MATERIAL AND EQUIPMENT STANDARD

FOR

VALVES

0. INTRODUCTION

This Standard covers the minimum requirements for purchasing conventional valves to be used in oil, gas and petro-chemical industries. The Standard contains six volumes. Each volume consists of two parts; part I, general requirements and part II pertaining to requirements for one of the following valves:

Gate valves	Volume one
Ball valves	Volume two
Globe valves	Volume three
Plug valves	Volume four
Butterfly valves	Volume five
Check valves	Volume six

Valves contained in this Standard have end connections as follows:

- Flanged end
- Buttwelding end
- Socket welding end
- Threaded end
- Special end

VOLUME ONE

GATE VALVES

PARTS I AND II

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PART I GENERAL REQUIREMENTS

PART II GATE VALVES

PART I
GENERAL REQUIREMENTS

1. SCOPE

1.1 This Standard specification covers general requirement(s) for purchasing valves.

1.2 The valve(s) offered by the vendor shall be in compliance with the requirement(s) of this Standard. If requirement(s) of this Standard differs from or is in conflict with other purchasing documents, the vendor shall clearly indicate points of conflict and request the Company for clarification and comments.

The Company's comments shall be fully considered and incorporated in the final specifications.

In case that no comment(s) is given by the Company, the followings will take precedence in the order of priority as indicated hereunder:

a) Purchase order.
b) Data sheets and drawings.
c) This Standard specifications.

2. GENERAL

2.1 Primarily this specification covers conventional gate, globe, ball, plug, butterfly and check valves. Other types of valves shall conform to this specification in so far as applicable.

2.2 Where pressure containing parts have been specified as forged, substitution of casting is not permitted without prior approval of the Company.

2.3 Drain taps shall be factory fitted with forged metal plug(s) per ANSI B 16-11 and of the same basic material as the valve body. They shall be made up leak tight.

2.4 All non-Newtonian and/or catalyst handling valves shall be equipped with a flushing connection.

2.5 All power actuated valves shall have capability of being operated with an auxiliary device such as handwheel (oriented as specified, hydraulic hand pump etc.

2.6 The maximum operating force for manually operated valves shall not exceed 350 N. However, for DN 200 (NPS8) and larger the maximum operating force may increase to 450 N, during seating and unseating of the valve.

2.7 Valve(s) gear boxes shall be dust and weather-proof, filled with suitable water resistant lubricant. Lubricant SAE No. shall be specified in quotation and shall also be shown on gear-box name plate. Gear operators shall have self-locking gears.

2.8 Valves shall be provided with a position indicator.

2.9 Clockwise rotation of the handwheel/wrench shall close the valve. The diameter of the handwheel or length of the wrench shall not exceed 800 mm.

2.10 Hydraulic, pneumatic or electric actuator shall be supplied by the valve manufacturer when specified. Manufacturer of the actuator and actuating mechanism shall be approved by the Company in advance.

2.11 When chain wheels are specified for valve actuation, chain guide shall be included. Clamp-on type chain wheels are not permitted.

2.12 When extended stem is specified, the valve shall have extended bleed/vent, balancing and lubricating lines.

2.13 Valve of 500 kg and heavier shall be fitted with lifting lugs, valve support and leveling base. Their design and position shall be agreed with the Company.

2.14 Where valves are specified "No Copper Permitted" this shall be understood to mean that no copper (except trace element) or copper-bearing alloy material shall be used in the construction of these valves. This includes internal and external parts such as trim, backseat, yoke bushing and gland-follower.

Exceptions: Alloy 20, Monel, 17-4 PH, 17-7 PH when specified.

2.15 The stem and stem head shall be sized to provide adequate strength under the most severe combination of operating condition. The weakest point shall always be outside of the stem seal.

2.16 Unless otherwise specified, wire inserted, graphited braided packing suitable for 538°C (1000°F) steam or petroleum services shall be used in steel and alloy valves. It shall contain a corrosion inhibitor.

2.17 Monel body material for screwed, socket-weld end and buttweld end valves shall be of a weldable composition.

2.18 Unless otherwise specified, all austenitic stainless steel valves shall be furnished in the solution annealed condition.

