	300RF			
6CS1P1	None	600RF			
15CS1P1	None	1500RJ			
9CS1P2	None	900RJ	Carbon steel ERW and X65 are permitted	1.6 mm	ASME B31.8 minus 18 to 121°C Dry gas Note (2)
25CS1P2	None	2500RJ	Carbon steel ERW and X65 are permitted	1.6 mm	ASME B31.8 minus 18 to 121°C Gas Injection Note (2)
85CS9P	2H1	Class 75 or 150 RF	Carbon steel	Per SAES-L-033	Flare lines, relief valve discharge headers, tank suction lines
90CS1T	None	API 3000RJ	Carbon Steel ERW and X65 are permitted	1.6 mm	ASME B31.4/B31.8 minus 18 to 343°C Wellhead Piping
95CS1T	None	API 10000RJ	Carbon Steel ERW and X-65 are permitted	1.6mm	ASME B31.8 High Pressure minus 18 to 343°C Khuff Gas Wellhead Piping
1SX0W	None	150RF	Duplex stainless steel	None	ASME B31.3/B31.4 0°C to 90°C, Sea Water, Wasia Water, Oily Water, Formation Water containing a maximum of 2 kPa partial pressure H ₂ S

Notes:

- (1) For liquefied butane services below minus 7°C with a pipe wall less than 13 mm, line classes 1CS9P-15CS9P and 1CS1P1-15CS1P1 may be used as alternatives.
- (2) A 1.6 mm corrosion allowance is included in the wall thickness of these line classes based on past experience with treated seawater and dry gas lines on upset conditions.
- (3) Refer to SAES-L-033 for definitions of corrosive services.

Line Class: 1CA9P (Formerly 1L1) Service: Refer to Table 1, Part I Rating Class: 150 RF B16.5 Temperature Limit: -45°C min. Corrosion Allowance: 1.6 mm (1)			Basic Material: Impact Tested C.S. Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A333 Gr. 6 or A671, Grades CC65 or CF65, Class 22 (Supplement S-1)	(1)
	3" to 6"	Sch 40			
	8" and above	Calculate 6.4 mm min. for D/t less than 135			
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	½" - 1½"	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
	2" and above		Buttweld	A420-Gr. WPL6, Seamless, B16.9	(3)
Nipples and Swages	½" - 1½"	Sch 80	Seamless	A333 Gr. 3 or 6	
Unions	½" - 1½"	Class 3000	Socketweld	A350-LF2, MSS SP-83	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
Weldolets	2" and above	Class 3000	Buttweld	A350-LF2, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A350-LF2, B16.5	
	2" and above	Class 150	Weldneck RF		(3) (5)
BOLTING	A320 Gr. L stud bolts, semi-finished heavy pattern, A194 G's 4 or 7 heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, API 602, Trim No.12	
	2" and above	Class 150	RF Flanged	A352-LCB body Wedge type: BB, OS&Y, graphite packing, API 600, Trim No. 12 Thru-Cond.: API 6D, Trim No.12	(4)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 150	RF Flanged	A352-LCB Body, BB, OS&Y, graphite packing, Trim No. 12	

Line Class 1CA9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BC, Trim No. 10	
	2" and above	Class 150	RF Flanged	A352-LCB body, BC, Trim No. 10	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A350-LF2 body, floating ball, RTFE seats, Trim No. 10	(4)
	2" to 4"	Class 150	RF Flanged	A352-LCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(4)
	6" and above	Class 150	RF Flanged	A352-LCB body, trunnion mounted, fire safe, API 6D, Trim No. 10	(4)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A350-LF2 body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
	2" and above	Class 150	RF Flanged	A352-LCB body, API 599, inverted pressure balanced, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 150	Lugged or RF Flanged	A352-LCB body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 3CA9P (Formerly 3L1) Service: Refer to Table 1, Part I Rating Class: 300 RF B16.5 Temperature Limit: -45°C min. Corrosion Allowance: 1.6 mm (1)			Basic Material: Impact Tested C.S. Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A333 Gr. 6 or A671, Grades CC65 or CF65, Class 22 (Supplement S-1)	(1)
	3" to 12"	Sch 40			
	14" and above	Calculate 6.4 mm min. for D/t less than 135			
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	½" – 1½"	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
	2" and above		Buttweld	A420-Gr. WPL6, Seamless, B16.9	(3)
Nipples and Swages	½" – 1½"	Sch 80	Seamless	A333 Gr. 3 or 6	
Unions	½" – 1½"	Class 3000	Socketweld	A350-LF2, MSS SP-83	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
Weldolets	2" and above	Class 300	Buttweld	A350-LF2, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A350-LF2, B16.5	
	2" and above	Class 300	Weldneck RF		(3) (5)
BOLTING	A320 Gr. L stud bolts, semi-finished heavy pattern, A194 Gr. 4 or 7 heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, API 602, Trim No.12	
	2" and above	Class 300	RF Flanged	A352-LCB body Wedge type: BB, OS&Y, graphite packing, API 600, Trim No. 12 Thru-Cond.: BB, API 6D, Trim No.12	(4)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 300	RF Flanged	A352-LCB body, BB, OS&Y, graphite packing, Trim No. 12	

Line Class 3CA9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BC, Trim No. 10	
	2" and above	Class 300	RF Flanged	A352-LCB body, BC, Trim No. 10	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A350-LF2 body, floating ball, RTFE seats, Trim No. 10	(4)
	2" to 4"	Class 300	RF Flanged	A352-LCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(4)
	6" and above	Class 300	RF Flanged	A352-LCB body, trunnion mounted, fire safe, API 6D, Trim No. 10	(4)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A350-LF2 body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
	2" and above	Class 300	RF Flanged	A352-LCB body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 300	Lugged or RF Flanged	A352-LCB body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 6CA9P Service: Refer to Table 1, Part I Rating Class: 600 RF B16.5 Temperature Limit: -45°C min. Corrosion Allowance: 1.6 mm (1)			Basic Material: Impact Tested C.S. Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	10" and under	Sch XS	Seamless or Welded	A333 Gr. 6 or A671, Grades CC65 or CF65, Class 22 (Supplement S-1)	(1)
	12" and above	Calculate 6.4 mm min. for D/t less than 135			
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	½" - 1½"	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
	2" and above		Buttweld	A420-Gr. WPL6, Seamless, B16.9	(3)
Nipples and Swages	½" - 1½"	Sch XS	Seamless	A333 Gr. 3 or 6	
Unions	½" - 1½"	Class 3000	Socketweld	A350-LF2, MSS SP-83	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
Weldolets	2" and above	Class 3000	Buttweld	A350-LF2, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A350-LF2, B16.5	
	2" and above	Class 600	Weldneck RF		(3) (5)
BOLTING	A320 Gr. L stud bolts, semi-finished heavy pattern, A194 Gr. 4 or 7 heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, API 602, Trim No.12	
	2" and above	Class 300	RF Flanged	A352-LCB body Wedge type: BB, OS&Y, graphite packing, API 600, Trim No. 12 Thru-Cond.: BB, API 6D, Trim No.12	(4)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 600	RF Flanged	A352-LCB body, BB, OS&Y, graphite packing, Trim No. 12	

Line Class 6CA9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BC, Trim No. 10	
	2" and above	Class 600	RF Flanged	A352-LCB body, BC, Trim No. 10	
BALL VALVES	1½" and under	Class 600	Socketweld/ Threaded	A350-LF2 body, floating ball, RTFE seats, Trim No. 10	(4)
	2" and above	Class 600	RF Flanged	A352-LCB body, trunnion mounted, fire safe, API 6D, Trim No. 10	(4)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A350-LF2 body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
	2" and above	Class 600	RF Flanged	A352-LCB body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 600	Lugged or RF Flanged	A352-LCB body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 1CS9P (Formerly 1A1) Service: Refer to Table 1, Part I Rating Class: 150 RF B16.5 Temperature Limit: -18 to 345°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2)
	3" to 6"	Sch 40		API 5L Gr. B	(3)
	8" and above	Calculate 6.4 mm min. for D/t less than 135		API 5L Gr. B or X60	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234-Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld		
FLANGES	1½" and under	Class 150	Socketweld RF	A105N, B16.5	
	2" and above	Class 150	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194-Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No.8	
	2" and above	Class 150	RF Flanged	A216-WCB body, Wedge type: BB, OS&Y, graphite packing, API 600, Trim No. 8 Thru-Cond.: API 6D, Trim ENP or SS410	(6) (7)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 1CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC, Trim No. 1	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A105N body, floating ball, RTFE seats, Trim No. 10	(6)
	2" to 4"	Class 150	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(6)
	6" and above	Class 150	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(6)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC Trim SS 316	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 150	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 3CS9P (Formerly 3A1) Service: Refer to Table 1, Part I Rating Class: 300 RF B16.5 Temperature Limit: -18 to 345°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2)
	3" to 6"	Sch 40		API 5L Gr. B	(3)
	8" and above	Calculate 6.4 mm min. for D/t less than 135		API 5L Gr. B or X60	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234-Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194-Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1-1/2" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No.8	
	2" and above	Class 300	RF Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-Cond.: API 6D, Trim ENP or SS410	(6) (7)
GLOBE VALVES	1-1/2" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 3CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim No. 1	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A105N body, floating ball, RTFE seats, Trim No. 10	(6)
	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(6)
	6" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(6) (7)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC Trim SS 316	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 300	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 6CS9P (Formerly 6A1) Service: Refer to Table 1, Part I Rating Class: 600 RF B16.5 Temperature Limit: -18 to 345°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2)
	10" and above	Sch 40 Calculate 6.4 mm min. for D/t less than 135		API 5L Gr. B or X60	(3)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234-Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A105N, B16.5	
	2" and above	Class 600	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194-Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No.8	
	2" and above	Class 600	RF Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-Cond.: API 6D, Trim ENP or SS410	(6) (7)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 6CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC, Trim No. 1	
BALL VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, trunnion mounted, Trim No. 10	(6)
	2" and above	Class 600	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(6) (7)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC Trim SS 316	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 600	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 9CS9P (Formerly 9A2) Service: Refer to Table 1, Part I Rating Class: 900 RJ B16.5 Temperature Limit: -18 to 345°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min.	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2) (3)
	10" and above	Calculate Sch 40 min		API 5L Gr. B or X60	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234-Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Calculate Sch 80 min.	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 900	Weldneck RJ		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194-Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GATE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No.8	
	2" and above	Class 900	RJ Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-Cond.: API 6D, Trim ENP or SS410	(6) (7)
GLOBE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 900	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 9CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 900	RJ Flanged	A216-WCB body, BC, Trim No. 1	
BALL VALVES	2" and above	Class 900	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(6) (7)
PLUG VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC Trim SS 316	
	2" and above	Class 900	RJ Flanged	A216-WCB body, BC lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 15CS9P (Formerly 15A2) Service: Refer to Table 1, Part I Rating Class: 1500 RJ B16.5 Temperature Limit: -18 to 345°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Calculate Sch 160 min.	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2) (3)
	3" and above	Calculate Sch 40 min		API 5L Gr. B or X60	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234-Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Calculate Sch 160 min.	Seamless	A106 Gr. B	
Unions	2" and under	Class 6000		A105N, MSS SP83	
Socklets/ Thredolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 1500	Weldneck RJ		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194-Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GATE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No.8	
	2" and above	Class 1500	RJ Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-Cond.: API 6D, Trim ENP or SS410	(6) (7)
GLOBE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 15CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BC, Trim No. 1	
BALL VALVES	2" and above	Class 1500	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(6) (7)
PLUG VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC Trim SS 316	
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BC lubricated, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 1SDOP Service: Refer to Table 1, Part I Rating Class: 150 RF B16.5 Temperature Limit: -29 to 205°C Corrosion Allowance: 0.0 (1)			Basic Material: Type 316L SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	12" and under	Sch 40S	Seamless	A312-Gr. 316L	(2)
	14" to 24"	Calculate Sch 10S min.	Seamless or EFW	A312-Gr. 316L or A358-Gr. 316L, Class 1	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. F316L, B16.11	(2) (3)
	2" and above		Buttweld	A403-Gr. WP316L, B16.9	(4)
Nipples and Swages	½" to 2"	Sch 40S	Seamless	A312-Gr. 316L	
Unions	½" to 2"	Class 3000	Socketweld	A403-Gr. F316L, MSS SP83	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. F316L, B16.11	(2) (3)
			Buttweld		A182-Gr. F316L, B16.9
Weldolets	2" and above		Buttweld	A182-Gr. F316L, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A182-Gr. F316L, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. F316L, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BB, OS&Y, graphite packing, API 602, Trim No. 12	
	2" and above	Class 150	RF Flanged	A351-CF8M body, BB, OS&Y, graphite packing API 600, Trim No. 12	
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 150	RF Flanged	A351- CF8M body, BB, OS&Y, graphite packing, Trim 12	

Line Class 1SDOP (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BC, Trim No. 10	
	2" and above	Class 150	RF Flanged	A351-Gr. CF8M body, BC, Trim 10	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A182-F316L body, floating ball, RTFE seats, Trim No. 10	(5)
	2" to 4"	Class 150	RF Flanged	A351-CF8M body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(5)
	6" and above	Class 150	RF Flanged	A351-CF8M body, trunnion mounted, fire safe, API 6D, Trim No. 10	(5)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A182-F316L body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 150	RF Flanged	A351-CF8M body, BC, lubricated, inverted pressure balanced, API 599, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 150	Lugged or RF Flanged	A351-CF8M body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) No corrosion allowance is included in the pipe and fitting wall thickness. For service conditions that require a corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Only use type 316 SS for threaded connections.
- (3) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.

Line Class: 3SDOP Service: Refer to Table 1, Part I Rating Class: 300 RF B16.5 Temperature Limit: -29 to 205°C Corrosion Allowance: 0.0 (1)			Basic Material: Type 316L SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	12" and under	Sch 40S	Seamless	A312-Gr. 316L	(2)
	14" to 24"	Calculate Sch 10S min.	Seamless or EFW	A312-Gr. 316L or A358-Gr. 316L, Class 1	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. F316L, B16.11	(2) (3)
	2" and above		Buttweld	A403-Gr. WP316L, B16.9	(4)
Nipples and Swages	½" to 2"	Sch 40S	Seamless	A312-Gr. 316L	
Unions	½" to 2"	Class 3000	Socketweld	A403-Gr. F316L, MSS SP83	
Socoklets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. F316L, B16.11	(2) (3)
	2" and above		Buttweld	A182-Gr. F316L, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. F316L, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. F316L, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BB, OS&Y, graphite packing, API 602, Trim No. 12	
	2" and above	Class 300	RF Flanged	A351-CF8M body, BB, OS&Y, graphite packing API 600, Trim No. 12	
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 300	RF Flanged	A351- CF8M body, BB, OS&Y, graphite packing, Trim 12	

Line Class 3SDOP (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A182-F316L body, BC, Trim No. 10	
	2" and above	Class 300	RF Flanged	A351-Gr. CF8M body, BC, Trim 10	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A182-F316L body, floating ball, RTFE seats, Trim No. 10	(5)
	2" to 4"	Class 300	RF Flanged	A351-CF8M body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(5)
	6" and above	Class 300	RF Flanged	A351-CF8M body, trunnion mounted, fire safe, API 6D, Trim No. 10	(5)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A182-F316L body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 300	RF Flanged	A351-CF8M body, BC, lubricated, inverted pressure balanced, API 599, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 300	Lugged or RF Flanged	A351-CF8M body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) No corrosion allowance is included in the pipe and fitting wall thickness. For service conditions that require a corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Only use type 316 SS for threaded connections.
- (3) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.

Line Class: 3CA1P1 Service: Refer to Table 1, Part I Rating Class: 300 RF B16.5 Temperature Limit: -45°C min. Corrosion Allowance: 1.6 mm (1)			Basic Material: Impact Tested C.S. Code: B31.4 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A333 Gr. 6 or API 5L Gr. B, or X60	(1)
	3" to 12"	Sch 40			
	14" and above	Calculate 6.4 mm min.			
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	½" to 1½"	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
	2" and above		Buttweld	A420-Gr. WPL6, Seamless, B16.9	(3)
Nipples and Swages	½" to 1½"	Sch 80	Seamless	Same as pipe	
Unions	½" to 1½"	Class 3000	Socketweld	A350-LF2, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A350-LF2, B16.11	(2)
Weldolets	2" and above	Class 3000	Buttweld	A350-LF2, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A350-LF2, B16.5	
	2" and above	Class 300	Weldneck RF		(3) (5)
BOLTING	A320 Gr. L stud bolts, semi-finished heavy pattern, A194 Gr's. 4 or 7 heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, API 602, Trim No. 12	
	2" and above	Class 300	RF Flanged	A352-LCB body Wedge type: BB, OS&Y, graphite packing API 600, Trim No. 12 Thru-cond.: BB, API 6D, Trim No. 12	(4)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BB, OS&Y, graphite packing, Trim No. 12	
	2" and above	Class 300	RF Flanged	A352-LCB body, BB, OS&Y, graphite packing, Trim 12	

Line Class 3CA1P1 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A350-LF2 body, BC, Trim No. 10	
	2" and above	Class 300	RF Flanged	A352-LCB body, BC, Trim 10	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A350-LF2 body, floating ball, RTFE seats, Trim No. 10	(4)
	2" to 4"	Class 300	RF Flanged	A352-LF2 body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(4)
	6" and above	Class 300	RF Flanged	A352-LF2 body, trunnion mounted, fire safe, API 6D, Trim No. 10	(4)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A350-LF2 body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
	2" and above	Class 300	RF Flanged	A352-LCB body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
BUTTERFLY VALVES	4" and above	Class 300	Lugged or RF Flanged	A352-LCB body, high performance, fire-safe, API 609 Cat. B, Trim No. 10	

Notes:

