



Materials System Specification

04-SAMSS-051

11 October 2010

Ball Valves, API SPEC 6D

Document Responsibility: Valves Standards Committee

Saudi Aramco DeskTop Standards

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Revised paragraphs are indicated in the right margin

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I Scope

This Specification along with the Purchase Order covers the minimum requirements for soft-seated, steel, flanged and butt-weld end, trunnion-supported ball valves in nominal pipe sizes (NPS) 2 inch and larger for ASME Classes 150 through 2500; and floating ball valves up to and including NPS 4 inch in ASME Classes 150 and 300.

Valves covered by this Specification shall be suitable for wet, sour liquid or gaseous hydrocarbon services from -18 to 120°C. For Low Temperature Service from -45°C to -18°C, [04-SAMSS-003](#) shall be applied.

Additional requirements for the following special services are covered in the following Appendices:

- Appendix A: Metal Seated Valves for Services from -18 to 400°C.
- Appendix B: Underwater Service.

II Conflicts and Deviations

- A. Any conflicts between this specification and other applicable Saudi Aramco Materials System Specifications (SAMSSs), Engineering Standards (SAESs), 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.
- B. Direct all requests to deviate from this specification 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.

III References

Material or equipment supplied to this specification shall comply with the latest edition of the references listed below unless otherwise noted:

- A. Saudi Aramco References

Saudi Aramco Engineering Procedure

[SAEP-302](#)

*Instructions for Obtaining a Waiver of a
Mandatory Saudi Aramco Engineering
Requirement*

Saudi Aramco Materials System Specifications

<u>04-SAMSS-003</u>	<i>Additional Requirements for Low Temperature Valves</i>
<u>04-SAMSS-035</u>	<i>General Requirements for Valves</i>
<u>04-SAMSS-048</u>	<i>Valve Inspection and Testing Requirements</i>

Saudi Aramco Forms and Data Sheets

<u>6233-1-ENG</u>	<i>Valve Data Sheet</i>
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B. Industry Codes and Standards

American Petroleum Institute

<i>API SPEC 6D</i>	<i>Specification for Pipeline Valves</i>
<i>API STD 598</i>	<i>Valve Inspection and Testing</i>
<i>API STD 602</i>	<i>Compact Steel Gate Valves</i>

American Society of Mechanical Engineers

<i>ASME/ANSI B16.34</i>	<i>Valves - Flanged, Threaded, and Welding End</i>
<i>ASME SEC VIII</i>	<i>Boiler and Pressure Vessel Code</i>

National Association of Corrosion Engineers/International Standardization Organization

<u>NACE MR0175/ISO 15156</u>	<i>Petroleum and Natural Gas Industries – Materials for Use in H₂S Containing Environments in Oil and Gas Production</i>
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IV Notes to Purchaser

In addition to the valve requirements specified in this SAMSS or approved modifications, the following information, at minimum, shall be considered and included in purchase requisitions/orders as applicable:

1. Valve size
2. Pressure class
3. Ends (flanged w/raised face or ring joint, or welding ends)

Commentary Note:

Refer to [04-SAMSS-035](#) and Saudi Aramco's Standard Drawings for flanged valves larger than NPS 24.

4. Face-to-face dimensions, if non-standard
5. Operation requirements (gear or power operator)

Commentary Note:

Manufacturer should be advised to provide a stem of sufficient length if it is anticipated that the valve may be retrofitted with an electrical actuator.

6. Above ground or buried service (specify burial depth) or insulated service
7. Seating, if other than soft type (see appendices)
8. Orientation of installed valve, if other than stem-vertical
9. Special internal or external coatings
10. Other than standard wet sour hydrocarbon services (see appendices)
11. Valves shall meet the applicable requirements of [04-SAMSS-035](#)
12. For hot tap operations (specify min. bore required)
13. Specify trim materials option in paragraph 3.4.
14. Seat pockets for scraper trap isolation valves shall be overlaid with Inconel 625.
15. Face-to-face dimensions, if non-standard
16. Floating ball design, if required
17. Low or high temperature service

Commentary Note:

Form [6233-1-ENG](#), Valve Data Sheet, (refer to [04-SAMSS-035](#)), shall be filled out by the Purchaser when ordering non-stock valves.

V Modifications to API SPEC 6D, Specification for Pipeline Valves

The following paragraph numbers refer to API SPEC 6D, Twenty-Second Edition, January 2002, which is part of this specification (standard). The text in each paragraph is an addition, exception, modification, or deletion to API SPEC 6D as noted. Paragraph numbers not appearing in API SPEC 6D are new paragraphs to be inserted in numerical order.

Section 5 - Valve Types and Configurations

- 5.1.3 (Addition) Unless otherwise specified in the Purchase Requisition/Order, valves shall be furnished trunnion-supported, full bore, long pattern, in either split body or top entry body styles.

(Addition) The ball shall be a substantially solid one-piece casting or forging.

(Addition) Trunnion-supported valves shall be designed to provide "double block and bleed" service.

(Addition) The seats shall be designed to ensure positive sealing at low differential pressures. Trunnion-supported valves, NPS 8 inch and larger, shall have a seat sealant injection system or other secondary means to achieve a seal in emergency cases.

(Addition) The stem shall be blowout-proof. Stem retention by means of a packing gland is not acceptable.

(Addition) Stem sealing shall be achieved with inner and outer seal elements or with stem packing that can be tightened under pressure by means of a mechanically loaded gland. If inner and outer seal elements are used, either the outer seal shall be replaceable with the valve in service or a means of injecting sealant between the seals shall be provided.