2.19 All flanged gate, globe, ball and check valves with ring joint facing shall also have ring joint bonnet, or purchaser approved equal.

3. REFERENCES

For the valves within the scope of this Standard specification, the following sources and references with the supplement, which will be discussed thereafter, shall be used.

ANSI (AMERICAN NATIONAL STANDARD INSTITUTE)

ANSI/ASME B 16.11 "Forged Fittings, Socket-welding"

API (AMERICAN PETROLEUM INSTITUTE)

API STD 598 "Valves Inspections and Tests"

SIS (STANDARDISERINGS-KOMMISSIONEN I SVERIGE)

SIS-05-5900 "Swedish Standards Institution Practice, Surface Preparation Standard for Painting Steel Surface"

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

MSS-SP-25 "Standard Marking System for Valves, Fittings, Flanges and Unions"

BSI (BRITISH STANDARDS INSTITUTION)

BS 1133 "Packaging Code"

4. DEFINITIONS AND TERMINOLOGY

4.1 Company

One of the following companies:

a) National Iranian Oil Company (NIOC)
b) National Iranian Gas Company (NIGC)
c) National Petrochemical Company (NPC).

4.2 Inspector

The representative of the purchaser who is entrusted with inspection of products and production records and observance of production operations and quality control tests.

4.3 Manufacturer

The party that manufactures or produces a valve or its components covered by this Standard.

4.4 Purchaser

The party or parties entering into a contract or agreement to purchase valve(s) in accordance with the requirements of this Standard and specially referred to as Company.

4.5 Supplier

The party or parties entering into a contract or agreement to supply valve(s) in accordance with the requirements of this Standard.

5. PURCHASER'S ACCESS TO MANUFACTURING PLANT(S)

The Purchaser or his nominee(s) shall have free access to the manufacturing plant engaged in the fabrication of the valves to carry out the necessary inspections at any stage of fabrication and witness the tests. The manufacturer shall place at the disposal of purchaser or his nominee, free of charge such instruments and tools as required at the inspection point to enable the Purchaser to carry out his inspection in this respect. Such inspections in no way relieve the supplier/manufacturer of his responsibilities under the term of this Standard inspection and/or other applicable relevant documents.

6. TESTING

6.1 All valves shall be tested in accordance with procedures laid down in their relevant standard(s).

6.2 The type or style of valve stem packing used during hydrotest shall be the same as that finally supplied with the valve.

7. INSPECTION

The inspection shall be as per requirements of API standard 598, section 2.0. Manufacturer shall be prepared for inspection of the valve by Inspector.

8. REPAIRS

8.1 Casting Repairs

Repair of casting by welding and/or impregnation is not permitted. Other repair methods shall receive prior approval of the purchaser.

8.2 Forging Repairs

Method(s) of repair shall have prior approval of the purchaser.

9. FINISHING, PAINTING (AND/OR COATING)

9.1 Unless otherwise specified, after final testing, all valves shall be internally and externally dried, and internally coated with grease or sealant.

9.2 After protection of all machined and threaded external surfaces and covering all valve(s) nozzles and openings, the equipment shall be blast cleaned to Swedish standard SIS-05-5900 grade, SA 2½. This shall be followed by the coating or painting as specified in data sheet to be filled in by design engineer. The color of final coat shall be beige per BS 381/C-388.

9.3 All machined or threaded surfaces shall be protected from corrosion with a rust preventive material which shall not become fluid and run off at a temperature less than 82°C. The shipment and storage time shall be assumed to be 18 months.

9.4 Unless otherwise specified in the data sheet or purchase order, bronze and stainless steel valve shall not be painted or coated.

9.5 Particular attention shall be given to protection of Austenitic stainless-steel valves from Chloride attack such as may occur in salt-contaminated atmospheres.

10. IDENTIFICATION

10.1 Manufacturer's Markings

Each valve shall be marked in strict accordance with MSS-SP-25.