- (1) The pipe wall thickness specified are based on a design factor of 0.72 and a corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 1CS1P1 Service: Refer to Table 1, Part I Rating Class: 150 RF B16.5 Temperature Limit: -18 to 121°C min. (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.4 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B, or X60	(1)
	3" to 6"	Sch 40			(2)
	8" and above	Calculate 6.4 mm min. for D/t less than 135			(3)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socklets/ Threadlets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A105N, B16.5	(6)
	2" and above	Class 150	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	Class 150	RF Flanged	A216-WCB body Wedge type: BB, OS&Y, graphite packing API 600, Trim No. 8 Thru-cond.: API 6D, Trim ENP or SS 410	(6) (7)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 1CS1P1 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A105N body, floating ball, RTFE seats, Trim No. 10	(6)
	2" to 4"	Class 150	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(6)
	6" and above	Class 150	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(6) (7)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 150	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 150	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) The pipe wall thickness specified are based on a design factor of 0.72 and a corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 3CS1P1 Service: Refer to Table 1, Part I Rating Class: 300 RF B16.5 Temperature Limit: -18 to 121°C (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.4 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B, or X60	(1)
	3" to 6"	Sch 40			(2)
	8" and above	Calculate 6.4 mm min.			(3)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	Class 300	RF Flanged	A216-WCB body Wedge type: BB, OS&Y, graphite packing API 600, Trim No. 8 Thru-cond.: API 6D, Trim ENP or SS 410	(6) (7)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 3CS1P1 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	1½" and under	Class 300	Socketweld/ Threaded	A105N body, floating ball, RTFE seats, Trim No. 10	(6)
	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No. 10	(6)
	6" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(6) (7)
PLUG VALVES	1½" and under	Class 300	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 300	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 300	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) The pipe wall thickness specified are based on a design factor of 0.72 and a corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 6CS1P1 Service: Refer to Table 1, Part I Rating Class: 600 RF B16.5 Temperature Limit: -18 to 121°C min. (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.4 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 80	Seamless or Welded	A106 Gr. B or API 5L Gr. B, or X60	(1)
	3" to 6"	Sch 40			(2)
	8" and above	Calculate 6.4 mm min.			(3)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A105N, B16.5	
	2" and above	Class 600	Weldneck RF		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	Class 600	RF Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-cond.: API 6D, Trim ENP or SS 410	(6) (7)
GLOBE VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 6CS1P1 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 800	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, trunnion mounted, RTFE seats, Trim No. 10	(6)
	2" and above	Class 600	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(6) (7)
PLUG VALVES	1½" and under	Class 600	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 600	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)
BUTTERFLY VALVES	4" and above	Class 600	Lugged or RF Flanged	A216-WCB body, high performance, fire-safe, API 609 Cat. B, Trim ENP or SS 316	(7)

Notes:

- (1) The pipe wall thickness specified are based on a design factor of 0.72 and a corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 15CS1P1 Service: Refer to Table 1, Part I Rating Class: 1500 RF B16.5 Temperature Limit: -18 to 121°C min. (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.4 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 160	Seamless or Welded	A106 Gr. B or API 5L Gr. B, or X60	(1)
	3" to 6"	Sch 40			(2)
	8" and above	Calculate 6.4 mm min.			(3)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 160	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 6000		A105N, MSS SP83	
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 1500	Weldneck RJ		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GATE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	Class 1500	RF Flanged	A216-WCB body Wedge type: BB, OS&Y, graphite packing API 600, Trim No. 8 Thru-cond.: API 6D, Trim ENP or SS 410	(6) (7)
GLOBE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 1500	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 15CS1P1 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	2" and above	Class 1500	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D Trim ENP or SS 410	(6) (7)
PLUG VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 1500	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) The pipe wall thickness specified are based on a design factor of 0.72 and a corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 9CS1P2 Service: Refer to Table 1, Part I Rating Class: 900 RJ B16.5 Temperature Limit: -18 to 121°C min. (2) Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.8 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min.	Seamless or Welded	A106 Gr. B or API 5L Gr. B, or X60	(1) (2) (3)
	10" and above	Calculate Sch 40 min.			
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Calculate Sch 80 min.	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP83	
Socklets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 900	Weldneck RJ		(5) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GATE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	Class 900	RJ Flanged	A216-WCB body, graphite packing Wedge type: BB, OS&Y, API 600, Trim No. 8 Thru-cond.: API 6D, Trim ENP or SS 410	(6) (7)
GLOBE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	Class 900	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 9CS1P2 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BC, Trim No. 1	
	2" and above	Class 900	RJ Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	2" and above	Class 900	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(6) (7)
PLUG VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, lubricated, inverted pressure balanced, BC, Trim SS 316	
	2" and above	Class 900	RJ Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If seal welding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 25CS1P2 Service: Refer to Table 1, Part I Rating Class: 2500 RJ B16.5 Temperature Limit: -18 to 204°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.8 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Calculate Sch 160 min.	Seamless or Welded	A106 Gr. B or API 5L Gr. B	(1) (2) (3)
	3" and above	Calculate 11.12 mm min.		API 5L Gr. B or X60	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Calculate Sch 160 min.	Seamless	A106 Gr. B	
Unions	-	-	-	-	(6)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(4)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 2500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 2500	Weldneck RJ	A105N, B16.5	(7)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GLOBE VALVES	1½" and under	Class 2500	Socketweld/ Threaded	A105N body, PSB, or WB, OS&Y, Y-pattern, Trim No. 8	
	2" and above	Class 2500	RJ Flanged	A216-WCB body, PSB or WB, OS&Y, Y-packing Trim No. 8	
CHECK VALVES	1½" and under	Class 2500	Socketweld/ Threaded	A105N body, PSB, or WB, Trim No. 8	
	2" and above	Class 2500	RJ Flanged	A216-WCB body, PSB, or WB, Trim No. 8	

Line Class 25CS1P2 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thickness. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Service temperatures and material grade limits shall be in accordance with B31.3, Table A-1.
- (3) Seamless or double-submerged arc welded pipe required.
- (4) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Use flanges.
- (7) Consult Materials Engineering Unit, Consulting Services Department, Saudi Aramco for material selection.

Line Class: 85CS9P (Formerly 2H1) Service: Refer to Table 1, Part III Pressure Rating: Cl.75 RF, ASME B16.47 Series B Temperature Limit: -18 to 149°C Corrosion Allowance: 0 mm			Basic Material: Carbon Steel Design Code: ASME B31.3 Stress Relief: Per ASME B31.3 Examination: Per ASME B31.3 Buttweld Construction: ASME B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and smaller	80		A106/API 5L Gr.B, Seamless or Welded	(1)
	3" - 6"	40			
	8" - 32"	6.4 mm minimum			
	34" - 60"	D/t less than 135			
NIPPLES	1½" and smaller	80		Seamless	
THREADED FITTINGS	1½" and smaller			ASTM A105/ASME B16.11	
Caps		Cl. 3000			
Elbows		Cl. 3000			
Tees		Cl. 3000			
Unions		Cl. 3000		MSS SP-83	
Couplings		Cl. 3000			
Plugs		Cl. 3000		Rd head	
Swaged Nipples		XS		Concentric	
Bosses		Cl. 3000		AE-036175 & AE-036643	
BUTT WELDING FITTINGS	2" thru 4"			ASME B16.9	
Elbows				Standard weight	
Tees					
Caps					
Reducers	26" and larger	Equivalent wall thickness to provide same strength as pipe			
FLANGES Weld Neck Class 150	2" - 24"			Slip-on; RF ASME B16.5	(1)
	26" - 60"			AE-036634	
Class 75	26" - 60"			Slip-on; ASME B6.47 Series B	
Blind Class 150	2" - 24"			RF; ASME B16.5	
	26" - 60"			AE-036634	
Class 75	26" - 48"			RF; ASME B16.47 Ser. B	
	54" - 60"			AE-036696	

Line Class 85CS9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Spectable Blind Class 150 Class 75	2" - 48"			FF, AD-036633	
	26" - 60"			FF, ASME B16.47 Ser. B	
GASKETS	2" - 60"			Spiral wound SS non-asbestos filled	
BOLTING	ASTM A193 B7 bolts/heavy pattern hex nuts A194 2H				
VALVES	Use 1CS9P materials				

Note:

- (1) For temperatures above 50°C, pipe flexibility analysis shall be made to confirm acceptability of slip-on flanges; otherwise use weld neck flanges. Limited to class 75 pressure rating.

Line Class: 90CS1T Service: Refer to Table 1, Part I Rating Class: API 6A, Class 3000 RJ Temperature Limit: -18 to 343°C Corrosion Allowance: (1)			Basic Material: Carbon Steel Code: B31.4 and B31.8 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" and under	Sch 160	Seamless or Welded	API 5L Gr. B, EWR, SAW or seamless	(1)
	2" to 10" (2-1/16" to 11")	Calculate		API 5L Gr. B, or X60	(9)
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(3)
Nipples and Swages	2" and under		Seamless	A106 Gr. B or API 5L Gr. B	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	2" and above	API 3000	Weldneck, RJ	API 3000 Type 6B	(3) (8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 Gr. 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
GATE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	
	2" and above	API 3000	RJ Flanged	Thru-conduit, A216-WCB body, BB, ISNRS, graphite packing, API 6A, Trim ENP or SS 410	(5) (7) (10)
GLOBE VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	API 3000	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 90CS9T (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
CHECK VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105 body, BC, Trim No. 1	
	2" and above	API 3000	RJ Flanged	A216-WCB body, BC, Trim 1	
BALL VALVES	2" and above	API 3000	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6A, Trim ENP or SS 410	(5) (7) (10)
PLUG VALVES	1½" and under	Class 1500	Socketweld/ Threaded	A105 body, lubricated, inverted pressure balanced, API 599, Trim SS 316	
	2" and above	API 3000	RJ Flanged	A216-WCB body, lubricated, inverted pressure balanced, API 599, Trim ENP or SS 410	(7) (10)

Notes:

- (1) The pipe wall thickness shall be calculated based on a design factor of 0.5 and a corrosion allowance of 1.6 mm. For service conditions that require higher corrosion allowances, the wall thickness are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Refer to SAES-L-010 for seal welding requirement of threaded connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class. If sealwelding is required, threaded end valves shall have extended bodies to prevent damage due to welding heat.
- (6) Dimensionally, ASME B16.5 Class 900 flanges can be used to match API-3000 flanges. However, the pressure rating of the flanged joint will be limited to that of ASME Class 900.
- (7) Refer to SAES-L-008 and the applicable SAMSS for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.
- (9) API 6A nominal sizes are in parenthesis.
- (10) When valves will be exposed to well acidizing fluids, trim shall be upgraded to TC, Inconel 625, or SS316. Soft seals, seats, and packing shall be PEEK or TEFZEL.

Line Class: 95CS1T Service: Khuff Gas Wellhead Piping (sour wet) Rating Class: API-6A, Class 10000 RJ Temperature Limit: -18 to 343°C Corrosion Allowance: Note (2)			Basic Material: Carbon Steel Code: ASME B31.8 (1) Stress Relief: Per ASME B31.8 Examination: Per ASME B31.8 Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	¾" thru 1"	Sch.160	Seamless	API 5L, B	(3)
	1½" thru 2" (1-13/16-2-1/16")	XXS		API 5LX, X60	
	3" thru 4" (3-1/8" - 4-1/16")	XXS		Seamless or ERW	
	6" (7-1/16")	1" (min. wall)			
	8" (9")	1.344" (min. wall)			
		10" (11")	1.658" (min. wall)		
FITTINGS					
El's, Tees Reducers, Cross	¾" thru 10"	API-10000	Carbon Steel	Equivalent wall thickness to provide same strength as pipe	(4) (5)
FLANGES					
Weld Neck	2" thru 10"	API-10000, RJ		API 6A Bore to match pipe ID	
Connectors	Sizes to suit pipe and valve			API-6A, Class 10000, Grayloc or equal	
Blind	2" thru 10"	API-10000, RJ		API 6A	
Spec. Blind	2" thru 10"	API-10000, RJ		Special design consult CSD	
BOLTS	All sizes	ASTM A193 B7 stud bolts, with semi-finished, heavy pattern, ASTM A194 Gr. 2H hex nuts.			
GASKETS	2" thru 10"	Octagonal ring per SAES-L-009			
VALVES					(6)
Check, ball	9/16"	API-10000	Special	Autoclave or equivalent	
Globe, needle	9/16"	API-10000	Special	Autoclave or equivalent	
Gate	1-13/16" and above	API-10000	RJ Flanged or Grayloc	Alloy steel body, SS 410 Trim with TC hard facing, Inconel 718 stem, Amine resistant PEEK stem packing, ISNRS, API 6A, PSL 3+	

Line Class 95CS1T (Continued)

Notes:

- (1) The pipe wall thickness shall be calculated in accordance with Appendix K (High Pressure Piping) of ASME B31.3 code.
- (2) The pipe wall thickness shall include a corrosion allowance of 1.6mm. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department of Saudi Aramco.
- (3) Pipe material shall be suitable for sour service.
- (4) Socket welded joints are not acceptable.
- (5) Tubing and fitting must be designed for high pressure service. Butt welded fittings must comply with [02-SAMSS-005](#).
- (6) Valves shall comply with 04-SAMMS-049.
- (7) API 6A nominal sizes are in parenthesis.

Line Class: 1SX0W (1) Service: Refer to Table 1, Part I Rating Class: 150 RF B16.5 Temperature Limit: 0 to 90°C Corrosion Allowance: None			Basic Material: Duplex SS Code: B31.3/B31.4 (2) Stress Relief: Per Code Examination: Per Code Buttweld Construction: Not Applicable		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½" - 1½"	40 S	Seamless Plain End	A-790 UNS S31803	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	½" - 1½"	Class 3000	Socketweld	A-182 Gr. F51	
Nipples and Swages	½" - 1½"	40 S	Seamless Plain End	A-790 UNS S31803	
Unions	½" - 1½"	Class 3000	GJ Integ. Seat	A-182 Gr. F51	
Socketweld/ Threadolets	½" - 1½"	Class 3000	Socketweld	A-182 Gr. F51	
Weldolets	-	-	-	-	(3)
FLANGES	½" - 1½"	Class 150 Sch. 40 S Bore	Socketweld	A-182 Gr. F51	
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer ring, per B16.20.				
GATE VALVES	½" - 1½"	Class 800	Socketweld	A182-F51 body and trim, BB, OS&Y, API 602	
	½" - 1½"	Class 150	RF Flanged	A182-F51 body and trim, BB, OS&Y, API 602	
GLOBE VALVES	½" - 1½"	Class 800	Socketweld	A182-F51 body and trim, BB, OS&Y	
CHECK VALVES	½" - 1½"	Class 800	Socketweld	A182-F51 body and trim, BC	

Notes:

- (1) The line class for duplex stainless steel has been developed only for class 150 rating. Line classes for higher pressure ratings can similarly be developed by specifying appropriate pipe schedule and fittings pressure ratings.
- (2) Duplex stainless steel can be used for both B31.3 and B31.4 piping, inside and outside plant areas.
- (3) Not applicable.

10 Line Class Index and Cross-Reference - Part II (Refinery)

The commonly used material specifications listed below are based on Process Industry Practices (PIP), Ras Tanura Upgrades (RTR, BI-3717) and Samarec standard classes. (Refer to SAMAREC Special Classes and Applicable Engineering Standards for the type of process unit and other special requirements).

Table 1

New Line Class Number	R.T.R. Line Class Number (BI-3717)	SAMAREC Std. Class Number	ASME Press Class	Primary Material/Valve Trim Note (8)	Service Note (1)		
1CA9P	1L1, 1L1A	T1A1	150RF	Impact tested carbon steel/Trim 12	-46°C to +343°C		
3CA9P	3L1A, 3L1N	None	300RF	Note (3)	General hydrocarbons (Low temp.)		
6CA9P	6L1	None	600RF				
3CB2Y	3C1B	None	300RF				
1CC9C4	1C1AT	N/A	150RF	Carbon Steel Grade B/Trim 9	Caustic PWHT Note (2)		
3CC9C4			300RF				
6CC9C4			600RF				
1CC9P	1A1, 1A1A, 1A1B	A1A1, A1B1, B1B1	150RF	Carbon Steel Grade B/Trim 8	-18°C to +343°C - General process - Ammonia, Note (2) - Hydrogen - General hydrocarbons w/ H ₂ - Steam & Boiler feed water		
3CC9P	3A1, 3A1B, 3A1F, 3A1S, 3C1C	A2A1	300RF				
6CC9P	6A1, 6A1D, 6A1S	A4A1 B4B1	600RF				
9CC9P	9A2B	B5A1	900RJ				
15CC9P	15A2B 15C2B	None	1500RJ				
25CC9P	25A2B	None	2500RJ				
1CC9P1	1A1K	N/A	150RF			Carbon Steel Grade B/Trim 8	-18°C to +204°C Fuel Gas, Nitrogen
3CC9P1	3A1K	N/A	300RF				
3CC9P2	3A1R, 3A1V	N/A	300RF	Carbon Steel Grade B/Trim 12	-18°C to +260°C Lean Diglycol Amine Note (2) & PWHT		
6CC9P2	6A1R	N/A	600RF				
1CC9P3	1C1E	N/A	150RF	Carbon Steel Grade B/Trim 13	-18°C to +80°C Hydrocarbon w/ traces of Sulfuric acid		
3CC9P3	3C1E	N/A	300RF				

Table 1 (Continued)

New Line Class Number	R.T.R. Line Class Number (BI-3717)	SAMAREC Std. Class Number	ASME Press Class	Primary Material/Valve Trim Note (8)	Service Note (1)
1CC4P1	1A1HT	None	150RF	Carbon Steel with Steam Jacket/Trim 8	-18°C to +194°C
3CC4P1	3A1HT	None	300RF		Sulfur
1CJ9P	None	E1B1	150RF	1-1/4 Cr-1/2 Mo/Trim 8 Note (5)	-29°C to +595°C
3CJ9P	3A1L, 3A1M, 3A1MT, 3T1DT, 3T2DT	E2A2, E2B1, E2B2, E2B3, E2B4	300RF		- Hydrocarbons w/ H ₂ - Superheated steam & Boiler feed water - Hydrogen
6CJ9P	6A1G, 6A1P, 6T1CT, 6T2E	E4A2, E4B1, E4B2, E4B3	600RF		- Reformer feed
9CJ9P	9A2G	E5B1, E5B2, E5B3, E5B4, E5C1, E5C2, E5C3, E5C4	900RJ		- Ammonia, Note (2) - Caustic wash
15CJ9P	15A2G, 15A2M	E6B2, E6C2	1500RJ		
25CJ9P	25A2G	None	2500RJ		
6CK2H	None	F4B2	600RF		2-1/4Cr-1 Mo/Trim 13
9CK2H	None	F5B2, F5C2	900RJ	- Hydrogen - Hydrogen rich Hydrocarbons	
15CK2H	None	F6B2, F6C2	1500RJ		
25CK2H	None	F7C2	2500RJ		
1CL9P	1T1FT, 1T1JT	H1A2, H1A3, H1A4	150RF	5 Cr-1/2 Mo/Trim 8 Note (5)	-29°C to +645°C
3CL9P	3T1AT, 3T1BT	H2A2, H2A3, H2A4, H2B2, H2B3, H2B4	300RF		- General hydrocarbons
6CL9P	6T1AT, 6T1BT	H4A2, H4A3, H4A4, H4B2, H4B3, H4B4, H4C2, H4C3, H4C4	600RF		
9CL9P	None	N/A	900 RF/RJ		
1CM9P	1A1U, 1T1ET	None	150RF	9 Cr-1 Mo/Trim 8 Note (5)	-29°C to +645°C
3CM9P	3A1U, 3A2C	None	300RF		- General hydrocarbons
6CM9P	6A1U	None	600RF		

Table 1 (Continued)