(Addition) Valves shall be designed to be internally self-relieving. A relief hole drilled in the ball is not acceptable.

(Addition) Trunnion-supported valves, NPS 8 inch and larger, shall be provided with body vent and drain API STD 602 gate valves. The drain and vent valves shall be fitted with NPT threaded plugs.

(Addition) Valves shall be qualified "fire-safe".

(Addition) Gear operators shall be provided on valves in the following sizes and classes:

ANSI Pressure Class	NPS (inch)
150	6 and larger
300	4 and larger
400 and above	3 and larger

Commentary Note:

Refer to [04-SAMSS-035](#) for operator requirements.

(Addition) For power operation requirements, refer to [04-SAMSS-035](#).

6 General Design

(Addition) Valves shall meet the applicable requirements of [04-SAMSS-035](#).

- 6.1 (Exception) All parts shall be suitable for continuous service at the maximum operating pressure rating through 120°C.
- 6.3 (Addition) When top entry valves are furnished in pressure classes 150 and 300, the face-to-face and end-to-end dimensions shall be as listed in Table 4 for pressure class 600.
- 6.7.1 (Exception) End flanges and associated flange facings shall be in accordance with [04-SAMSS-035](#).
- 6.7.2 (Exception) Welding ends shall be in accordance with [04-SAMSS-035](#).
- 6.23 Add (New Paragraph) All valves shall have minimum wall thicknesses in accordance with ASME B16.34, Table 3. Wall thicknesses for valves not included in ASME B16.34 Table 3 shall be determined by linear interpolation or extrapolation.
- 6.24 Add (New Paragraph) The design of body joints, except for the body end flanges, shall be in accordance with ASME Boiler and Pressure Vessel Code Section VIII Division I.

Section 7 - Material

- 7.1 (Addition) All parts, welds and heat-affected zones of welds exposed to line fluids shall meet the hardness and heat treatment requirements as specified in [NACE MR0175/ISO 15156](#). This includes materials under overlays, platings or coatings. A component shall be heat treated following the application of an overlay, or coating, if necessary, to bring the condition and properties of the heat affected zone into compliance with [NACE MR0175/ISO 15156](#).
 - 7.6 (Modification) Body, bonnet and cover bolting shall be in accordance with [NACE MR0175/ISO 15156](#), Class III for valves NPS 12 inch and smaller, and Class I or II for valves NPS 14 inch and larger. When the Purchase Order specifies that the valves will be buried or insulated, bolting shall be in accordance with [NACE MR0175/ISO 15156](#), Class I or II irrespective of size.
 - 7.2 (Addition) Nitrile rubbers, SBR, Neoprene, and EPDM shall not be used as insert, seal, and packing material. TEFZEL or PEEK shall be used if acidizing is specified. All parts shall be suitable for continuous service at the maximum operating pressure rating through 120°C.
 - 7.2 (Addition) Purchaser will specify the trim option for ball, stem and seat ring materials as defined in Table 1.
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Table 1 – Trim Option

TRIM COMPONENTS	Service	
	Liquid hydrocarbons with up to 10% watercut, and dry sweet gas	Liquid hydrocarbons with watercut greater than 10%, and wet or sour gas
Ball, stem, and seat rings	Carbon steel per API SPEC 6D Table 3.1 with 75 micrometers min. ENP	AISI SS Type 410 (or higher grade stainless steel as specified)

- 7.2 (Addition) All wetted parts such as vents and drains shall be upgraded accordingly to provide equivalent corrosion resistance when a more corrosion resistant trim has been specified.
- 9 Quality Control Requirements (Addition) Refer to [04-SAMSS-035](#) and [04-SAMSS-048](#).
- 10 Tests (Addition) Refer to [04-SAMSS-035](#) and [04-SAMSS-048](#)
- 11 Marking (Addition) Refer to [04-SAMSS-035](#).
- 12 Storing and Shipping (Addition) Refer to [04-SAMSS-035](#) for additional requirements.

Revision Summary

11 October 2010 Revised the "Next Planned Update." Reaffirmed the contents of the document, and reissued with editorial revision to reflect the changes in committee members list.

Appendix A

Additional requirements for metal seated valves in services from -18 to 400°C.

- 1) The requirement to meet [NACE MR0175/ISO 15156](#) is not mandatory for valves supplied to this Appendix unless specified in the Purchase Order.
- 2) Ball and seat rings shall be overlaid with (Stellite 6), tungsten carbide, chromium carbide or other suitable hardfacings. Vendor shall submit his detailed technical proposal for approval by the Chairman of the Valves Standards Committee.
- 3) Bearings shall be Stellite No. 6.
- 4) Stem packing shall be graphite.

Appendix B

Additional requirements for valves in underwater services.

- 1) The bottom of the body cavity of the valve shall be filled with grease to preclude entrapment of water after field hydrotest. The grease is to be lithium-based with additional corrosion inhibitor and EP additives, Shell Alvania EP-2 or equal.
- 2) Any cavity between valve and operator shall be filled with grease or heavy oil.
- 3) Flanged connections shall be sealed with fluoro-elastomer O-ring seals.
- 4) The operator shall be suitable for operating at a water depth of 60 m.
- 5) A pressure-balancing device shall be provided between operator/cavity and the surrounding water to compensate for pressure variations caused by water depths and to prevent seawater entry.
- 6) A pressure-relief valve shall be installed in the operator/cavity to prevent overpressurizing if there is any stem leakage.
- 7) Drains and vents shall be plugged and seal welded.