10.2 Contract Tagging

10.2.1 Each valve shall be fitted with a rust-resistant metal tag securely attached to it with sufficient twists of stainless steel wire. The same shall apply to other items which are noted as metal tagged in the item description.

10.2.2 Tags shall normally be attached to the gland bolting. Tags on valves that do not have gland bolting may be attached to the hand-wheel or other appropriate location.

10.2.3 Tags shall not be attached through bolt-holes of end flanges.

10.2.4 Each tag shall be clearly stamped with item number and other identification number as specified by Company, including body and trim materials.

10.2.5 If the valve is for special service, an additional tag shall be used spelling out this requirement, e.g. "for Chlorine Service".

10.2.6 The minimum dimension(s) for tags and wire are as follows:

a)	Size of tag	Round 40 mm (1½ inches) dia. Rectangular 12 × 70 mm (½ × 2¾ inches)
b)	Thickness of tag	16 B & S Gage (1.3 mm) minimum
c)	Lettering height	6 mm (¼ inches) minimum
d)	Wire diameter	16 B & S Gage (1.3 mm) minimum

Note:

B & S stands for Brown and Sharp.

11. PACKING

Valve packing shall meet the requirement of BS 1133 Section 2.

12. HANDLING AND SHIPPING

12.1 Gate and Globe valves shall be in closed position for shipment, plug and ball valves shall be in open position and flapper of check valves shall be protected from movement during shipment. Butterfly valve's disc shall be unseated before shipment.

12.2 All soft seated valves shall be packed in open position.

12.3 Valves shall be shipped with a correct stem packing installed and with a gland-follower sufficiently tightened to prevent in-service leaking.

12.4 Openings shall be closed with a metal, wood or plastic protector to exclude dirt and other foreign matter from the interior of the valve; for flanged valves these shall be no smaller than the flange-outside diameter.

12.5 Provision shall be made to prevent disposition of the valves closure element during shipment.

13. GUARANTEE

13.1 The manufacturer/supplier shall guarantee his equipment during commissioning and for one year operation starting from the completion of seven days continuous service test "in site" at full load, against the following defects:

a) All operational defects.
b) All material defects.
c) All constructional and design defects.

13.2 All defective parts shall be replaced by the supplier in the shortest possible time, free of charge. The cost of dismantling, reassembling at site and all transportation involved shall be borne by the supplier.

13.3 The supplier shall guarantee the provision of spare parts with the same standard specification and tests of the original equipment to the Purchaser for a minimum period of 10 years from the date of dispatch of the valve.

13.4 In the event that the supplier cannot supply the required spares (whether of his own manufacture or others) within this period of time, the cost of complete replacement units shall be borne by the supplier.

14. REJECT CAUSES

The valve may be rejected if measurement, inspection and/or testing, reveal discrepancies between quoted figures in purchase documents and those obtained actually.

15. DOCUMENTATIONS AND LANGUAGE

All Vendor supply documentations including all correspondence, literature, drawings and data shall be as per ISO documentation and drawing standards, and shall be prepared in English.

Offers in languages other than English shall not be accepted.

Drawings, certificates and other documents shall be submitted by manufacturer in standard robust files. The files containing the documents shall have proper classification and numbering for easy reference.

16. DRAWING AND DATA

The supplier shall provide the Purchaser the following drawings and data at no extra cost to the Purchaser.

16.1 With Quotation

4 sets of:

a) Comprehensive catalogues, technical data, outline drawings, derating curves, proposed test procedure, service facilities etc., of the equipment offered and its various components:

b) Preliminary connection and wiring diagrams, if applicable, dimensional and cross sectional drawings.

c) Declaration of confirmation with the set standards and/or clear indication of deviations from the standards and specification.

d) Reference list showing the location of successful continuous operation for at least two years in major oil or pipeline companies, of the offered valve(s).

e) Recommended commissioning and 3 years running consumables and spare parts separately listed, numbered, referenced, duly priced and approximate normal delivery time and stocking points given.

f) Recommended special tools for maintenance and installation with price list.

16.2 After Placing Order (60 Days At Latest)

5 sets of:

g) Shipping dimensions (length, width and height) and weight with shipping schedule.