New Line Class Number	R.T.R. Line Class Number (BI-3717)	SAMAREC Std. Class Number	ASME Press Class	Primary Material/Valve Trim Note (8)	Service Note (1)
3CM9P1	3T1FT	N/A	300RF	9 Cr-1 Mo/Trim 5	-29°C to +454°C - High vel. steam, - Decoking - Vacuum transfer
1LP0P	1C1A	None	150FF	Polypropylene lined carbon steel/ PP Lined	0°C to 93°C Weak acid sewer, above grade (acid concentration less than 30%)
6NM1C	6C1D	None	600RF	Monel/Trim 9	2°C to 399°C Caustic Injection
1NR1Q	1C2A	None	150RJ	Incoloy 800H/ Trim Incoloy 800H	21 kPa @ 510°C Chlorination gas
3NR1Q	3A2B		300RJ		448 kPa @ 649°C Chlorination gas
1NT9A	1C1F	None	150FF	Alloy 20/Trim 13	-18°C to +66°C (1NT9A) -18°C to +82°C (3NT9A) Concentrated H ₂ SO ₄ (≥ 93%) > 50°C safety shield required
3NT9A	3C1F		300FF		
1SC1P	1A1A	None	150RF	304H SS/304H trim	0°C to 677°C
3SC1P	3A2A	None	300RJ		Flue gas
1SD0P	3C1J, 1C1K, 1G1AT	K1A1, L1A1, M1A1, N1A1	150RF	316/316L SS/Trim 12	-29°C to +399°C
3SD0P	3C1H, 3C1K	K2A1, K2B1, M2A1, N2A1	300RF		- General process - Corrosive process - Rich DGA, (high ve/ Flashing), Note (2)
6SD0P	6C1H	K4B1, L4A1	600RF	Note (4)	
9SD0P	None	None	900RF		
15SD0P	None	None	1500RF		
None	None	L5B1	900RF	Note (7)	- Phosphate injection Note (2)
None	None	L6B1, L6C1	1500 RF/RJ		- Concentrated H ₂ SO ₄ (≥ 93%) > 50°C Note (2)
None	None	L7C1	2500RJ		- Lube and seal oil - Nitric acid - Wet carbon dioxide

Table 1 (Continued)

New Line Class Number	R.T.R. Line Class Number (BI-3717)	SAMAREC Std. Class Number	ASME Press Class	Primary Material/Valve Trim Note (8)	Service Note (1)
1SD0P1	1A1P	N/A	150RF	316/316L/Teflon	-29°C to +121°C and 290°C Catalyst loading
3SD0P1	3A1P	N/A	300RF		
6SD0P1	6A	None	600	316 SS Tubing/Trim 12	0°C to 427°C Process/Steam Tracing
None	None	Q1A1	150RF	321 SS/321 SS Trim Note (6)	0°C to 425°C - General Hydrocarbons - H ₂ rich hydrocarbons - Hydrogen - Corrosive Hydrocarbons
3SJ1P	None	Q2A1	300RF		
6SJ1P	6A1J	Q4B1	600RF		
9SJ1P	9A2D	Q5B1, Q5C1	900RJ		
15SJ1P	15C2A	Q6B1, Q6C1	1500RJ		
25SJ1P	25A2K	Q7C1	2500RJ		

Notes:

- (1) Services listed are based on the primary material. Line classes with commonly used corrosion allowance, 1.6 mm and 3.2 mm, are listed (except 1CC4P1 and 3CC4P1). For former referenced line classes, i.e. RT Upgrade and SAMAREC, having a corrosion allowance 4.8 mm and 6.4 mm, calculate pipe wall thicknesses to include the appropriate corrosion allowance.

For vacuum service class 150 (former RT Upgrade line class 1A1FT), calculate pipe wall thickness.

Unless specifically indicated in the individual service or line class, material applications shall be made within the temperature range indicated.
- (2) No copper or copper alloy permitted.
- (3) Refer to the same line class in Part I for material specifications.
- (4) For material standardization purpose, Type 316/316L SS is specified instead of Type 304/304L which is adequate in services such as Nitric acid, wet carbon dioxide. Refer to SAES-L-032 for specific details. Type 304/304L SS may be used in suitable services for new projects. Corrosion allowance may be added to Type 304/304L. Type 316/316L having better corrosion resistance does not require corrosion allowance.
- (5) Refer to detailed line class specification for specific corrosion allowance. For referenced RT Upgrade and Samarec line classes having corrosion allowance 3.2 mm, 4.8 mm and 6.4 mm, calculate pipe wall thicknesses to include the appropriate corrosion allowance.
- (6) Use carbon steel, 316L SS or 2-1/4Cr-1Mo as alternate materials for Samarec line classes Q1A1 and Q2A1, 150 RF and 300 RF for service temperature 29°C to 371°C.
- (7) Use carbon steel as alternate material for Samarec line classes L5B1, L6B1, L6C1 and L6C1, 900 RF through 2500 RJ for service temperature 29°C to 260°C.
- (8) Refer to Table 1 for valve trims and SAES-L-008 for limitations on ENP trim.

Line Class: 3CB2Y Service: Refer to Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 to 150°C Corrosion Allowance: 3.2 mm			Basic Material: Carbon Steel (1) Code: B31.3 (1) Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch 160	Seamless	A106 Gr. B.	(2)
	3" to 8"	XS	Seamless	A106 Gr. B.	
FITTINGS					(2)
El's Tees, Reducers, Caps, Couplings etc.	All		Buttweld	A105N or A350-LF2, B16.11	(3)
Nipples and Swages	-	-	-	-	(2)
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	-	-	-	-	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	All	Class 300	Weldneck, RF	A105N or A350-LF2, B16.5	(3) (6)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20.				
Plug Valves	6" and 8"	Class 300	RF Flanged	A216-WCB body, TFE sleeved non-lubricated, BC, Monel trim, Chlorine Inst. #6.	(5)
Ball Valves	4" and under	Class 300	RF Flanged	A216-WCB body, floating ball, TFE seats and seals, Monel trim, Chlorine Inst. #6.	(5)

Notes:

- (1) Design practices, material selection, and material specifications are to be in accordance with Pamphlet 6 of the Chlorine Institute and B31.3.
- (2) Threaded and socketwelded connections are not permitted, use flanges including connections for: vents, drains, hydrotest, and thermowells.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (6) Refer to SAES-L-009 for flange material selection.

Line Class: 1CC9P Service: Refer to Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: -18 to 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(2)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's Tees, Reducers, Caps, Couplings etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A234-WPB, B16.9	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83 SP-83	
Sockolets/ Threadolets	1½"and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½"and under	Class 150	Socketweld RF	A105N, B16.5	
	2" and above	Class 150	Weldneck RF		(4) (9)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				(6)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	(3)
	1½"and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, API 602, Trim No. 8	(7)
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No. 8	
Globe Valves	1½"and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No. 8	
	2" and above	API 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No. 8	

Line Class 1CC9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.1	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC, Trim No.1	
Ball Valves	1½" and under	Class 300	Socketweld	A105N body, floating ball, RTFE seats, Trim No. 10	(7)
	2" to 4"	Class 150	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.10	(7)
	6" and above	Class 150	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(7) (8)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated, inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 150	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, BC, API 599, Trim ENP or SS 410	(8)
Butterfly Valves	4" and above	Class 150	Lugged or RF Flanged	A216-WCB body, high performance, fire safe, API 609 Cat.B, Trim ENP or SS316	(8)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) (Not used).
- (6) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings.
- (7) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (8) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (9) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC9P Service: Refer to Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 to 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B.	(2)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B.	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11.	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9.	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L Gr. B.	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11.	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9.	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5.	(7)
	2" and above	Class 300	Weldneck RF		(4) (9)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				(8)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	(3)
	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.8	
Globe Valves	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.8	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.8	

Line Class 3CC9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.1	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim No.1	
Ball Valves	1½" and under	Class 300	Socketweld	A105N body, floating ball, RTFE seats, Trim No. 10	(7)
	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.10	(7)
	6" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(8)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated, inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 300	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, BC, API 599, Trim ENP or SS 410	(8)
Butterfly Valves	4" and above	Class300	Lugged or RF Flanged	A216-WCB body, high performance, fire safe, API 609 Cat.B, Trim ENP or SS316	(8)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) (Not used).
- (6) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings.
- (7) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (8) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (9) Refer to SAES-L-009 for flange material selection.

Line Class: 6CC9P Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: -18 To 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(2)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11.	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9.	
FLANGES	1½" and under	Class 600	Socketweld RF	A105N, B16.5.	
	2" and above	Class 600	Weldneck RF		(4) (9)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	(3)
	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.8	
Globe Valves	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.8	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.8	

Line Class 6CC9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.1	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC, Trim No.1	
Ball Valves	1½" and under	Class 600	Socketweld	A105N body, floating ball, RTFE seats, Trim No. 10	(7)
	2" and above	Class 600	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410	(7) (8)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated, inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 600	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, BC, API 599, Trim ENP or SS 410	(8)
Butterfly Valves	4" and above	Class 600	Lugged or RF Flanged	A216-WCB body, high performance, fire safe, API 609 Cat.B, Trim ENP or SS316	(8)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) (Not used).
- (6) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings.
- (7) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (8) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (9) Refer to SAES-L-009 for flange material selection.

Line Class: 9CC9P Service: Refer To Table 1, Part II Rating Class: 900 RJ B16.5 Temperature Limit: -18 To 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B.	(2)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B.	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11.	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9.	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L Gr. B.	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11.	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9.	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5.	
	2" and above	Class 900	Weldneck RJ		(8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
Gate Valves	1½" and under	Class 1500	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	(5)
	2" and above	Class 900	RJ Flanged	A216-WCB body, BB, OS&Y, API 600, Trim No.8	
Globe Valves	1½" and under	Class 1500	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.8	(5)
	2" and above	Class 900	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.8	
Check Valves	1½" and under	Class 1500	Socketweld	A105N body, BC, Trim No.1	
	2" and above	Class 900	RJ Flanged	A216-WCB Body, BC, Trim No.1	

Line Class 9CC9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Ball Valves	2" and above	Class 900	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS410.	(6) (7)
Plug Valves	1½" and under	Class 1500	Socketweld	A105N body, lubricated inverted pressure balanced, BC, Trim 316 SS	(5)
	2" and above	Class 900	RJ Flanged	A216-WCB Body, BC, lubricated inverted pressure balanced, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Double-block valves required for vent and drain connections.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 15CC9P Service: Refer To Table 1, Part II Rating Class: 1500 RJ B16.5 Temperature Limit: -18 To 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B.	(2)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B.	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11.	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9.	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B.	
Unions	2" and under	Class 6000		A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11.	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9.	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A105N, B16.5.	
	2" and above	Class 1500	Weldneck RJ		(8)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
Gate Valves	1½" and under	Class 1500	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.8	(5)
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BB, OS&Y, API 600, Trim No.8	
Globe Valves	1½" and under	Class 1500	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.8	(5)
	2" and above	Class 1500	RJ Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.8	
Check Valves	1½" and under	Class 1500	Socketweld	A105N body, BC, Trim No.1	
	2" and above	Class 1500	RJ Flanged	A216-WCB Body, BC, Trim No.1	

Line Class 15CC9P (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Ball Valves	2" and above	Class 1500	RJ Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410.	(6) (7)
Plug Valves	1½" and under	Class 1500	Socketweld	A105N body, lubricated inverted pressure balanced, BC, Trim 316 SS	(5)
	2" and above	Class 1500	RJ Flanged	A216-WCB Body, BC, lubricated inverted pressure balanced, API 599, Trim ENP or SS 410	(7)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Double-block valves required for vent and drain connections.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (7) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (8) Refer to SAES-L-009 for flange material selection.

Line Class: 25CC9P Service: Refer To Table 1, Part II Rating Class: 2500 RJ B16.5 Temperature Limit: -18 To 345°C (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: Carbon Steel (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	Sch 160	Seamless	A106 Gr. B	(2)
	2" to 12"	Sch. 160	Seamless or Welded	API 5L, Gr. B	
	14" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(5)
Nipples and Swages	2" and under	Sch 160	Seamless	A106 Gr. B	
Unions	-	-		-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 2500	Socketweld RJ	A105N, B16.5	
	2" and above	Class 2500	Weldneck, RJ		(5) (7)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Soft-Iron octagonal ring, per B16.20.				
Globe Valves	1½" and under	Class 2500	Socketweld	A105N body, PSB or WB, OS&Y, Y-pattern, Trim No.8	(6)
	2" and above	Class 2500	RJ Flanged	A216-WCB body, PSB or WB, OS&Y, Y-pattern, Trim No.8	
Check Valves	1½" and under	Class 2500	Socketweld	A105N body, PSB or WB, Trim No.8	
	2" and above	Class 2500	RJ Flanged	A216-WCB body, PSB or WB, Trim No. 8	

Line Class 25CC9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Use flanges.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Use for vent and drain connections.
- (7) Consult Materials Engineering Unit, Consulting Services Department, Saudi Aramco for flange material selection.

Line Class: 1CC9P1 Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: -18 To 205°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	ASTM A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A105N, B16.5	
	2" and above	Class 150	Weldneck RF		(3) (6)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Ball Valves	1½" and under	Class 800	Socketweld	A105N body, floating ball, RTFE seats, Trim No.10	(4)
	2" to 4"	Class 150	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.10	(4)
	4" and above	Class 150	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(4) (5)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 150	RF Flanged	A216-WCB Body, lubricated inverted pressure balanced, BC, API 599, Trim ENP or SS 410	(5)

Line Class 1CC9P1 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (5) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (6) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC9P1 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 To 205°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	ASTM A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF	A105N, B16.5	(3) (6)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Ball Valves	1½" and under	Class 800	Socketweld	A105N body, floating ball, RTFE seats, Trim No.10	(4)
	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.10	(4)
	4" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim ENP or SS 410	(4) (5)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 300	RF Flanged	A216-WCB Body, lubricated inverted pressure balanced, BC, API 599, Trim ENP or SS 410.	(5)

Line Class 3CC9P1 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (5) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (6) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC9P2 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 To 204°C Corrosion Allowance: 1.6 mm (1)			Basic Material: PWHT Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF		(3) (6)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.12	
	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.12	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.12	
Globe Valves	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.12	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.12	

Line Class 3CC9P2 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.10	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim No.10	
Ball Valves	1½" and under	Class 300	Socketweld	A105N body, floating ball, RTFE seats, Trim No. 10	(5)
	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.10	(5)
	6" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim No.10	(5)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated, inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 300	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, BC, API 599, Trim SS 316	
Butterfly Valves	4" and above	Class 300	Lugged or RF Flanged	A216-WCB body, high performance, fire safe, API 609 Cat.B, Trim SS316	

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) (Not used).
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (6) Refer to SAES-L-009 for flange material selection.

Line Class: 6CC9P2 Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: -18 To 260°C Corrosion Allowance: 1.6 mm (1)			Basic Material: PWHT Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(3)
Nipples and Swages	2" and under	Sch 80	Seamless	A106 Gr. B or API 5L Gr. B.	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A105N, B16.5	
	2" and above	Class 600	Weldneck RF		(3) (7)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.12	
	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, API-602, Trim No.12	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.12	
Globe Valves	1½" and under	Class 800	Socketweld	A105N body, BB, OS&Y, graphite packing, Trim No.12	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.12	

Line Class 6CC9P2 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.10	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC, Trim No.10	
Ball Valves	1½" and under	Class 600	Socketweld	A105N body, floating ball, RTFE seats, Trim No. 10	(5)
	2" and above	Class 600	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim No.10	(5)
Plug Valves	1½" and under	Class 600	Socketweld	A105N body, lubricated, inverted pressure balanced, BC, Trim 316 SS	
	2" and above	Class 600	RF Flanged	A216-WCB body, lubricated, inverted pressure balanced, BC, API 599, Trim SS 316	
Butterfly Valves	4" and above	Class 600	Lugged or RF Flanged	A216-WCB body, high performance, fire safe, API 609 Cat.B, Trim SS316	

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) (Not used).
- (5) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (6) Refer to the applicable SAMSS and SAES-L-008 for trim selection.
- (7) Refer to SAES-L-009 for flange material selection.

Line Class: 1CC9P3 Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: -18 To 80°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	ASTM A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A105N, B16.5	
	2" and above	Class 150	Weldneck RF		(3) (5)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 150	RF Flanged	A351-CN7M body, BB, OS&Y, graphite packing, Trim No.13	
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.13	
Globe Valves	1½" and under	Class 150	RF Flanged	A351-CN7M body, BB, OS&Y, graphite packing, Trim No.13	
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.13	
Check Valves	1½" and under	Class 150	RF Flanged	A351-CN7M body, BC, Trim No.13	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC, Trim No.13	

Line Class 1CC9P3 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Ball Valves	2" to 4"	Class 150	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.13	(4)
	6" and above	Class 150	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim No.13	(4)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC9P3 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 To 80°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L, Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Sockolets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF		(3) (5)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 300	RF Flanged	A351-CN7M body, BB, OS&Y, graphite packing, Trim No.13	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, API-600, Trim No.13	
Globe Valves	1½" and under	Class 300	RF Flanged	A351-CN7M body, BB, OS&Y, graphite packing, Trim No.13	
	2" and above	Class 3000	RF Flanged	A216-WCB body, BB, OS&Y, graphite packing, Trim No.13	
Check Valves	1½" and under	Class 300	RF Flanged	A351-CN7M body, BC, Trim No.13	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim No.13	

Line Class 3CC9P3 (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
Ball Valves	2" to 4"	Class 300	RF Flanged	A216-WCB body, floating ball, RTFE seats, fire safe, API 6D, Trim No.13	(4)
	6" and above	Class 300	RF Flanged	A216-WCB body, trunnion mounted, fire safe, API 6D, Trim No.13	(4)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 1CC9C4 Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: -18 To 105°C Corrosion Allowance: 1.6 mm (1)			Basic Material: PWHT Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B	
Unions	2" and under	Class 3000	Socketweld	A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A105N, B16.5	
	2" and above	Class 150	Weldneck RF		(3) (5)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, API-602, Trim No.9	
	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, API-602, Trim No.9	
	2" and above	Class 150	RF Flanged	A216-WCB body, BB, OS&Y, API-600, Trim No.9	
Globe Valves	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, Trim No.9	
	2" and above	Class 150	RF Flanged	A216-WCB Body, BB, OS&Y, Trim No.9	
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.9	
	2" and above	Class 150	RF Flanged	A216-WCB body, BC, Trim No. 9	

Line Class 1CC9C4 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) (Not used).
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC9C4 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 To 105°C Corrosion Allowance: 1.6 mm (1)			Basic Material: PWHT Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API-5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234-WPB, B16.9	(3)
Nipples and Swages	½"-1½"	XS	Seamless	ASTM A106 Gr. B	
Unions	½"-1½"	Class 3000	Socketweld	A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A105N, B16.5	
	2" and above	Class 300	Weldneck RF		(3) (5)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, API-602, Trim No.9	
	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, API-602, Trim No.9	
	2" and above	Class 300	RF Flanged	A216-WCB body, BB, OS&Y, API-600, Trim No.9	
Globe Valves	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, Trim No.9	
	2" and above	Class 150	RF Flanged	A216-WCB Body, BB, OS&Y, Trim No.9	
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.9	
	2" and above	Class 300	RF Flanged	A216-WCB body, BC, Trim No. 9	

Line Class 3CC9C4 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) (Not used).
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 6CC9C4 Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: -18 To 105°C Corrosion Allowance: 1.6 mm (1)			Basic Material: PWHT Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½"-1½"	XS	Seamless	A106 Gr. B	(1)
	2" to 24"	Std. Wall	Seamless or Welded	API 5L, Gr. B	
	26" and larger	Calculate	Welded	API 5L, Gr. B or A671-CC60 Class 32. (Supplement S-1).	
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(2)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(3)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L, Gr. B	
Unions	2" and under	Class 3000		A105N, MSS SP-83.	
Socketlets/ Threadolets	1½" and under	Class 3000	Socketweld/ Threaded	A105N, B16.11	(3)
Weldolets	2" and above		Buttweld	A105N, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A105N, B16.5	
	2" and above	Class 600	Weldneck RF		(3) (5)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A105N body, BB, OS&Y, API-602, Trim No.9	
	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, API-602, Trim No.9	
	2" and above	Class 600	RF Flanged	A216-WCB body, BB, OS&Y, API-600, Trim No.9	
Globe Valves	1½" and under	Class 800	Socketweld	A105N Body, BB, OS&Y, Trim No.9	
	2" and above	Class 600	RF Flanged	A216-WCB Body, BB, OS&Y, Trim No.9	
Check Valves	1½" and under	Class 800	Socketweld	A105N body, BC, Trim No.9	
	2" and above	Class 600	RF Flanged	A216-WCB body, BC, Trim No. 9	

Line Class 6CC9C4 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note, when a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) (Not used).
- (5) Refer to SAES-L-009 for flange material selection.

Line Class: 1CC4P1 Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Design Conditions Inner Pipe; 172 Kpa Inner Pipe For 75 Psig Steam At 195°C Corrosion Allowance: 6.4 mm (1)			Basic Material: Double-Pipe, Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: Special		
Item	Size	Rating Schedule	Type	Specification	Notes
INNER PIPE	2" and under	160	Seamless	A106 Gr. B or API 5L Gr. B.	(1) (2)
	3" to 6"	XS	Seamless or Welded	API 5L, Gr. B	
	8" to 18"	Standard Weight	Seamless or Welded	API 5L, Gr. B.	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WPB, B16.9	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L, Gr. B	
Unions	-	-	-	-	(5)
FLANGES	2" and above	Class 150	Weldneck RF		(4) (7)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings and 304 or 316 SS inner ring, per B16.20.				
Check Valves	2" and above	Class 150	RF Flanged	A216-WCB body, full- steam jacket, BC, Trim No.8	
Plug Valves	2" and above	Class 150	RF Flanged	A216-WCB body, non- lubricated TFE sleeve, BC, partial-steam jacket, API 599	(6)

Notes:

- (1) A corrosion allowance of 3.2 mm may be used for 6" and smaller inner pipe.
- (2) Steam jacket to sized one NPS larger than inner pipe using the same material specification and wall thickness of inner pipe.
- (3) Threaded connections only allowed for caps and plugs.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (7) Refer to SAES-L-009 for flange material selection.

Line Class: 3CC4P1 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: -18 To 194°C Corrosion Allowance: 6.4 mm (1)			Basic Material: Double-Pipe, Carbon Steel Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: Special		
Item	Size	Rating Schedule	Type	Specification	Notes
INNER PIPE	2" and under	XS	Seamless	A106 Gr. B or API 5L Gr. B.	(1) (2)
	3" to 6"	XS	Seamless or Welded	API 5L, Gr. B	
	8" to 18"	Standard Weight	Seamless or Welded	API 5L, Gr. B.	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	½"-1½"	Class 3000	Threaded	A105N, B16.11	(3)
	2" and above		Buttweld	A234-WPB, B16.9	(4)
Nipples and Swages	2" and under	XS	Seamless	A106 Gr. B or API 5L, Gr. B	
Unions	-	-	-	-	(5)
FLANGES	2" and above	Class 300	Weldneck RF		(4) (7)
BOLTING	A193 B7 stud bolts, semi-finished, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings and 304 or 316 SS inner ring, per B16.20.				
Check Valves	2" and above	Class 300	RF Flanged	A216-WCB body, full-steam jacket, BC, Trim No. 8	
Plug Valves	2" and above	Class 300	RF Flanged	A216-WCB body, non-lubricated TFE sleeve, BC, partial-steam jacket, API 599	(6)

Notes:

- (1) A corrosion allowance of 3.2 mm may be used for 6" and smaller inner pipe.
- (2) Steam jacket to sized one NPS larger than inner pipe using the same material specification and wall thickness of inner pipe.
- (3) Threaded connections only allowed for caps and plugs.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Where non-metallic seats, seals, liners etc. are used, the manufacturer's pressure/temperature ratings shall limit the service of this class.
- (7) Refer to SAES-L-009 for flange material selection.

Line Class: 1CJ9P Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 1¼ Cr.-½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P11	(2)
	10" to 24"	Calculate Sch 40 min	Seamless, or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(4)
Nipples and Swages	½" - 2"	Sch 80 min	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(5)
Sockolets/ Thredolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A182-Gr. F11, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. F11, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F11 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 150	RF Flanged	A217-WC6 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, Trim No. 8	
	2" and above	Class 150	RF Flanged	A217-WC6 Body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BC, Trim No. 1	
	2" and above	Class 150	RF Flanged	A217-WC6 Body, BC, Trim No. 1	

Line Class 1CJ9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings. Limited to 550°C in hydrogen service.

Line Class: 3CJ9P Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 1¼ Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P11	(2)
	10" to 16"	Calculate Std min.	Seamless	A335-Gr. P11	(2)
	18" and above	Calculate	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32.	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(5)
Socketlets/ Threadlets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. F11	
	2" and above	Class 300	Weldneck RF	A182-Gr. F11	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F11 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, API 602, Trim No.8	
	2" and above	Class 300	RF Flanged	A217-WC6 body, BB, OS&Y, API-600, Trim No.8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, Trim No.8	
	2" and above	Class 300	RF Flanged	A217-WC6 Body, BB, OS&Y, Trim No.8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BC, Trim No.1	
	2" and above	Class 300	RF Flanged	A217-WC6 Body, BC, Trim No.1	

Line Class 3CJ9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings. Limited to 550°C in hydrogen service.

Line Class: 6CJ9P Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 1¼ Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P11	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F11, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. F11, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F11 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, API 602, Trim No.8	
	2" and above	Class 600	RF Flanged	A217-WC6 body, BB, OS&Y, API-600, Trim No.8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BB, OS&Y, Trim No.8	
	2" and above	Class 600	RF Flanged	A217-WC6 Body, BB, OS&Y, Trim No.8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F11 body, BC, Trim No.1	
	2" and above	Class 600	RF Flanged	A217-WC6 Body, BC, Trim No.1	

Line Class 6CJ9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings. Limited to 550°C in hydrogen service.

Line Class: 9CJ9P Service: Refer To Table 1, Part II Rating Class: 900 RF B16.5 (1) Temperature Limit: 595°C Max.(2) Corrosion Allowance: 1.6 mm (3)			Basic Material: 1¼ Cr. ½ Mo. (2) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P11	(3)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32.	(3)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(5)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(6)
Sockolets/ Thredolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(4)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ or RF	A182-Gr. F11, B16.5	
	2" and above	Class 900	Weldneck RJ or RF	A182-Gr. F11, B16.5	(5)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	For RF: Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C. For RJ: 5Cr-½ Mo Octagonal Ring.				(8)
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BB, OS&Y, API 602, Trim No.8	(7)
	2" and above	Class 900	RF or RJ Flanged	A217-WC6 body, BB, OS&Y, API-600, Trim No.8	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BB, OS&Y, Trim No.8	
	2" and above	Class 900	RF or RJ Flanged	A217-WC6 Body, BB, OS&Y, Trim No.8	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BC, Trim No.1	
	2" and above	Class 900	RF or RJ Flanged	A217-WC6 Body, BC, Trim No.1	

Line Class 9CJ9P (Continued)

Notes:

- (1) Use RJ flanges only when required on equipment.
- (2) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (3) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (4) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Use flanges.
- (7) Double-block valves required for vent and drain connections.
- (8) Spiral-wound gaskets for vacuum and catalyst services also require 316 SS inner rings. Limited to 550°C in hydrogen service.

Line Class: 15CJ9P Service: Refer To Table 1, Part II Rating Class: 1500 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 1¼ Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P11	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(5)
Sockolets/ Thredolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A182-Gr. F11, B16.5	
	2" and above	Class 1500	Weldneck RJ	A182-Gr. F11, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Octagonal ring, 5Cr.-½ Mo.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BB, OS&Y, API 602, Trim No.8	(6)
	2" and above	Class 1500	RJ Flanged	A217-WC6 body, BB, OS&Y, API-600, Trim No.8	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BB, OS&Y, Trim No.8	
	2" and above	Class 1500	RJ Flanged	A217-WC6 Body, BB, OS&Y, Trim No.8	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F11 body, BC, Trim No.1	
	2" and above	Class 1500	RJ Flanged	A217-WC6 Body, BC, Trim No.1	

Line Class 15CJ9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) Double-block valves required for vent and drain connections.

Line Class: 25CJ9P Service: Refer To Table 1, Part II Rating Class: 2500 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 1¼ Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	4" and under	Calculate XXS min.	Seamless	A335-Gr. P11	(2)
	6" to 24"	Calculate Sch 80 min	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 1¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 9000	Socketweld/ Threaded	A182 Gr.F11, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP11, B16.9	(4)
Nipples and Swages	½"-1½"	XXS	Seamless	A335-Gr. P11	
Unions	-	-	-	-	(5)
Socketolets/ Threadolets	1½" and under	Class 9000	Socketweld/ Threaded	A182-Gr. F11, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F11, B16.9	
FLANGES	1½" and under	Class 2500	Socketweld RJ	A182-Gr. F11, B16.5	
	2" and above	Class 2500	Weldneck RJ	A182-Gr. F11, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Octagonal ring, 5Cr.-½ Mo.				
Globe Valves	1½" and under	Class 2500	Socketweld	A182-F11 body, PSB or WB, OS&Y, Y-pattern, Trim No.8	(6)
	2" and above	Class 2500	RJ Flanged	A217-WC6 body, PSB or WB, OS&Y, Y-pattern, Trim No.8	
Check Valves	1½" and under	Class 2500	Socketweld	A182-F11 body, PSB or WB, Trim No.8	
	2" and above	Class 2500	RJ Flanged	A217-WC6 Body, PSB or WB, Trim No.8	

Line Class 25CJ9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) Use for vent and drain connections. Double block required.

Line Class: 6CK2H Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: 595°C Max.(1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 2¼ Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P22	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P22 or A-691 Gr. 2¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F22, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP22, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80	Seamless	A335-Gr. P22	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F22, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F22, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F22, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. F22, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F22 body, BB, OS&Y, API 602, Trim No. 14	(3)
	1½" and under	Class 800	Socketweld	A182-F22 body, BB, OS&Y, API 602, Trim No. 14	
	2" and above	Class 600	RF Flanged	A217-WC9 body, BB, OS&Y, API-600, Trim No. 14	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F22 body, BB, OS&Y, Trim No. 14	
	2" and above	Class 600	RF Flanged	A217-WC9 Body, BB, OS&Y, Trim No. 14	
Check Valves	1½" and under	Class 800	Socketweld	A182-F22 body, BC, Trim No. 13	
	2" and above	Class 600	RF Flanged	A217-WC9 Body, BC, Trim No. 13	

Line Class 6CK2H (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 3.2 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.

Line Class: 9CK2H Service: Refer To Table 1, Part II Rating Class: 900 RF/RJ B16.5 (1) Temperature Limit: 595°C Max. (2) Corrosion Allowance: 3.2 mm (3)			Basic Material: 2¼ Cr. 1 Mo. (2) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P22	(3)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P22 or A-691 Gr. 2¼ Cr. Class 32.	(3)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F22, B16.11	(4)
	2" and above		Buttweld	A234 Gr. WP22, B16.9	(5)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P22	
Unions	-	-	-	-	(6)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F22, B16.11	(4)
Weldolets	2" and above		Buttweld	A182-Gr. F22, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ or RF	A182-Gr. F22, B16.5	
	2" and above	Class 900	Weldneck RJ or RF	A182-Gr. F22, B16.5	(5)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	For RF: Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 595°C. For RJ: 2¼ Cr.-1 Mo. Octagonal Ring.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BB, OS&Y, API 602, Trim No. 14	(7)
	2" and above	Class 900	RF or RJ Flanged	A217-WC9 body, BB, OS&Y, API-600, Trim No. 14	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BB, OS&Y, Trim No. 14	
	2" and above	Class 900	RF or RJ Flanged	A217-WC9 Body, BB, OS&Y, Trim No. 14	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BC, Trim No. 13	
	2" and above	Class 900	RF or RJ Flanged	A217-WC9 Body, BC, Trim No. 13	

Line Class 9CK2H (Continued)

Notes:

- (1) Use RJ flanges only when required on equipment.
- (2) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (3) A corrosion allowance of 3.2 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (4) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Use flanges.
- (7) Double-block valves required for vent and drain connections.

Line Class: 15CK2H Service: Refer To Table 1, Part II Rating Class: 1500 RJ B16.5 Temperature Limit: 595°C Max. (1) Corrosion Allowance: 3.2 mm (2)			Basic Material: 2¼ Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P22	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P22 or A-691 Gr. 2¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A182 Gr.F22, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP22, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P22	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F22, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F22, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A182-Gr. F22, B16.5	
	2" and above	Class 1500	Weldneck RJ	A182-Gr. F22, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Octagonal ring, 2¼ Cr.-1 Mo.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BB, OS&Y, API 602, Trim No. 14	(6)
	2" and above	Class 1500	RJ Flanged	A217-WC9 body, BB, OS&Y, API-600, Trim No. 14	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BB, OS&Y, Trim No. 14	
	2" and above	Class 1500	RJ Flanged	A217-WC9 Body, BB, OS&Y, Trim No. 14	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F22 body, BC, Trim No. 13	
	2" and above	Class 1500	RJ Flanged	A217-WC9 Body, BC, Trim No. 13	

Line Class 15CK2H (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 3.2 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) Double-block valves required for vent and drain connections.

Line Class: 25CK2H Service: Refer To Table 1, Part II Rating Class: 2500 RJ B16.5 Temperature Limit: 595°C Max. (1) Corrosion Allowance: 3.2 mm (2)			Basic Material: 2¼ Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	4" and under	Calculate XXS min.	Seamless	A335-Gr. P22	(2)
	6" to 24"	Calculate Sch 80 min	Seamless or EFW	A335-Gr. P22 or A-691 Gr. 2¼ Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 9000	Socketweld/ Threaded	A182 Gr.F22, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP22, B16.9	(4)
Nipples and Swages	½" - 1½"	XXS	Seamless	A335-Gr. P22	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 9000	Socketweld/ Threaded	A182-Gr. F22, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F22, B16.9	
FLANGES	1½" and under	Class 2500	Socketweld RJ	A182-Gr. F22, B16.5	
	2" and above	Class 2500	Weldneck RJ	A182-Gr. F22, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 595°C.				
GASKETS	Octagonal ring, 2¼ Cr.-1 Mo.				
Globe Valves	1½" and under	Class 2500	Socketweld	A182-F22 body, PSB or WB, OS&Y, Y-pattern, Trim No.14	(6)
	2" and above	Class 2500	RJ Flanged	A217-WC9 body, PSB or WB, OS&Y, Y-pattern, Trim No.14	
Check Valves	1½" and under	Class 2500	Socketweld	A182-F22 body, BC, Trim No.13	
	2" and above	Class 2500	RJ Flanged	A217-WC9 Body, BC, Trim No. 13	

Line Class 25CK2H (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 3.2 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) Double-block valves required for vent and drain connections.

Line Class: 1CL9P Service: Refer To Table 1, Part II Rating Class: 150 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 5 Cr. ½ Mo.(1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P5	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P5 or A-691 Gr. 5 Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F5, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP5, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P5	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F5, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F5, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F5, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. F5, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 150	RF Flanged	A217-C5 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, Trim No.8	
	2" and above	Class 150	RF Flanged	A217-C5 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BC, Trim No. 1	
	2" and above	Class 150	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 1CL9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalysts services require 316 SS inner rings.

Line Class: 3CL9P Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 5 Cr. ½ Mo.(1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P5	(2)
	10" to 16"	Calculate Std min.	Seamless	A335-Gr. P5	(2)
	18" and above	Calculate	Seamless or EFW	A335-Gr. P11 or A-691 Gr. 5 Cr. Class 32.	(2)
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F5, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP5, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P5	
Unions	-	-	-	-	(5)
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F5, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F5, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F5, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. F5, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 300	RF Flanged	A217-C5 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, Trim No.8	
	2" and above	Class 300	RF Flanged	A217-C5 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BC, Trim No. 1	
	2" and above	Class 300	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 3CL9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalysts services require 316 SS inner rings.

Line Class: 6CL9P Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 5 Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P5	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P5 or A-691 Gr. 5 Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F5, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP5, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P5	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F5, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F5, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F5, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. F5, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				(7)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 600	RF Flanged	A217-C5 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, Trim No.8	
	2" and above	Class 600	RF Flanged	A217-C5 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BC, Trim No. 1	
	2" and above	Class 600	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 6CL9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) (Not used).
- (7) Spiral-wound gaskets for vacuum and catalysts services require 316 SS inner rings.

Line Class: 9CL9P Service: Refer To Table 1, Part II Rating Class: 900 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 5 Cr. ½ Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P5	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P5 or A-691 Gr. 5 Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F5, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP5, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P5	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F5, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F5, B16.9	
FLANGES	1½" and under	Class 900	Socketweld RF or RJ	A182-Gr. F5, B16.5	
	2" and above	Class 900	Weldneck RF or RJ	A182-Gr. F5, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				(7)
Gate Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, API 602, Trim No. 8	(6)
	2" and above	Class 900	RF or RJ Flanged	A217-C5 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BB, OS&Y, Trim No. 8	
	2" and above	Class 900	RF or RJ Flanged	A217-C5 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F5 body, BC, Trim No. 1	
	2" and above	Class 900	RF or RJ Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 9CL9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.
- (6) Double-block valves required for vent and drain connections.
- (7) Spiral-wound gaskets for vacuum and catalysts services require 316 SS inner rings.

Line Class: 1CM9P Service: Refer To Table 1, Part II Rating Class: 150 RF ASME B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 9 Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P9	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P9 or A-691 Gr. 9 Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F9, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP9, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P9	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F9, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F9, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F9, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. F9, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 150	RF Flanged	A217-C12 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, Trim No. 8	
	2" and above	Class 150	RF Flanged	A217-C12 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BC, Trim No. 1	
	2" and above	Class 150	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 1CM9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.