The quotation will be rejected as incomplete if the above required information are not included.

h) Piping, wiring and dimensional/outline drawings and foundation plans, if applicable, specially given size, location of various connections to the outside equipment and recommended installation details for purchaser's approval.

i) Proposed tests procedure for Purchaser's approval.

j) Reproducibles (1 set only) of above mentioned drawings after approval duly certified by the manufacturer/supplier. No dimensional changes will be allowed after approval.

k) Prints of certified drawings as well as agreed and approved test procedure.

l) Detailed manufacturing and testing program for the equipment and its components. Monthly progress report shall be submitted to the Purchaser at the end of each calendar month.

16.3 Before Delivery

15 sets:

m) Codes and standards compliance certificates;
n) Final connection and wiring diagrams;
o) Installation, operation and maintenance manuals;
p) Factory test certificates, including test data and calculated results (when ready);
q) Illustrated and numbered parts list and final revision of 3 years running spare parts list. (Refer to the attached spare parts list and interchangeability record, SPLIR).

The above drawings and data, provision of which is the manufacturer/supplier's obligation, shall include but not limited to the followings:

i) Certificate of shop inspection;
ii) Welding procedure and welder qualifications;
iii) Non-destructive test certificates;
iv) Certified reports giving chemical analysis and physical properties of steel and lining materials;
v) Hydrostatic test certificates;
vi) Certified dimensions and sectional drawings.

PART II
GATE VALVES

1. SCOPE

This Standard covers minimum requirements for design, fabrication, material inspection and tests of gate valves to be installed both in on-plot and off-plot piping.

For the valves within the scope of this Standard specification, the limitation stated in the following standards, as applicable, shall govern.

ANSI - ASME - B31.1	"Power Piping"
ANSI - ASME - B31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI - ASME - B31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Amonia and Alcohol"
ANSI - ASME - B31.8	"Gas Transmission and Distribution Systems"

2. REFERENCES

For the valves within the scope of this Standard specification, the following sources and references with the supplement, which will be discussed thereafter, shall be used.

API (AMERICAN PETROLEUM INSTITUTE)

SPEC 6 D	"Specification for Pipeline Valves (Steel Gate, Plug, Ball, and Check Valves)"
SPEC 6 FA	"Specification for Fire Test for Valves"
Std. 600	"Steel Gate Valves, Flanged and Buttwelding Ends"
Std. 602	"Compact Steel Gate Valves"
Std. 603	"Class 150, Cast Corrosion-Resistant, Flanged-End Gate Valves"
Std. 606	"Compact Carbon Steel Gate Valves-Extended Body"
Std. 607	"Fire Test for Soft-Seated Quarter-Turn Valves"

BSI (BRITISH STANDARDIZATION INSTITUTE)

BS 5151	"Specification for Cast Iron Gate (Parallel Slide) Valves for General Purposes"
BS 5154	"Specification for Copper Alloy Globe, Globe Stop and Check, Check and Gate Valves"
BS 5157	"Specification for Steel Gate (Parallel Slide) Valves for General Purposes"
BS 6755 Part 2	"Specification for Fire-Type Testing Requirements"

ANSI / AWWA (AMERICAN NATIONAL STANDARD INSTITUTE / AMERICAN WATER WORK ASSOCIATION)

C 500	"Gate Valves for Water and Sewage Systems"
C 501	"Cast-iron Sluice Gates"
C 509	"Resilient-Seated Gate Valves for Water and Sewerage Systems"