Line Class: 3CM9P Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 9 Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P9	(2)
	10" to 16"	Calculate Std min.	Seamless	A335-Gr. P9	(2)
	18" and above	Calculate	Seamless or EFW	A335-Gr. P9 or A-691 Gr. 9 Cr. Class 32.	(2)
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F9, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP9, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80 min	Seamless	A335-Gr. P9	
Unions	-	-	-	-	(5)
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F9, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F9, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. F9, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. F9, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 300	RF Flanged	A217-C12 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, Trim No. 8	
	2" and above	Class 300	RF Flanged	A217-C12 body, BB, OS&Y, Trim No. 8	
Check Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BC, Trim No. 1	
	2" and above	Class 300	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 3CM9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.

Line Class: 6CM9P Service: Refer To Table 1, Part II Rating Class: 600 RF B16.5 Temperature Limit: 645°C Max. (1) Corrosion Allowance: 1.6 mm (2)			Basic Material: 9 Cr. 1 Mo. (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	8" and under	Calculate Sch 80 min	Seamless	A335-Gr. P9	(2)
	10" to 24"	Calculate Sch 40 min	Seamless or EFW	A335-Gr. P9 or A-691 Gr. 9 Cr. Class 32.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F9, B16.11	(3)
	2" and above		Buttweld	A234 Gr. WP9, B16.9	(4)
Nipples and Swages	½"-1½"		Seamless	A335-Gr. P9	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F9, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. F9, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. F9, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. F9, B16.5	(4)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 645°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with 316 SS outer rings, per B16.20 up to 645°C.				
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	(3)
	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, API 602, Trim No. 8	
	2" and above	Class 600	RF Flanged	A217-C12 body, BB, OS&Y, API-600, Trim No. 8	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, Trim No. 8	
	2" and above	Class 600	RF Flanged	A217-Gr. C12 Body, BB, OS&Y, Plug Disc. Trim 8/HFS	
Check Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BC, Trim No. 1	
	2" and above	Class 600	RF Flanged	A217-C5 body, BC, Trim No. 1	

Line Class 6CM9P (Continued)

Notes:

- (1) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.
- (2) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and flanges to be same as pipe.
- (5) Use flanges.

Line Class: 3CM9P1 Service: Refer To Table 1, Part II Rating Class: 300 RF B16.5 Temperature Limit: 454°C Max. Corrosion Allowance: 1.6 mm (1)			Basic Material: 9 Cr. 1 Mo. Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	¾" and under	Sch 160	Seamless	A335-Gr. P9	(1)
	1" to 14"	XS	Seamless or EFW	A335-Gr. P9 or A-691 Gr. 9 Cr. Class 32.	(1)
	16" and above	Calculate XS min	Seamless or EFW		
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182 Gr.F9, B16.11	(2)
	2" and above		Buttweld	A234 Gr. WP9, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 160 min	Seamless	A335-Gr. P9	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. F9, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. F9, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. F9, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. F9, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings and 316 SS inner rings, per B16.20.				(6)
Gate Valves	¾" and under	Class 800	Male SW by Female Threaded	A182-F9 body, BB, OS&Y, API 602, Trim No. 5	(3)
	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, API 602, Trim No. 5	
	2" and above	Class 300	RF Flanged	A217-C12 body, BB, OS&Y, API-600, Trim No. 5	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BB, OS&Y, Trim No. 5	
	2" and above	Class 300	RF Flanged	A217-Gr. C12 Body, BB, OS&Y, Trim No. 5	
Check Valves	1½" and under	Class 800	Socketweld	A182-F9 body, BC, Trim No. 5	
	2" and above	Class 300	RF Flanged	A217-C5 body, BC, Trim No. 5	

Line Class 3CM9P1 (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and flanges to be same as pipe.
- (4) Use flanges.
- (5) (Not used).
- (6) Spiral-wound gaskets for vacuum and catalysts services require 316 SS inner rings.

Line Class: 1LP0P Service: Refer To Table 1, Part II Rating Class: 150 FF ASME B16.5 Temperature Limit: 0 to 93°C Corrosion Allowance: None			Basic Material: Polypropylene-lined CS Code: ASME B31.3 Stress Relief: Per Code Examination: ASME B31.3 Buttweld Construction: None		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1" - 2"	XS	Flanged ends Polypropylene lining	ASTM A587 ASTM F492	(1)
	3" - 8"	40			
FITTINGS Elbows, Tees, Couplings, Reducers	1" - 8"	Class 150	Flanged ends Polypropylene lining	ASTM A216-WCB ASTM F492	
FLANGES Threaded, Reducing, Blind, Spectacle	1" - 8"	Class 150 FF	Polypropylene lining	ASTM A105 ASTM F492 ASTM A-36	
BOLTING	ASTM A193-B7 stud /A194-2H Heavy Hex nuts.				
GASKETS	Full Face, 3.2 mm, Ethylene Propylene rubber.				
Check Valves	1" - 8"	Class 150	FF Flanged	Polypropylene lined, ductile iron ASTM A395 body	
Plug Valves	1" - 8"	Class 150	FF Flanged	Polypropylene lined, ductile iron ASTM A395 body	

Note:

- (1) Welding to Polypropylene-lined pipe (e.g. branch connections, vents and drains) requires special consideration and must be planned during the design phase. Contact the Material Engineering Unit, Consulting Services Department, Saudi Aramco for welding procedures.

Line Class: 6NM1C Service: Refer To Table 1, Part II Rating Class: 600 RF ASME B16.5 Temperature Limit: 400°C Max. Corrosion Allowance: 1.6 mm (1)			Basic Material: Monel-400 Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	4" and under	Sch 40 min.	Seamless	B165 (UNS N04400) Annealed Condition	(1)
	6" to 8"	Sch 80 min.	Seamless	B165 (UNS N04400) Annealed Condition	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	B564, (UNS N04400), B16.11	(2)
	2" and above		Buttweld	B366, WPNC Annealed, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80	Seamless	B165 (UNS N04400) Annealed	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	B564, (UNS N04400), B16.11	(2)
Weldolets	2" and above		Buttweld	B564, (UNS N04400), B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	B564, (UNS N04400), B16.5	
	2" and above	Class 600	Weldneck RF	B564, (UNS N04400), B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, Monel 400 windings, graphite filled with Monel 400 outer and inner rings, per B16.20.				
Gate Valves	1½" and under	Class 600	Socketweld	B494 Gr. M-35-1 Cl. 1 body, BB, OS&Y, API 602, Trim No.9	(5) (6)
	2" and above	Class 600	RF Flanged	B494 Gr. M-35-1 Cl. 1 body, BB, OS&Y, API 600, Trim No.9	(6)
Globe Valves	1½" and under	Class 600	Socketweld	B494 Gr. M-35-1 Cl. 1 body, BB, OS&Y, Trim No. 9/HFS	(6)
	2" and above	Class 600	RF Flanged	B494 Gr. M-35-1 Cl. 1 body, BB, OS&Y, Trim No. 9/HFS	(6)
Check Valves	1½" and under	Class 600	Socketweld	B494 Gr. M-35-1 Cl. 1 body, BC, Trim No. 9	(6)
	2" and above	Class 600	RF Flanged	B494 Gr. M-35-1 Cl. 1 body, BC, Trim No. 9	(6)

Line Class 6NM1C (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) Due to service conditions no copper, brass, or bronze components permitted.

Line Class: 1NR1Q Service: Refer To Table 1, Part II Rating Class: 150 RJ ASME B16.5 Temperature Limit: 510°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Incoloy 800H Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" and under	Sch. 80S min.	Seamless	B407, (UNS N08810)	(1)
	2" to 8"	Sch 10S min.	Seamless	B407, (UNS N08810)	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	B564, (UNS N008810), B16.11	(2)
	2" and above		Buttweld	B366, (UNS N08810), B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	B407, (UNS N08810)	
Unions	-	-	-	-	(4)
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	B564, (UNS N08810), B16.11	(2)
Weldolets	2" and above		Buttweld	B366, (UNS N08810), B16.9	
FLANGES	1½" and under	Class 150	Socketweld RJ	B564, (UNS N08810), B16.5	
	2" and above	Class 150	Weldneck RJ	B564, (UNS N08810), B16.5	(3)
BOLTING	A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts.				
GASKETS	Octagonal ring, Nickel 201, 95 BHN maximum hardness.				
Gate Valves	1½" and under	Class 150	Socketweld	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y, full port, API 602	(5)
	2" and above	Class 150	RJ Flanged	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y, API 600	
Globe Valves	1½" and under	Class 150	Socketweld	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y	
	2" and above	Class 150	RJ Flanged	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y	
Check Valves	1½" and under	Class 150	Socketweld	A351-CT15C or A494-CY-40 body and trim	
	2" and above	Class 150	RJ Flanged	A351-CT15C or A494-CY-40 body and trim	

Line Class 1NR1Q (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.

Line Class: 3NR1Q Service: Refer To Table 1, Part II Rating Class: 300 RJ ASME B16.5 Temperature Limit: 650°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Incoloy 800H Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" and under	Sch. 80S min.	Seamless	B407, (UNS N08810)	(1)
	2" to 30"	Sch 10S min.	Seamless	B407, (UNS N08810)	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	B564, (UNS N008810), B16.11	(2)
	2" and above		Buttweld	B366, (UNS N08810), B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	B407, (UNS N08810)	
Unions	-	-	-	-	(4)
Socketlets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	B564, (UNS N08810), B16.11	(2)
Weldolets	2" and above		Buttweld	B366, (UNS N08810), B16.9	
FLANGES	1½" and under	Class 300	Socketweld RJ	B564, (UNS N08810), B16.5	
	2" and above	Class 300	Weldneck RJ	B564, (UNS N08810), B16.5	(3)
BOLTING	A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts.				
GASKETS	Octagonal ring, Nickel 210, 95 BHN maximum hardness.				
Gate Valves	1½" and under	Class 300	Socketweld	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y, full port, API 602	(5)
	2" and above	Class 300	RJ Flanged	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y, API 600	
Globe Valves	1½" and under	Class 300	Socketweld	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y	
	2" and above	Class 300	RJ Flanged	A351-CT15C or A494-CY-40 body and trim, BB, OS&Y	
Check Valves	1½" and under	Class 300	Socketweld	A351-CT15C or A494-CY-40 body and trim, BC	
	2" and above	Class 300	RJ Flanged	A351-CT15C or A494-CY-40 body and trim, BC	

Line Class 3NR1Q (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.

Line Class: 1NT9A Service: Refer To Table 1, Part II Rating Class: 150 FF ASME B16.5 Temperature Limit: -18 to 66°C Corrosion Allowance: 0.8 mm (1)			Basic Material: Alloy 20 Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" and under	Sch. 40S min.	Seamless	B464, (UNS N08020)	(1)
	2" to 12"	Sch 10S min.	Seamless	B464 or B474, (UNS N08020)	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	B366, (UNS N008020), B16.11	(2)
	2" and above		Buttweld	B366 (UNS N08810), B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	B464, (UNS N08020)	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	B462 (UNS N08020), B16.11	(2)
Weldolets	2" and above		Buttweld	B462 (UNS N08020), B16.9	
FLANGES	1½" and under	Class 300	Socketweld FF	B462 (UNS N08020), B16.5	
	2" and above	Class 300	Weldneck FF	B462 (UNS N08020), B16.5	(3)
BOLTING	A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts.				
GASKETS	Full face, 1.6 mm thick, PTFE/Filler Blend, Garlock's GYLON 3504, or equal.				
Gate Valves	1½" to 12"	Class 150	FF Flanged	A351-CN7M body, BB, OS&Y, Trim No.13	(5)
Globe Valves	1½" to 12"	Class 150	FF Flanged	A351-CN7M body, BB, OS&Y, Trim No.13	
Check Valves	1½" to 12"	Class 150	FF Flanged	A351-CN7M body, BC, Trim No.13	
Ball Valves	1½" to 12"	Class 150	FF Flanged	A351-CN7M body, floating ball, RTFE seats and seals, Trim No.13	

Notes:

- (1) A corrosion allowance of 0.8 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.

Line Class: 3NT9A Service: Refer To Table 1, Part II Rating Class: 300 FF ASME B16.5 Temperature Limit: -18 to 82°C Corrosion Allowance: 0.8 mm (1)			Basic Material: Alloy 20 Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" and under	Sch. 40S min.	Seamless	B464, (UNS N08020)	(1)
	14" and 16"	STD WT.	Seamless	B464 or B474, (UNS N08020)	(1)
	18" and 20"	X.S.	Seamless	B464 or B474, (UNS N08020)	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	B366, (UNS N008020), B16.11	(2)
	2" and above		Buttweld	B366 (UNS N08810), B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	B464, (UNS N08020)	
Unions	-	-	-	-	(4)
Socketlets/ Threadlets	1½" and under	Class 6000	Socketweld/ Threaded	B462 (UNS N08020), B16.11	(2)
Weldolets	2" and above		Buttweld	B462 (UNS N08020), B16.9	
FLANGES	1½" and under	Class 300	Socketweld FF	B462 (UNS N08020), B16.5	
	2" and above	Class 300	Weldneck FF	B462 (UNS N08020), B16.5	(3)
BOLTING	A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts.				
GASKETS	Full face, 1.6 mm thick, PTFE/Filler Blend, Garlock's GYLON 3504, or equal.				
Gate Valves	1½" to 12"	Class 300	FF Flanged	A351-CN7M body, BB, OS&Y, Trim No.13	(5)
Globe Valves	1½" to 12"	Class 300	FF Flanged	A351-CN7M body, BB, OS&Y, Trim No.13	
Check Valves	1½" to 12"	Class 300	FF Flanged	A351-CN7M body, BC, Trim No.13	
Ball Valves	1½" to 12"	Class 300	FF Flanged	A351-CN7M body, floating ball, RTFE seats and seals, Trim No.13	

Notes:

- (1) A corrosion allowance of 0.8 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.

Line Class: 1SC1P Service: Refer To Table 1, Part II Rating Class: 150 RF, B16.5 Temperature Limit: 455°C Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 304 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 304	(1)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 304 Seamless, or A358-Gr. 304, Class 1.	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 304, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP304, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 304	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 304, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 304, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A182-Gr. 304, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. 304, B16.5	(3)
BOLTING	A193 B8M stud bolts, heavy pattern with A194 8MA heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 425°C. Spiral-wound, 321 or 347 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20 up to 455°C.				
Gate Valves	1½" and under	Class 800	Socketweld	A182-F304L body, BB, OS&Y, API 602, Trim No. 2 w/HFS	(5)
	2" and above	Class 150	RF Flanged	A351-CF8 body, BB, OS&Y, Trim No.2 w/HFS	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F304L body, BB, OS&Y, Trim No. 2 w/HFS.	
	2" and above	Class 150	RF Flanged	A351-CF8 body, OS&Y, Trim No. 2 w/HFS.	
Check Valves	1½" and under	Class 800	Socketweld	A182-F304L body, BC, Trim No. 2	
	2" and above	Class 150	RF Flanged	A351-CF8 body, BC, Trim No. 2	

Line Class 1SC1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.

Line Class: 3SC1P Service: Refer To Table 1, Part II Rating Class: 300 RJ, B16.5 Temperature Limit: 680°C (8) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 304H SS (6) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 80S min.	Seamless	A312-Type 304H	(1)
	3" and above.	Calculate Sch 40S min.	Seamless or Welded	A312-Type 304H Seamless, or A358-Gr. 304H, Class 1.	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 304H, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP304H, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	A312-Type 304H	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 304H, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 304H, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RJ	A182-Gr. 304H, B16.5	
	2" and above	Class 300	Weldneck RJ	A182-Gr. 304H, B16.5	(3)
BOLTING	A193 B8M stud bolts, heavy pattern with A194 8MA heavy hex nuts.				
GASKETS	Octagonal ring, 347 SS, 140 BHN max. hardness.				
Gate Valves	1½" and under	Class 600	Socketweld	A182-F304H body, BB, OS&Y, API 602, Trim SS 304H w/HFS	(5)
	2" and above	Class 300	RJ Flanged	A351-CF10 body, BB, OS&Y, Trim SS 304H w/HFS	
Globe Valves	1½" and under	Class 600	Socketweld	A182-F304H body, OS&Y, API 602, Trim SS 304H w/HFS.	
	2" and above	Class 300	RJ Flanged	A351-CF10 body, OS&Y, Trim SS 304H w/HFS	
Check Valves	1½" and under	Class 600	Socketweld	A182-F304H body, BC, Trim SS 304H	
	2" and above	Class 300	RJ Flanged	A351-CF10 body, BC, Trim SS 304H.	

Line Class 3SC1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

Line Class: 1SD0P Service: Refer To Table 1, Part II Rating Class: 150 RF, B16.5 Temperature Limit: 340°C Corrosion Allowance: 0.0 mm (2)			Basic Material: Type 316L SS (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 316L	(2)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 316L Seamless, or A358-Gr. 316L, Class 1.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. 316L, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BB, OS&Y, API 602, Trim No. 12	(6) (7)
	2" and above	Class 150	RF Flanged	A351-CF8M body, BB, OS&Y, Trim No. 12	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F316L body, OS&Y, Trim No. 12	(7)
	2" and above	Class 150	RF Flanged	A351-CF8M body, OS&Y, Trim No. 12	
Check Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BC, Trim No. 12	(7)
	2" and above	Class 150	RF Flanged	A351-CF8M body, BC, Trim No. 12	

Line Class 1SD0P (Continued)

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) For service conditions that require a corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Use ¾" valves for vent and drain connections.
- (7) Due to service conditions no copper, brass, or bronze components permitted.

Line Class: 3SD0P Service: Refer To Table 1, Part II Rating Class: 300 RF, B16.5 Temperature Limit: 340°C Corrosion Allowance: 0.0 mm (2)			Basic Material: Type 316L SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 316L	(2)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 316L Seamless, or A358-Gr. 316L, Class 1.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. 316L, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BB, OS&Y, API 602, Trim No. 12	(6) (7)
	2" and above	Class 300	RF Flanged	A351-CF8M body, BB, OS&Y, Trim No. 12	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F316L body, OS&Y, Trim No. 12	(7)
	2" and above	Class 300	RF Flanged	A351-CF8M body, OS&Y, Trim No. 12	
Check Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BC, Trim No. 12	(7)
	2" and above	Class 300	RF Flanged	A351-CF8M body, BC, Trim No. 12	

Line Class 3SD0P (Continued)

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) For service conditions that require a corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Use ¾" valves for vent and drain connections.
- (7) Due to service conditions no copper, brass, or bronze components permitted.

Line Class: 6SD0P Service: Refer To Table 1, Part II Rating Class: 600 RF, B16.5 Temperature Limit: 340°C Corrosion Allowance: 0.0 mm (2)			Basic Material: Type 316L SS (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 316L	(2)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 316L Seamless, or A358-Gr. 316L, Class 1.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. 316L, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BB, OS&Y, API 602, Trim No. 12	(6) (7)
	2" and above	Class 600	RF Flanged	A351-CF8M body, BB, OS&Y, Trim No. 12	
Globe Valves	1½" and under	Class 800	Socketweld	A182-F316L body, OS&Y, Trim No. 12	(7)
	2" and above	Class 600	RF Flanged	A351-CF8M body, OS&Y, Trim No. 12	
Check Valves	1½" and under	Class 800	Socketweld	A182-F316L body, BC, Trim No. 12	(7)
	2" and above	Class 600	RF Flanged	A351-CF8M body, BC, Trim No. 12	

Line Class 6SD0P (Continued)

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) For service conditions that require a corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Use ¾" valves for vent and drain connections.
- (7) Due to service conditions no copper, brass, or bronze components permitted.

Line Class: 9SD0P Service: Refer To Table 1, Part II Rating Class: 900 RF, B16.5 Temperature Limit: 340°C Corrosion Allowance: 0.0 mm (2)			Basic Material: Type 316L SS (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Calculate Sch. 40S min.	Seamless	A312-Type 316L	(2)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 316L Seamless, or A358-Gr. 316L, Class 1.	(2)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(4)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(3)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 900	Weldneck RF	A182-Gr. 316L, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer rings, per B16.20.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F316L body, BB, OS&Y, Trim No.12	(6) (7)
	2" and above	Class 900	RF Flanged	A351-CF8M body, BB, OS&Y, Trim No. 12	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F316L body, OS&Y, API 602, Trim No.12	(6)
	2" and above	Class 900	RF Flanged	A351-CF8M body, OS&Y, Trim No. 12	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F316L body, BC, Trim No. 10	(6)
	2" and above	Class 900	RF Flanged	A351-CF8M body, BC, Trim No. 10	

Line Class 9SD0P (Continued)

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) For service conditions that require a corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (3) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.
- (6) Due to service conditions no copper, brass, or bronze components permitted.
- (7) Double-block valves required for vent and drain connections.

Line Class: 15SD0P Service: Refer To Table 1, Part II Rating Class: 1500 RF/RJ, B16.5 (1) Temperature Limit: 340°C Corrosion Allowance: 0.0 mm (3)			Basic Material: Type 316L SS (2) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Calculate Sch. 40S min.	Seamless	A312-Type 316L	(3)
	3" and above.	Calculate Sch 10S min.	Seamless or Welded	A312-Type 316L Seamless, or A358-Gr. 316L, Class 1.	(3)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(4)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(5)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(6)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(4)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 1500	Weldneck RF	A182-Gr. 316L, B16.5	(5)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	For RF: Spiral-wound, 316 SS windings, graphite filled with carbon steel outer rings, per B16.20. For RJ: Octagonal ring 347 SS, 140 BHN maximum.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F316L body, BB, OS&Y, API 602, Trim No. 12	(7) (8)
	2" and above	Class 1500	RF Flanged	A351-CF8M body, BB, OS&Y, Trim No. 12	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F316L body, OS&Y, Trim No. 12	(7) (8)
	2" and above	Class 1500	RF Flanged	A351-CF8M body, OS&Y, Trim No. 12	
Check Valves	1½" and under	Class 1500	Socketweld	A12-F316L body, BC, Trim No. 10	(8)
	2" and above	Class 1500	RF Flanged	A351-CF8M body, BC, Trim No. 10	

Line Class 15SD0P (Continued)

Notes:

- (1) Use RJ flanges only when required on equipment.
- (2) Type 316 SS may be used for threaded connections.
- (3) For service conditions that require a corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (4) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (5) Schedule of fittings and weldneck flanges to be same as pipe.
- (6) Use flanges.
- (7) Double-block valves required for vent and drain connections.
- (8) Due to service conditions no copper, brass, or bronze components permitted.

Line Class: 1SD0P1 Service: Refer To Table 1, Part II Rating Class: 150 RF, B16.5 Temperature Limit: 120°C Corrosion Allowance: 0.0 mm			Basic Material: Type 316L SS (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 316L	
	3" and above	Calculate Sch 40S min.	Seamless	A312-Type 316L	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(2) (4)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 150	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 150	Weldneck RF	A182-Gr. 316L, B16.5	
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, graphite filled with carbon steel outer rings, per B16.20.				
Ball Valves	1" to 4"	Class 150	RF Flanged	A351-CF8M body, floating ball, fire safe, RTFE seats, Trim No. 10	

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) For change in direction use 10D minimum bends.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.

Line Class: 3SD0P1 Service: Refer To Table 1, Part II Rating Class: 300 RF, B16.5 Temperature Limit: 290°C Corrosion Allowance: 0.0 mm			Basic Material: Type 316L SS (1) Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 40S min.	Seamless	A312-Type 316L	
	3" and above	Calculate Sch 40S min.	Seamless	A312-Type 316L	
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(2) (4)
	2" and above		Buttweld	A403-Gr. WP316L, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 40S	Seamless	A312-Type 316L	
Unions	-	-	-	-	(5)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 316L, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 316L, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. 316L, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. 316L, B16.5	
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts.				
GASKETS	Spiral-wound, 316 SS windings, graphite filled with carbon steel outer rings, per B16.20.				
Ball Valves	1" to 4"	Class 300	RF Flanged	A351-CF8M body, floating ball, fire safe, RTFE seats, Trim No. 10	

Notes:

- (1) Type 316 SS may be used for threaded connections.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) For change in direction use 10D minimum bends.
- (4) Schedule of fittings and weldneck flanges to be same as pipe.
- (5) Use flanges.

Line Class: 6SD0P1 Service: Process/Steam Tracing Rating Class: 600, ASME B16.5 Temperature Limit: 0 to 427°C Corrosion Allowance: 0.0 mm			Basic Material: 316 SS Code: ASME B31.3 Stress Relief: None Req'd Examination: Per ASME B31.3 Buttweld Construction: Per ASME B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½" - 1"	80S		ASTM A312 Type 316 BE, Smls	(1)
NIPPLES	½" - 1"	80S		TOE, Smls	
FITTINGS Threaded Caps Elbows Tees Unions Plugs Couplings		Class 3000 Class 3000 Class 3000 Class 3000 Class 3000 Class 3000 XS		ASTM A182-F316 ASME B16.11 ASME B16.11 ASME B16.11 MSS Sp-83 Hex. Hd., ASME B16.11 ASME B16.11 TOE, Concentric, ASTM A403-WP316	
TUBE Tube Preinsulated Tube Bundle	3/8" - ½" 3/8" - ½"	.035" .035" .035"		ASTM A269-TP316, Smls 1 or 2 process and 1 tracer	
TUBE FITTINGS	3/8" - ½"			Compression Type, 316SS SWAGelok or approved equal	
VALVES Gate	½" - 1"	Class 800		ASTM A182-F316 body OS&Y, Threaded, Trim 12	

Note:

(1) Use 316 SS for threaded connections and components which do not require welding. Use 316L SS if welding is required.

Line Class: 3SJ1P Service: Refer To Table 1, Part II Rating Class: 300 RF, B16.5 Temperature Limit: 510°C (6) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 321 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 80S min.	Seamless	A312-Type 321	(1)
	3" to 12"	Calculate Sch 40S min.	Seamless or Welded	A312-Type 321 Seamless, or A358-Gr. 321, Class 1.	(1)
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP321, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	A312-Type 321	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 321, B16.9	
FLANGES	1½" and under	Class 300	Socketweld RF	A182-Gr. 321, B16.5	
	2" and above	Class 300	Weldneck RF	A182-Gr. 321, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 510°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 425°C. Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 510°C.				
Gate Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351-CF8C body, BB, OS&Y, API 602, Trim SS 347	(5)
	2" and above	Class 300	RF Flanged	A351-CF8C body, BB, OS&Y, Trim SS 347	
Globe Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
	2" and above	Class 300	RF Flanged	A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
Check Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351- CF8C body, BC, Trim SS 347	
	2" and above	Class 300	RF Flanged	A351-CF8C body, BC, Trim SS 347	

Line Class 3SJ1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

Line Class: 6SJ1P Service: Refer To Table 1, Part II Rating Class: 600 RF, B16.5 Temperature Limit: 510°C (6) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 321 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 80S min.	Seamless	A312-Type 321	(1)
	3" to 12"	Calculate Sch 40S min.	Seamless or Welded	A312-Type 321 Seamless, or A358-Gr. 321, Class 1.	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 3000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP321, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	A312-Type 321	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 321, B16.9	
FLANGES	1½" and under	Class 600	Socketweld RF	A182-Gr. 321, B16.5	
	2" and above	Class 600	Weldneck RF	A182-Gr. 321, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 510°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 425°C. Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 510°C.				
Gate Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351-CF8C body, BB, OS&Y, API 602, Trim SS 347	(5)
	2" and above	Class 600	RF Flanged	A351-CF8C body, BB, OS&Y, Trim SS 347	
Globe Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
	2" and above	Class 600	RF Flanged	A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
Check Valves	1½" and under	Class 600/800	Socketweld	A182-F321 or A351- CF8C body, BC, Trim SS 347	
	2" and above	Class 600	RF Flanged	A351-CF8C body, BC, Trim SS 347	

Line Class 6SJ1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

Line Class: 9SJ1P Service: Refer To Table 1, Part II Rating Class: 900 RJ, B16.5 Temperature Limit: 510°C (6) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 321 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 80S min.	Seamless	A312-Type 321	(1)
	3" to 12"	Calculate Sch 40S min.	Seamless or Welded	A312-Type 321 Seamless, or A358-Gr. 321, Class 1.	(1)
FITTINGS					
El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP321, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 80S	Seamless	A312-Type 321	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 321, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A182-Gr. 321, B16.5	
	2" and above	Class 900	Weldneck RJ	A182-Gr. 321, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 510°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 425°C. Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 510°C.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, BB, OS&Y, API 602, Trim SS 347	(5)
	2" and above	Class 900	RF Flanged	A351-CF8C body, BB, OS&Y, Trim SS 347	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
	2" and above	Class 900	RF Flanged	A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, BC, Trim SS 347	
	2" and above	Class 900	RF Flanged	A351-CF8C body, BC, Trim SS 347	

Line Class 9SJ1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

Line Class: 15SJ1P Service: Refer To Table 1, Part II Rating Class: 1500 RJ, B16.5 Temperature Limit: 510°C (6) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 321 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. 160 min.	Seamless	A312-Type 321	(1)
	3" and above	Calculate Sch 80S min.	Seamless or Welded	A312-Type 321 Seamless, or A358-Gr. 321, Class 1.	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP321, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch 160	Seamless	A312-Type 321	
Unions	-	-	-	-	(4)
Sockolets/ Threadolets	1½" and under	Class 6000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 321, B16.9	
FLANGES	1½" and under	Class 1500	Socketweld RJ	A182-Gr. 321, B16.5	
	2" and above	Class 1500	Weldneck RJ	A182-Gr. 321, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 510°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 425°C. Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 510°C.				
Gate Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, BB, OS&Y, API 602, Trim SS 347	(5)
	2" and above	Class 1500	RJ Flanged	A351-CF8C body, BB, OS&Y, Trim SS 347	
Globe Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
	2" and above	Class 1500	RJ Flanged	A351-CF8C body, OS&Y, Trim SS 347 w/HFS	
Check Valves	1½" and under	Class 1500	Socketweld	A182-F321 or A351-CF8C body, BC, Trim SS 347	
	2" and above	Class 1500	RJ Flanged	A351-CF8C body, BC, Trim SS 347	

Line Class 15SJ1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use ¾" valves for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

Line Class: 25SJ1P Service: Refer To Table 1, Part II Rating Class: 2500 RJ, B16.5 Temperature Limit: 510°C (6) Corrosion Allowance: 1.6 mm (1)			Basic Material: Type 321 SS Code: B31.3 Stress Relief: Per Code Examination: Per Code Buttweld Construction: B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and under	Sch. XXS min.	Seamless	A312-Type 321	(1)
	3" and above	Calculate Sch 160 min.	Seamless or Welded	A312-Type 321 Seamless, or A358-Gr. 321, Class 1.	(1)
FITTINGS El's, Tees Reducers, Caps, Couplings, etc.	1½" and under	Class 9000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
	2" and above		Buttweld	A403-Gr. WP321, Seamless, B16.9	(3)
Nipples and Swages	½"-1½"	Sch XXS	Seamless	A312-Type 321	
Socketlets/ Threadlets	1½" and under	Class 9000	Socketweld/ Threaded	A182-Gr. 321, B16.11	(2)
Weldolets	2" and above		Buttweld	A182-Gr. 321, B16.9	
FLANGES	1½" and under	Class 2500	Socketweld RJ	A182-Gr. 321, B16.5	
	2" and above	Class 2500	Weldneck RJ	A182-Gr. 321, B16.5	(3)
BOLTING	A193 B7 stud bolts, heavy pattern with A194 2H heavy hex nuts up to 425°C. A193 B16 stud bolts, heavy pattern with A194 4 heavy hex nuts up to 510°C.				
GASKETS	Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 425°C. Spiral-wound, 316 SS windings, flexible graphite filled with carbon steel outer and inner rings, per B16.20 up to 510°C.				
Globe Valves	1½" and under	Class 2500	Socketweld	A182-F321 or A351-CF8C body, PSB or WB, OS&Y, Y-Pattern, Trim SS 347 w/HFS	
	2" and above	Class 2500	RJ Flanged	A351-CF8C body, PSB or WB OS&Y, Y-Pattern, Trim SS 347 w/HFS	
Check Valves	1½" and under	Class 2500	Socketweld	A182-F321 or A351-CF8C body, PSB or WB, Y-Pattern, Trim SS 347	
	2" and above	Class 2500	RJ Flanged	A351-CF8C body, PSB or WB, Y-Pattern, Trim SS 347	

Line Class 25SJ1P (Continued)

Notes:

- (1) A corrosion allowance of 1.6 mm is included in the pipe and fitting wall thicknesses. For service conditions that require higher corrosion allowances, the wall thicknesses are to be increased accordingly. Note. When a small decrease in corrosion allowance would permit the use of the nearest minimum pipe schedule, approval must be obtained from the Consulting Services Department, Saudi Aramco.
- (2) Threaded connections only allowed downstream of vents, drains, hydrotest connections, and instrument take-offs. Threaded O'lets only allowed for thermowell and hydrotest connections.
- (3) Schedule of fittings and weldneck flanges to be same as pipe.
- (4) Use flanges.
- (5) Use for vent and drain connections.
- (6) For hydrogen service, refer to API-941 for temperature limits of material at applicable hydrogen partial pressure.

11 Line Class Index and Cross-Reference-Part III (Utility)

The following table provides the line class index which summarizes the pressure rating, primary material, corrosion allowance, and service applications of a given line class (i.e. specification number). It also provides a cross-reference between the new and former line class.

Table 1

New Spec. Number	Former Spec. Number	ASME Press. Class	Primary Material	Corr. Allowance	Service
12CG0U	2D3	125	Galvanized CS, (3" and smaller)/ API 5L Gr. B	None	Non-corrosive low pressure utilities - Air & water, inhibited Refer to paragraph 12.1 for service conditions
12LC0U	2E3A	125/150	Cement-lined Carbon steel	None	Corrosive low pressure utilities Refer to paragraph 12.2 for details and service conditions.
12LE0U	None	125/150	Fusion Bonded Epoxy-Lined CS		
12BD0U	2E1B	125/150	90/10 Cu-Ni		
12PV0U	2E3C	125	PVC/UPVC		
12PU0U	2E3D	125	CPVC		
12FE0U	2E3E	125	RTR per 01-SAMSS-034		
12BC0U	2E3G	125	Copper tube & fittings with soldered or brazed joints		
80DC0D	FA	Non-pressure	Cast iron soil pipe	None	Gravity drains, inside/outside buildings. Refer to paragraph 12.3.
80PV0D	FB	Non-pressure	PVC sewer pattern pipe	None	Gravity drains, outside buildings. Refer to paragraph 12.3.
None	FC		Vitrified clay		No longer used
80FE0D	FD	Non-pressure	RTR per 01-SAMSS-029	None	Gravity-drains, outside buildings. Refer to paragraph 12.3.
80CG0D1	NA	Non-pressure	Galvanized carbon steel	None	Vent piping on oily water sewers and gravity drains. Refer to paragraph 12.4.
80PV0D1	NB	Non-pressure	PVC	None	For drain, waste and vent inside buildings. Refer to paragraph 12.4.

12 Line Class Service Conditions

Service conditions and limitations of each line class of Part III are given below:

- 12.1 The following line class covers piping in non-corrosive utility services, and/or air and water inhibited against corrosion of steel. (Use applicable line classes in paragraph 12.2 for non-inhibited raw water, potable water, and seawater service).
- 12CG0U Class 125 FF Galvanized steel pipe, 3-inch NPS and smaller; API 5L Gr. B, 24-inch NPS and smaller.
- Galvanized pipe, 3-inch NPS and smaller, may be used for dedicated, normally stagnant fire water piping within buildings. See [SAES-M-100](#) and [SAES-S-050](#).
- Carbon steel API 5L Gr. B pipe may be used in non-corrosive utility services, and/or air and water inhibited against corrosion of steel in the temperature range of minus 18° C to plus 100°C and not above 1000 kPa non-shock pressures. API 5L Gr. B pipe may also be used for building gas distribution systems, see [SAES-S-060](#).
- 12.2 The following line classes cover various materials for corrosive water services, some of which may also be used for gravity sewers, as detailed below.
- 12LC0U Cement-lined steel pipe and fittings may be used for any non-acidic water and oily water service in 4-inch NPS or larger, below ground, above ground and in buildings. It is mainly intended for applications where plastic pipe is not permitted.
- 12LE0U Fusion Bonded Epoxy-lined carbon steel piping may be used as alternate materials to cement-lined piping.
- 12BD0U 90/10 Copper Nickel pipe and fittings is normally used only in pipe sizes up to 4-inch NPS. It is used mainly for seawater but may be used for other corrosive water. It is also specified for firewater in plant control buildings per SAES-O-126.
- 12PV0U PVC/UPVC pipe and fittings are used for water services, except for dedicated firewater, up to a temperature of 49°C, normally below ground. SAS 14/15 class 5 pipe for water services outside buildings and ASTM D1785 schedule 80 pipe for inside and outside buildings. Refer to SAES-S-040 and [SAES-S-060](#).
-

- 12PU0U CPVC pipe and fittings are used for hot water service up to 71°C temperature. Other refinery services include sodium hypochlorite, chlorinated water. Refer to SAES-L-032 and [SAES-S-060](#).
- 12FE0U Reinforced thermosetting resin (RTR) pipe and fittings per 01-SAMSS-034 with restrained and unrestrained joints may be used for water services within the given pressure/temperature limits, including buried firewater piping. It may also be used for sanitary sewer, oily water sewer, and other gravity and pressure sewers.
- 12BC0U Copper tube and fittings with soldered or brazed joints are used for small diameter piping from water mains up to and inside buildings, including the utility water inside plant control buildings except the firewater system in control buildings per SAES-O-126. It is also used for refrigerant piping.
- 12.2.1 Connections between 12LC0U and 12BD0U or 12BC0U shall be made with an isolation gasket, such as Pikotek or equal, or a dielectric union to prevent galvanic corrosion. Cathodic protection, if provided, must be on separate circuits for the different materials. Care must be taken to assure that the isolated joint is not short-circuited by pipe supports.
- 12.2.2 Connections between cement-lined steel pipe and the same size Copper-Nickel pipe shall be made with an isolated, flanged joint in accordance with Standard Drawing AB-036865. The raised face of the cement-lined steel flange shall be machined off to accommodate the connection to the flat-faced Copper-Nickel flange.
- 12.2.3 Connections between a larger cement-lined steel header and Copper-Nickel pipe shall be accomplished with special cement-lined, flanged tees with a 4-inch minimum size branch. The flanged branch connection to the Copper-Nickel pipe shall be isolated in accordance with Standard Drawing AB-036865. A Copper-Nickel reducer may then be incorporated to obtain the desired pipe size. Welding bosses shall not be used.
- 12.3 The following line classes cover materials normally recommended for gravity-drained systems outside buildings (see exceptions for 80DC0D). For plumbing drainage, waste and vent piping inside buildings refer to line classes in paragraph 12.4.
- 80DC0D Cast iron soil pipe and fittings (for oily water and storm sewers: inside and outside buildings, for sanitary sewer: inside buildings only)
-

80PV0D PVC sewer pattern pipe and fittings, see [SAES-S-010](#) and [SAES-S-030](#).