ANSI / ASME (AMERICAN NATIONAL STANDARD INSTITUTE / AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ANSI/ASME	B 1.20.1	"Pipe Threads, General Purpose"
ANSI/ASME	B 16.4	"Cast-iron Threaded Fittings, Classes 125 and 250"
ANSI/ASME	B 16.5	"Pipe Flanges and Flanged Fittings"
ANSI/ASME	B 16.11	"Forged Fittings, Socket-Welding and Threaded"
ANSI/ASME	B 16.15	"Cast Bronze Threaded Fittings, Classes 125 and 250"
ANSI/ASME	B 16.24	"Cast Copper Alloy Pipe Flanges and Flanged Fittings"
ANSI/ASME	B 16.25	"Buttwelding Ends"
ANSI/ASME	B 16.34	"Valves-Flanged, Threaded and Welding End"
ANSI/ASME	B 16.42	"Ductile Iron Pipe Flanges and Flanged Fittings"
ANSI/ASME	B 31.1	"Power Piping"
ANSI/ASME	B 31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI/ASME	B 31.4	"Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohol"
ANSI/ASME	B 31.8	"Gas Transmission and Distribution Piping Systems"

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

SP-6	"Standard Finishes for Contact Faces of Pipe Flanges and Connecting End Flanges of Valves and Fittings"
SP-44	"Steel Pipeline Flanges"
SP-70	"Cast Iron Gate Valves, Flanged and Threaded Ends"
SP-80	"Bronze Gate, Globe, Angle and Check Valves"
SP-81	"Stainless Steel, Bonnetless, Flanged Knife Gate Valves"

3. DIMENSIONS AND PRESSURE - TEMPERATURE RATINGS

Dimension and pressure-temperature ratings of gate valves shall meet the requirements of the following standards:

3.1 Face to face (end to end) dimensions of valves shall be as per the related standards. Valves having dimensions not listed in the related standard shall be per manufacturer standard with prior approval of the purchaser

3.2 End flanges dimensions shall conform to the following standards:

3.2.1 Steel and nickel base flanges up to DN 600 (NPS 24)	Per ANSI/ASME-B 16.5
3.2.2 Steel and nickel base flanges over DN 600 (NPS 24)	Per MSS-SP-44
3.2.3 Cast iron flanges	Per ANSI/ASME-B 16.1
3.2.4 Bronze flanges	Per ANSI/ASME-B 16.24

3.3 Flanges surface finishing shall conform to standard MSS-SP-6. Where a smooth finish is specified, the gasket contact surface roughness shall be 100-150 Ra in accordance with MSS-SP-6.

3.4 Buttwelding ends shall conform to standards — ANSI-ASME B 16.25/31.1/31.3/31.4/31.8 as Applicable

3.5 Socket welding ends shall conform to standard — ANSI/ASME-B 16.11

3.6 Threaded ends shall conform to the following standards:

3.6.1 Steel and nickel base valves: — Per ANSI/ASME-B 1.20.1

3.6.2 Cast iron valves — Per ANSI/ASME-B 16.4

3.6.3 Bronze valves — Per ANSI/ASME-B 16.15

3.7 Gate valves pressure-temperature ratings shall conform to the following standards:

3.7.1 Valves of steel and nickel base alloys generally — Per ANSI/ASME-B 16.34 or API 6D as Applicable

3.7.2 Ductile iron valves — Per ANSI/ASME-B 16.42

3.7.3 Cast iron valves — Per ANSI/ASME-B 16.1

3.7.4 PN 120 (ANSI 800) — Per API 602

4. DESIGN AND CONSTRUCTION

4.1 General Requirements

Design and construction of gate valves shall generally meet the requirements of the following standards:

4.1.1 All classes of carbon and ferritic alloy steel DN 25 (NPS 1) and higher, stainless steel and nickel base alloy, flanged and buttwelding ends double disc and wedge gate valves — Per API-STD-600-1988 or API-STD-6D-1994 as Applicable

4.1.2 Unless otherwise specified, smaller than DN 80 (NPS 3), flanged ends gate valves (compact design) may be furnished to API 602 or API 606 As Applicable.