80FE0D Reinforced thermosetting resin pipe and fittings per [01-SAMSS-029](#), for gravity flow sanitary system.

12.3.1 Hydrocarbon waste shall not be discharged into sanitary sewer system or storm water system, inside or outside plant areas.

12.3.2 Spent acid sewers may use specifications 80PV0D and 80FE0D, provided that the concentration and temperature of the acid waste does not exceed the recommended service limitations for the materials used. Neutralized acid wastes may use any of the materials listed above. For acidic discharges, refer to specifications in [SAES-S-060](#) for materials of construction.

12.3.3 For additional information on plastic pipe selection, refer to SAES-L-060.

12.4 The following line classes cover materials for storm drain piping and for sanitary drain, waste, and vent piping of building plumbing systems. Cast iron soil pipe, 80DC0D, may also be used for sanitary system inside buildings, oily water and storm sewers.

80CG0D1 Galvanized steel pipe with galvanized malleable iron fittings for vent piping above grade, and cast iron drainage pattern fittings for drain and waste piping.

80PV0D1 ASTM D2665 PVC pipe and D3311 pattern fittings for drain, waste, and vent piping, for building plumbing.

For drain and vent piping in laboratory and battery rooms, see [SAES-S-060](#).

Line Class: 12CG0U (Formerly 2D3) Service: Refer to Table 1, Part III Rating Class: 125 FF, ASME B16.1 Temperature Limit: 0 to 100°C Corrosion Allowance: 0 mm			Basic Material: Galvanized/Carbon Steel Design Code: Note (4) Stress Relief: Not Required Examination: Per Applicable Code Buttweld Construction: Note (2)		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE				ASTM A53 or API 5L	(1) (2)
	3" and smaller	40	Smls, threaded	Gr. B Galvanized	
	4" and 6"	40	Smls or ERW	API 5L Gr. B	
	8" - 24"	0.25 in. min.	Smls or ERW	API 5L Gr. B	
NIPPLES	3" and smaller	40	Seamless	Gr. B Galvanized	
THREADED FITTINGS Caps Elbows Tees Couplings Plugs	3" and smaller	Class 150		ASME B16.3 malleable iron, galvanized	
Unions	3" and smaller	Class 300		Malleable iron, galvanized, brass seat/ASME B16.39	
Swaged Nipples	3" and smaller	Sch. 80	Seamless	ASTM A53-B/API 5L-B	
Bosses	2" and smaller	Class 3000		Welding, threaded female outlet (AE-036175)	
BUTT WELD FITTINGS Elbows Tees Caps Reducers	4" - 24"	Match pipe		ASME B16.9	
MECHANICAL JOINTS Water Service only	2" and smaller			Dresser style No. 65-B	
	3" - 24"			Dresser style No. 38	
FLANGES Weld Neck or Slip on	4" and 6"	Class 150 FF, Std. bore		B16.5	
	8" - 24"	Class 150 FF		B16.5	
Blinds	4" - 24"	Class 150 FF		B16.5	
Spec. Blinds	4" - 24"	Flat Face		AD-036631 or AD-036633	
GASKETS	4" - 24"			1.6 mm Synthetic fiber	(3)

Line Class 12CG0U (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
BOLTING	1¼" and smaller			Mild steel machine bolts/ square heads and hex nuts to ASTM A307, Grade B	
	1½" and larger			ASTM A193 B7 stud bolts, semi-finished, heavy pattern ASTM A194 2H hex nuts	
GATE VALVES	2" and smaller	Class 800	Socketweld/ Threaded	ASTM A105 body, BB, OS&Y, API 602, Trim No.8	
	3" and larger	Class 150	FF Flanged	ASTM A216-WCB body, BB, OS&Y, API 600, Trim No.8	
GLOBE VALVES	2" and smaller	Class 800	Socketweld/ Threaded	ASTM A105 body, BB, OS&Y, Trim No.8	
	3" and larger	Class 150	FF Flanged	ASTM A216-WCB body, BB, OS&Y, Trim No.8	
CHECK VALVES	2" and smaller	Class 800	Socketweld/ Threaded	ASTM A105 body, BC, Trim No.8	
	3" and larger	Class 150	FF Flanged	ASTM A216-WCB body, BC, Trim No.1	
BALL VALVES	2" and smaller	Class 300	Socketweld/ Threaded	ASTM A105 body, floating ball, RTFE seats, Trim No.10	
	3" and 4"	Class 150	FF Flanged	ASTM A216-WCB body, floating ball, RTFE seats, Trim No.10	
	6" and larger	Class 150	FF Flanged	ASTM A216-WCB body, trunnion mounted, Trim ENP	
BUTTERFLY VALVES	4" and larger	200 psig	Wafer or lug	Ductile Iron ASTM A395 body, API 609 Cat.A, Trim ENP	

Notes:

- (1) Welded pipe including spiral weld pipe to [01-SAMSS-035](#) and ERW pipe to 01-SAMSS-033 is permitted in this class.
- (2) Butt welded pipe and fittings per 1CS9P or 1CS9P1 may be substituted for threaded pipe when economic or operating circumstances dictate.
- (3) For flat face flanges use full face gaskets.
- (4) Select design code in accordance with ASME B31.3 or [SAES-B-017](#) as the service requires.

Line Class: 12LC0U (Formerly 2E3A) Service: Refer to Table 1, Part III Rating Class: 125 FF ASME B16.1/150 FF ASME B16.5 Temperature Limit: 0 to 100°C Corrosion Allowance: 0 mm			Basic Material: Cement Lined CS Design Code: ASME B31.3 Note (5) Stress Relief: Not Required Examination: Per ASME B31.3 Joint Construction: Note (2)		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	4" and larger	Calculate	Seamless or welded	ASTM A53 or API 5L, Cement-lined per 01-SAMSS-005	(1) (4)
FITTINGS Elbows Tees Caps Reducers	4" and larger	Calculate to match pipe		02-SAMSS-005 /ASME B16.9	(2) (4)
Sleeve Couplings	4" and larger			Std. Dwg. AE-036768	
FLANGES Weld Neck Slip-on Blinds	4" and larger	Class 150 FF Bore to match pipe		02-SAMSS-011	(3)
GASKETS	4" and larger			1.6 mm, Synthetic fiber	
BOLTING				Machine bolts ASTM A307 Gr. A or B	
GATE VALVES	4" and larger	Class 150	FF Flanged	Ductile iron ASTM A395 epoxy lined body, BB, ASTM B61/B62 bronze trim (less than 16% zinc)	(7) (8)
CHECK VALVES	4" and larger	Class 150	FF Flanged	Ductile iron ASTM A395 epoxy lined body, BC, ASTM B61/B62 bronze trim (less than 16% zinc)	
GLOBE VALVES	4" and larger	Class 150	FF Flanged	Ductile iron ASTM A395 epoxy lined body, BB, ASTM B61/B62 bronze trim (less than 16% zinc)	
BUTTERFLY VALVES	4" and larger	200 psig min.	Wafer or Lug or FF Flanged	Ductile iron ASTM A395 rubber lined body, stem packing integral with liner, protected SS stem, AL-BR disc (less than 16% zinc), Monel pins	(6) (9)

Line Class 12LC0U (Continued)

Notes:

- (1) This line class is normally limited to the range of 4 to 30-inch NPS and is used in conjunction with line class 12BD0U or 12BC0U for smaller diameter pipe material.
- (2) Pipe fittings with butt welded pipe pups shall be cement lined per [01-SAMSS-005](#) and installed with sleeve couplings per Standard Drawing [AE-036768](#) or per approved alternative method.
- (3) Refer to Standard Drawing AE-036634 for welding neck and blind flanges 26-inch NPS and larger. The raised face shall be removed when matching with flat face flanged valves.
- (4) Welding to cement-lined pipe (e.g. branch connections, vents and drains) requires special consideration and must be planned during the design phase. Contact the Materials Engineering Unit in CSD for welding procedures.
- (5) For non-process services, see SAES-S series for applicable design code.
- (6) Use EPDM lining if no hydrocarbons are present. Otherwise, use NBR lining
- (7) OS&Y style for above ground valves, ISNRS style with stem extensions for buried valves
- (8) Wedge may be solid, double-disc, or rubber lined
- (9) If either the wafer or lug style is selected, the cement lining in the adjacent pipe must be shaved to accommodate the movement of the disc.

Line Class: 12LE0U Service: Refer to Table 1, Part III Rating Class: 125 FF ASME B16.1/150 FF ASME B16.5 Temperature Limit: 0 to 90°C Corrosion Allowance: 0 mm			Basic Material: FBE-Lined CS Design Code: ASME B31.3 Note (1) Stress Relief: Not Required Examination: Per ASME B31.3 Buttweld Construction: ASME B16.25		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" and larger	Calculate	Seamless or welded	ASTM A53 or API 5L Fusion Bonded Epoxy lined per 09-SAMSS-091 (internal)	(2)
FITTINGS Elbows Tees Caps Reducers	2" and larger	Calculate to match pipe		02-SAMSS-005 /ASME B16.9	
FLANGES Weld Neck Slip-on Blinds	2" and larger	Class 150 FF		02-SAMSS-011 , ASME B16.5	(3)
GASKETS	2" and larger			1.6 mm, Synthetic fiber	
BOLTING				Machine bolts ASTM A307 Gr. B or ASME A193 B7 stud bolts semi-finished, heavy pattern A194 Gr. 2H hex nuts	
VALVES	2" and larger	SAME AS LINE CLASS 12LC0U			

Notes:

- (1) For non-process services, see SAES-S series for applicable design code.
- (2) Welding to FBE-lined pipe (e.g. branch connections, vents and drains) requires special consideration and must be planned during the design phase. Contact the Materials Engineering Unit in CSD for welding procedures.
- (3) Refer to Standard Drawing AE-036634 for welding neck and blind flanges 26-inch NPS and larger. The raised face shall be removed.

Line Class: 12BD0U (Formerly 2E1B) Service: Refer to Table 1, Part III Rating Class: 125 FF, ASME B16.1/150 FF B16.5 Temperature Limit: 0 to 100°C Corrosion Allowance: 0 mm			Basic Material: 90/10 Cu-Ni Design Code: ASME B31.3 Stress Relief: Not Required Examination: Per ASME B31.3 Butt weld Construction: Note (8)		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE/TUBE	½" - 16"	Calculate	Seamless	UNS-C70610 to BS 2871, Part 2 and EEMUA Publication No. 144, Section 1	(1) (2) (3) (4)
FITTINGS Elbows-90 deg	½" - 2"	Match pipe	Socket Weld	90/10 Cu-Ni	(8)
	3" - 16"		Long Radius Butt Weld	90/10 Cu-Ni	
Elbows-45 deg	6" - 16"		Long Radius Butt Weld	90/10 Cu-Ni	
Tees	½" - 2"		Socket Weld,	90/10 Cu-Ni or Equal	
	3" - 16"	Butt Weld,	90/10 Cu-Ni or Equal		
	1½" x 1½" x 1"	Socket Weld, Reducing	90/10 Cu-Ni		
	6" x 6" x 4" - 16" x 16" x 12"	Butt Weld, Reducing	90/10 Cu-Ni		
Couplings	½" - 2"		Socket Weld	90/10 Cu-Ni	
	1" x ½" - 2" x 1"		Socket Weld, Reducing	90/10 Cu-Ni	
Plug	½"		Hexagon	90/10 Cu-Ni	
Reducers	3" x 2" - 16" x 10"		Butt Weld, Concentric	90/10 Cu-Ni	
Adapter	16mm API x ½" Male end for insertion into fitting		Female Thread x Male Socket Weld	90/10 Cu-Ni	
Connectors	½" - 2"		Socket weld, straight, with male threads for connecting Cu-Ni Pipe to Female Threaded Bronze Valves	90/10 Cu-Ni	(5)

Line Class 12BD0U (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
FLANGES	2" - 4"	Class 125/150	Composite, Blind Disc	90/10 Cu-Ni, ASME B16.5 dimensions, 5mm thick, to BS 2871	(6)
	6" - 16"	Class 150	Composite Slip On	90/10 Cu-Ni (UNS C70610) to BS 2871, Part 2 and EEMUA Publication No. 145, Section 2.2 and 2.3. 90/10 Cu-Ni inner stub end, ASTM, A105 backing flange, Class 150, Galvanized to BS729	
BLIND (BLANK)	2" - 4"	Class 150		Forged steel, ASTM A105, Flat Face, Galvanized to BS 729	
GASKETS	1.6 mm			Synthetic fiber	
BOLTING				ASTM A193 B7 Stud Bolts, semi-finished, heavy pattern ASTM A194 2H hex nuts	(7)
GATE VALVES	2" and below	Class 150	Threaded	Bronze body and trim ASTM B61/B62, ISRS, MSS-SP-80	(10)
	3" and above	Class 150	FF Flanged	Bronze ASTM B61/B62 or AL-BR body, trim ASTM B61/B62 or Monel or AL-BR, BB	
GLOBE VALVES	2" and below	Class 150	Threaded	Bronze body and trim ASTM B61/B62, ISRS, MSS-SP-80	(9) (10)
	3" and above	Class 150	FF Flanged	Bronze ASTM B61/B62 or AL-BR body, trim ASTM B61/B62 or Monel or AL-BR, BB	
CHECK VALVES	2" and below	Class 150	Threaded	Bronze body and trim ASTM B61/B62, MSS-SP-80	(9) (10)
	3" and above	Class 150	FF Flanged	Bronze ASTM B61/B62 or AL-BR body, trim ASTM B61/B62 or Monel or AL-BR, BC	
BALL VALVES	2" and below	Class 150	Threaded	Bronze body and trim ASTM B61/B62, TFE seats	(9) (10)
BUTTERFLY VALVES	3" and above	Class 150	wafer or lug or FF Flanged	Bronze ASTM B61/B62 or AL-BR body, trim ASTM B61/B62 or Monel or AL-BR	(9) (10)

Line Class 12BD0U (Continued)

Item	Size	Rating Schedule	Type	Specification	Notes
FIRE HYDRANT VALVES	2½" x 2½"	300 psi	NPT x hose	Angle type, bronze body, ISRS, renewable SBR disc	
	3" x 2½"	300 psi	NPT x hose	Angle type, bronze body, ISRS, renewable SBR disc	
	4" x 4½"	300 psi	NPT x hose	Angle type, bronze body, ISRS, renewable SBR disc	

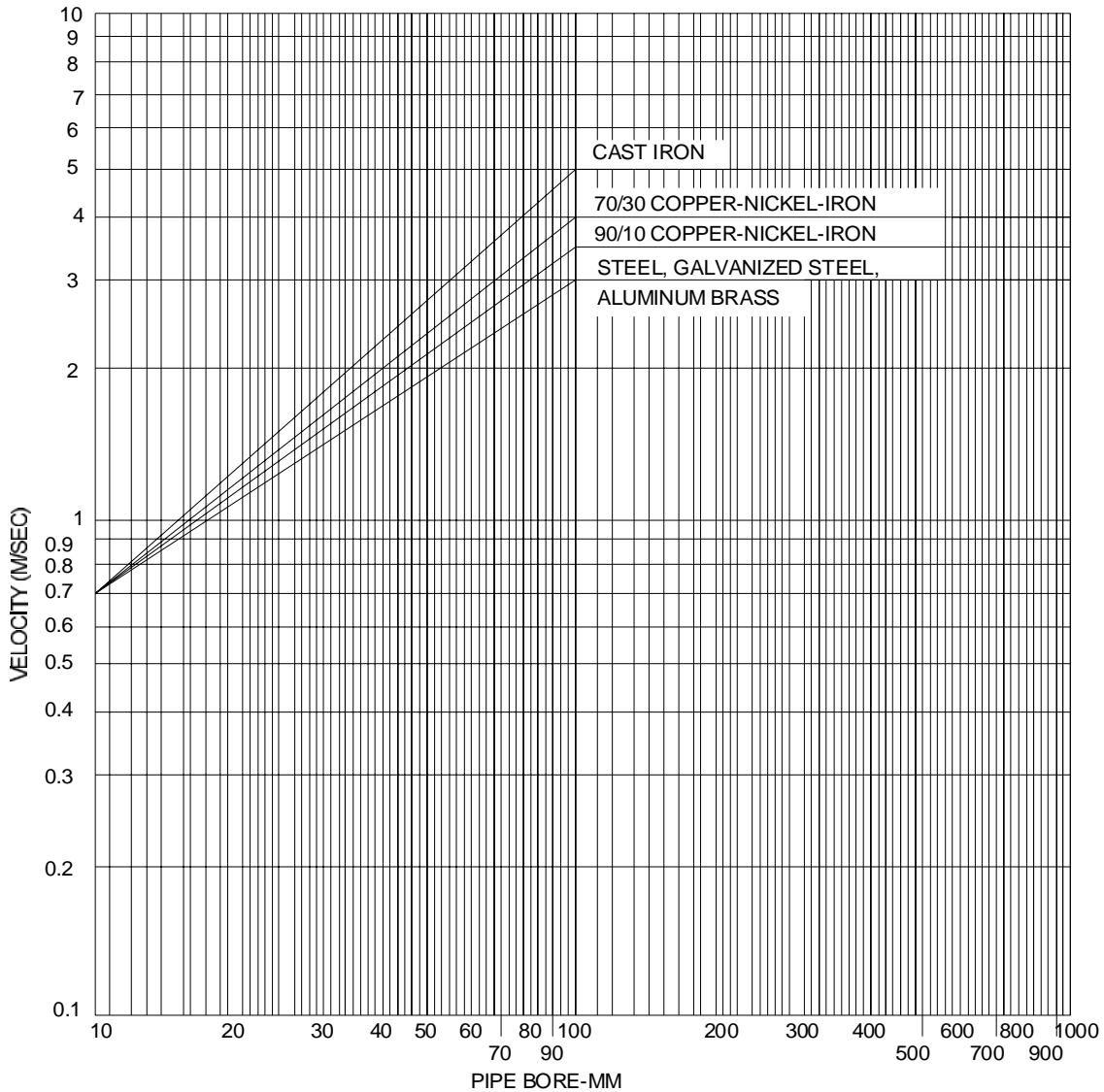
Notes:

- (1) This line class is normally limited to ½ to 4-inch NPS (16 to 108 mm OD). This size range is in SAMS stock, and is used in conjunction with Specification 12LC0U cement lined pipe 4-inch NPS and larger. Cu-Ni pipes larger than 4-inch NPS (108mm OD) may be butt welded and used in seawater applications instead of cement lined pipe but it is RR coded.
- (2) The terms pipe and tube are used interchangeably in this specification.
- (3) Alternative copper alloy materials may be specified for applications where higher strength or increased erosion resistance is required, such as:
 70/30 Copper Nickel, UNS C71500
 Aluminum Bronze, UNS C61400
- (4) Design Notes for Copper-Nickel Piping Systems:
 - a) The design velocity for liquids in UNS C70610 Cu-Ni pipe is indicated in Figure 1. The layout of pipe bends and valves shall be made to minimize the damaging effects of erosion;
 - b) The piping shall be adequately supported by means of suitable hangers or supports to prevent mechanical damage to the copper-nickel alloy pipe;
 - c) When Copper-Nickel pipe is connected to cement-lined carbon steel pipe systems, insulating flanges or dielectric unions shall be used to prevent galvanic corrosion of the steel. Care shall be taken to assure that the insulated joint is not short-circuited by pipe supports.
 - d) Solid 90/10 Copper Nickel weld neck flanges shall be utilized in the corrosive splash and spray zone. These will have to be DC ordered.
- (5) Straight male connectors are required to allow connection between pipe and female threaded valves, threads shall be lubricated with an anti-galling grease SN 26-011-057.
- (6) Solid copper-nickel weld neck flanges rather than composite flanges shall be utilized in the splash zone.
- (7) Consideration shall be given to fluoropolymer coated bolts for offshore applications. Coated bolts are not stocked. However, DURABOLT is available from Saudi Conduit Coating Co., P.O. Box 230, Al Khobar, and fluoropolymer coated (Ameri-Cote) bolts are available from American International Industries Pte. Ltd., through Yusuf Bin Ahmed Kanoo, P.O. Box 37, Dammam.
- (8) The GTAW process shall be used for all copper-nickel wall thicknesses less than 4.75 mm. AWS A5.7 Type ERCuNi or ERCuNi-1 consumables are required per [SAES-W-011](#). Type ERCuNi filler rod is available in SAMS (SN 20-504-390)
- (9) All Copper alloys for valves shall contain a maximum of 16% zinc to avoid dezincification.
- (10) All valves shall have a minimum rating of 200 psi.

Line Class 12BD0U (Continued)

AS DESIGNATED IN LLOYDS RULES AND BSMA 18, FOR CONTINUOUS FLOW (E.G. PROCESS COOLING AND OTHER CONTINUALLY OPERATED SYSTEMS) THE FOLLOWING WATER SPEEDS APPLY:

MAXIMUM SEA WATER VELOCITIES IN PIPES, FOR CONTINUOUS FLOW CONDITIONS *



* WHERE INTERMITTENT TO MAINLY NO-FLOW APPLICATIONS OCCUR, SUCH AS IN FIRE MAINS, WATER SPEEDS OF BETWEEN SIX AND TEN METERS PER SECOND CAN BE ACCEPTABLE, DEPENDENT ON DURATION/FREQUENCY OF SYSTEMS TESTING.

FIGURE 1 - PIPING SPECIFICATION 12BD0U

Line Class: 12PV0U (Formerly 2E3C) Service: Refer to Table 1, Part III Pressure/Temperature Limit: Notes (7),(8) Corrosion Allowance: 0 mm			Basic Material: PVC/UPVC Design Code: ASME B31.3, Note (1) Examination: Per ASME B31.3 Joint Construction: Notes (2) thru (6)		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	20 - 200 mm	Class 5	PVC/uPVC	PVC/uPVC, SAS 14/15 Class 5 Local Made Article	(1) (2)
	½" - 6"	Sch. 80	PVC/uPVC	ASTM D1785 PVC 1120 OR 1220	(3)
FITTINGS FOR SOLVENT WELD JOINTS Bushings Couplings Elbows Tees Unions	20 - 200 mm ½" - 6"	Class 5 Sch. 80	PVC/uPVC PVC/uPVC or CPVC	uPVC, SAS 14/15 Class 5 (0 to 49°C), ASTM F439 Sch. 80 CPVC 4120 (0 to 49°C)	(2)
Pipe Union	½" - 3"	Sch. 80	CPVC	ASTM F439 CPVC female socket by male IPS adaptor	(4)
DIN X ASTM ADAPTORS	½ in x 20 mm 3 in x 90 mm	Class 5 Sch. 80	PVC/uPVC or CPVC	PVC/uPVC, SAS 14/15 Class 5, Local Made Article	
FLANGES Socket Type	¾" - 8"	Class 150 Sch. 80	Flat Face	ASTM F439 CPVC Schedule 80 Class 150 FF	(5)
Threaded Type	½" - 2"	Class 150 Sch. 80	Flat Face	ASTM F437 CPVC Schedule 80 Class 150 FF	(3)
GASKETS	3.2 mm	50-60 Shore A durometer	elastomeric	Full face, elastomeric, 50-60 Shore A durometer	
BOLTING	All Sizes			ASTM A307 Grade A or B bolts with ASTM A563 Grade A heavy hex nuts	(6)
SOLVENT CEMENT				ASTM D2564 PVC to PVC ASTM F-493 CPVC to PVC or CPVC	(9)
VALVES (All Types)	Use 12LC0U and 12BD0U valves				(5)
Ball Valves And Ball Check Valves	½" and above	150 psi	Threaded Socketweld Flanged FF	PVC ASTM D1784 CL. 12454-B or CPVC ASTM D1784 CL. 23447-B body and ball, EPDM seats, double union	

Line Class 12PV0U (Continued)

Notes:

- (1) See Saudi Aramco Plumbing Code [SAES-S-060](#) for material usage within buildings. For non-process services, see SAES-S series for applicable design code.
- (2) ASTM F439 schedule 80 CPVC 4120 fittings may be used with ASTM D1785 pipe. (Use ASTM F-493 CPVC solvent cement). PVC fittings Sch. 80 per ASTM D2467 may also be used with Sch. 80 PVC pipe.
- (3) Threaded pipe shall be derated 50% from the applicable pressure rating. Threaded joints 2-inch and larger shall be seal welded with solvent cement.
- (4) Union adaptors between thermoplastic and metallic pipe have a plastic socket for solvent cementing and a red brass female pipe threaded end.
- (5) Inch dimension flanges and valves shall be used with metric PVC pipe. The exception is in Saudi Aramco-built Home Ownership areas where metric valves are usually used.
Connections shall be made using DIN X ASME adaptor couplings and inch dimension nipples.
- (6) Use washers on both ends of the bolts. Corrosion protection is required for below ground use. Consideration shall be given to fluoropolymer coated bolts for buried service.
Coated bolts are not stocked. DURABOLT is available from Saudi Conduit Coating Co., P.O. Box 230, Al Khobar.
- (7) SAS 14/15 Class 5 PVC has the following ratings: 1600 kPa at 23°C, 992 kPa at 38°C and 640 kPa at 50°C.
- (8) Maximum operating pressures for ASTM D1785 Sch 80 PVC 1120 appear in the table below. PVC 1120, formerly Type I Grade 1 PVC, now meets cell classification PVC 12454-B.

MAXIMUM OPERATING PRESSURE FOR PVC 1120, SCHEDULE 80

Nominal Size Inches	SAMS Stock No.	23°C kPa	38°C kPa	49°C kPa
¼	01-515-414	7790	4830	3115
½	01-515-417	5860	3630	2345
¾	01-515-421	4760	2950	1905
1	01-515-432	4340	2690	1735
1-½	01-515-441	3240	2010	1295
2	01-515-450	2760	1710	1105
3	01-515-451	2550	1580	1020
4	01-515-470	2210	1370	885
6	01-515-500	1930	1195	770
8	01-515-505	1720	1065	690

- (9) Solvent cement shall be stored in an air conditioned room at approximately 21°C and shall not be used after the date indicated on the label or one year after date of manufacture.

Line Class: 12PU0U (Formerly 2E3D) Service: Refer to Table 1, Part III Pressure/Temperature Limit: Notes (5) Corrosion Allowance: 0 mm			Basic Material: CPVC Design Code: ASME B31.3, Note (1) Examination: ASME B31.3 Joint Construction: Notes (2) (3)		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	½" - 6"	Sch. 80	CPVC	ASTM F441 CPVC 4120	(2)
FITTINGS FOR SOLVENT WELD JOINTS					
Bushings Couplings Elbows Tees	½" - 6"	Sch. 80	CPVC	ASTM F439 CPVC 4120, Sch. 80, 0 to 72°C	
Pipe Union	½" - 3"	Sch. 80	CPVC	ASTM F439 CPVC female socket by male IPS adaptor	(3)
FLANGES					
Socket Type	¾" - 6"	Class 150, Sch. 80	Flat Face	ASTM F439 CPVC, Sch. 80 Class 150 FF	
Threaded type	½" - 2"	Class 150, Sch. 80	Flat Face	ASTM F437 CPVC Class 150 FF	(2)
GASKETS	3.2 mm	50-60 Shore A durometer	elastomeric	Full face elastomeric, 50-60 Shore A durometer	
BOLTING	All Sizes			ASTM A307 Grade A or B bolts, ASTM A563 Grade A heavy hex nuts	(4)
SOLVENT CEMENT				ASTM F493 CPVC to PVC or CPVC	(6)
VALVES (All Types)	Use 12LC0U and 12BD0U valves				
Ball Valves And Ball Check Valves	½" and above	150 psi	Threaded Socketweld Flanged FF	CPVC ASTM D1784 CL. 23447-B body and ball, EPDM seats, double union	

Line Class 12PU0U (Continued)

Notes:

- (1) See Saudi Aramco Plumbing Code [SAES-S-060](#) for material usage within buildings. For non-process services, see SAES-S series for applicable design code.
- (2) Threaded pipe shall be derated 50% from the applicable pressure rating.
Threaded joints 2 inch and larger shall be seal welded with solvent cement.
- (3) Union adaptors between thermoplastic and metallic pipe have a plastic socket for solvent cementing and a red brass female pipe threaded end.
- (4) Use washers on both ends of the bolts. Corrosion protection is required for below ground use. Consideration shall be given to fluoropolymer coated bolts for buried service.
Coated bolts are not stocked. DURABOLT is available from Saudi Conduit Coating Co., P.O. Box 230, Al Khobar.
- (5) Maximum operating pressures appear in the table below. CPVC 4120, formerly Type IV Grade 1 CPVC, now meets cell classification CPVC 23447-B.

MAXIMUM OPERATING PRESSURE FOR CPVC, SCHEDULE 80

Nominal Size Inches	SAMS Stock No.	23°C kPa	38°C kPa	60°C kPa	71°C kPa
½	01-515-617	5860	4100	3225	2345
¾	01-515-621	4760	3330	2620	1905
1	01-515-626	4340	3040	2390	1735
1-¼	01-515-631	3590	2515	1975	1435
1-½	01-515-640	3240	2270	1780	1295
2	01-515-650	2760	1930	1520	1105
3	01-515-661	2550	1785	1400	1020
4	01-515-673	2210	1550	1215	885
6	01-515-691	1930	1350	1060	770

- (6) Solvent cement shall be stored in an air conditioned area at approximately 21°C and shall not be used past the date indicated on the label or one year after date of manufacture.

Line Class: 12FE0U (Formerly 2E3E) Service: Refer to Table 1, Part III Pressure Limit: 1030 kPa Temperature Limit: 0 to 93°C Corrosion Allowance: 0 mm			Basic Material: RTR Per 01-SAMSS-034 Design Code: ASME B31.3 Note (1) Stress Relief: None Req'd Examination: Per Manufacturer Joint Construction: Per Manufacturer		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	25 - 3700 mm	Refer to 01-SAMSS-034	Refer to 01-SAMSS-034	01-SAMSS-034 RTR Pipe and Fittings, 0 to 93°C	
FITTINGS & FLANGES	25 - 3700 mm	Refer to 01-SAMSS-034	Refer to 01-SAMSS-034	Shall be made by the Manufacturer supplying the pipe	(2)
GASKETS	3.2 mm	50-60 Shore A durometer	elastomeric	Full face elastomeric, 50-60 Shore A durometer	
BOLTING	All Sizes			ASTM A307 Grade A or B bolts with ASTM A563 Grade A heavy hex nuts	(3)
VALVES	Use 12LC0U or 12BD0U flanged valves				(2)

Notes:

- (1) For non-process services, see SAES-S series for applicable design code.
- (2) Inch-dimension flanges and valves are used with metric RTR pipe.
- (3) Use washers on both ends of the bolts. Corrosion protection is required for below ground use. Consideration shall be given to fluoropolymer coated bolts for buried service.
 Coated bolts are not stocked. DURABOLT is available from Saudi Conduit Coating Co., P.O. Box 230, Al Khobar.

Line Class: 80DC0D (Formerly FA) Service: Refer to Table 1, Part III Pressure Rating: Non-Pressure Temperature Limit: 60°C Corrosion Allowance: 0 mm			Basic Material: Cast iron Design Code: Note (1) Stress Relief: Not Required Examination: Note (1) Joint Construction: Per Manufacturer		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" - 12"	Service Weight	Single or double hub type	Cast iron soil, ASTM A74 single or double hub, service weight, 60°C max.	(2) (3)
FITTINGS	2" - 12"	Service Weight		Cast iron soil ASTM A74 service weight, 60°C max.	(2) (3)

Notes:

- (1) Per Saudi Aramco [SAES-S-020](#) or [SAES-S-030](#) as the service requires
- (2) Service weight pipe and fittings can be joined to extra heavy pipe and fittings.
- (3) For caulked joints, acid-resisting oakum shall be used.

Line Class: 80PV0D (Formerly FB) Service: Refer to Table 1, Part III Pressure Rating: Non-Pressure Temperature Limit: 60°C Corrosion Allowance: 0 mm			Basic Material: PVC Design Code: Note (1) Examination: Note (1) Joint Construction: Solvent Cement per Manufacturer		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	160mm-315 mm	Class 3		uPVC SAS 14/15 Class 3 with Anger joints 60°C max. LOCALLY MADE ARTICLE	(1) (2)
FITTINGS	160mm-315 mm	Class 3	Sewer Pattern	uPVC 14/15 Class 3 sewer services fittings with Anger joints 60°C max LOCALLY MADE ARTICLES	

Notes:

- (1) Per Saudi Aramco [SAES-S-010](#) or [SAES-S-030](#) as the service requires.
- (2) ASTM D3034, Type PSM, PVC pipe and fittings may be used to match existing pipe.

Line Class: 80FE0D (Formerly FD) Service: Refer to Table 1, Part III Pressure Rating: Non-Pressure Temperature Limit: 0 to 49°C Corrosion Allowance: 0 mm			Basic Material: RTR per 01-SAMSS-029 Design Code: Note (1) Examination: Per Manufacturer Joint Construction: Per Manufacturer		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	80mm-3700 mm	Refer to 01-SAMSS-029	Refer to 01-SAMSS-029	01-SAMSS-029 RTR sewer pipe and fittings, 0 to 49°C	(2) (3)
FITTINGS & FLANGES	80mm-3700 mm	Refer to 01-SAMSS-029	Refer to 01-SAMSS-029	Shall be made by the Manufacturer supplying the pipe	

Notes:

- (1) Per Saudi Aramco [SAES-S-020](#) or [SAES-S-030](#) as the service requires.
- (2) Not stocked. Carried in stock by the Saudi Arabian Amiantit Co., Ltd., P.O. Box 569, Dammam. [01-SAMSS-029](#) also allows epoxy RTR sewer pipe up to 65°C.
- (3) Use ASTM A307 Grade A or B bolts with ASTM A563 Grade A heavy hex nuts and use washers on both sides for flanges. Use 3.2 mm thick full face elastomeric gaskets with 50 to 60 Shore A durometer hardness for all flanges.

Line Class: 80CG0D1 (Formerly NA) Service: Refer to Table 1, Part III Pressure Rating: Non-Pressure Temperature Limit: 18 to 60°C Corrosion Allowance: 0.00 inch			Basic Material: Galvanized Carbon Steel Design Code: SAES-S-060 & SAES-S-020 Stress Relief: Not Required Examination: Per SAES-S-060 Joint Construction: Threaded		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	1½" – 4"	Sch. 40	Seamless or Welded	ASTM A53 galvanized 0 to 60°C	(1)
FITTINGS	1½" – 4"	Service Weight	Drainage Fittings	Cast iron threaded drainage fittings galvanized, ASME B16.12	(1)

Note:

(1) Larger pipe/fitting sizes may be used. However, they are not stocked by SAMS.

Line Class: 80PV0D1 (Formerly NB) Service: Refer to Table 1, Part III Pressure Rating: Non-Pressure Temperature Limit: 60°C Corrosion Allowance: 0 mm			Basic Material: PVC Design Code: SAES-S-060 Stress Relief: Not Required Examination: Per SAES-S-060 Joint Construction: Solvent cement		
Item	Size	Rating Schedule	Type	Specification	Notes
PIPE	2" - 8"	Sch. 40	Drain, Waste and Vent Pipe	ASTM D2665 PVC , 60°C	(1)
FITTINGS Bends Elbows Tees Traps Wyes	2" - 8"	Sch. 40	Drain, Waste and Vent Fittings	ASTM D2665 PVC, 60°C ASTM D3311 patters for solvent cement joints	
SOLVENT CEMENT				ASTM D2564 PVC	

Note:

(1) See Saudi Aramco Plumbing Code [SAES-S-060](#) for limitations on plastic materials used in plumbing systems.

Revision Summary

30 September 2003 Revised the "Next Planned Update".
 Minor revision to renumber the standard from SAES-L-005 to SAES-L-105 and update reference to the piping standards with new numbers. The branch connection chart was moved to the new [SAES-L-110](#). Also, RVL [SAES-L-101](#) and [SAES-L-102](#) are referenced for emphasis.

30 March 2005 Editorial revision to replace NACE MR0175 with newly approved [SAES-A-301](#).