4.1.3 PN 20 (ANSI 150) and PN 50 (ANSI 300) stainless steel and nickel base alloy flanged ends, wedge gate valves. — Per API-STD. 602 API-STD. 603 as Applicable

4.1.4 PN 130 (ANSI 800), Carbon, ferritic alloy and stainless steel and nickel base alloy, threaded and socket welding ends, wedge gate valves up to DN 50 (NPS 2) — Per : API-STD. 602 API-STD. 606 as Applicable

4.1.5 Carbon, ferritic alloy, stainless steel, through conduit gate valve s — Per API-STD. 6D

4.1.6 Parallel slide steel gate valves — Per BS-STD. 5157

4.1.7 Stainless steel bonnetless, wafer (knife) gate valves — Per MSS-SP-81

4.1.8 Cast Iron, flanged ends, wedge gate valves — Per MSS-SP-70

4.1.9 Cast Iron, threaded ends, wedge gate valves — Per MSS-SP-80

4.1.10 Cast Iron, parallel slide gate valves — Per BS-STD. 5151

4.1.11 Cast Iron gate valves for water and sewerage — Per ANSI/AWWA-C500

4.1.12 Cast Iron sluice gate valves for water supply and waste water services — Per ANSI/AWWA-C501

4.1.13 Cast Iron resilient seated gate valves for general water and sewerage — Per ANSI/AWWA-C509

4.1.14 Copper alloy gate valves up to DN 100 (NPS 4) PN 20 (ANSI 150) and PN50 (ANSI 300) — Per BS-STD. 5154

4.1.15 Bronze valves up to and including DN 80 (NPS 3) — Per MSS-SP-80

4.2 Fire Safe Design

Unless otherwise specified in data sheet, all steel gate valves shall have fire safe design and capability of meeting the requirements of API 6FA, BS 6755 Part 2 and API 607 as applicable.

4.2.1 The following terminology shall be used:

a) Fire safe design : A design that by nature of its features and properties is capable of passing a fire test.
b) Fire tested design: A design subjected successfully to fire testing.

4.2.2 Soft-seated valves shall have a fire-tested design. Metal-seated valves shall have a fire-safe design. A handwheel or gear operator shall have a fire-safe design.

4.2.3 Any special provision for protecting actuator system against fire shall be stated in the Purchase requisition.

4.2.4 Fire testing shall be done in accordance with API 6FA or BS 6755 Part 2 or API 607. Existing certificate to these standards is acceptable.

5. SUPPLEMENT TO REFERENCE STANDARDS

SECTION ONE API-6D 1994

SECTION TWO API-600 1987

SECTION THREE API-602 1985

5.1 For ease of reference, the clause or section numbering of reference standards has been used.

5.2 For the purpose of this standard, the following definitions shall hold:

Sub.(Substitution): "The Clause in Reference Standard Is Deleted and Replaced by a New Clause".

Del. (Deletion): "The Clause in Reference Standard Is Deleted without Any Replacement"

Add.(Addition): "A New Clause with a New Number Is Added"

Mod. (Modification): "Part of Reference Standard Clause Is Modified and/or a New Description and/or Statement Is Added to that Clause"

SECTION ONE API-6D 1994

1.1 This Standard applies to through conduit gate valves, with flanged or butt-welding ends, in nominal sizes DN50 (NPS 2) and larger in PN20 (ANSI 150) to PN 420 (ANSI 2500) designed and manufactured to API 6D. **(Mod.)**

2.1 Bonnets shall have at least four bolts or other fasteners. Other method of attachment shall be subject to prior agreement. **(Mod.)**

2.7 Unless otherwise specified in data sheet all buttwelding ends of gate valves, shall be furnished with two pipe transition pieces, welded to each end of the valve. The diameter of each transition piece shall be equal to valve nominal diameters. The length of each piece shall be equal to valve DN (NPS) or 300 mm (12 inches) whichever is greater. The material and wall thickness of transition piece shall be same as those of connecting pipe which are specified in Appendix A1 of this Standard. The transition piece shall be shop welded and fully radiographed with X-ray prior to valve test. Post weld heat treatment, if required, shall be conducted after welding of transition pieces. **(Mod.)**

2.10 Pressure Relief

2.10.1 Unless otherwise specified for valves DN 100 (NPS 4) and over a bleed connection position G or H per ANSI B 16.34 Fig. 1 shall be provided to permit valve testing in situ: Bleed fitting shall have an anti-blow out design. **(Add.)**

2.10.2 Body cavity over pressure shall be prevented by self-relieving seat rings/assemblies unless otherwise specified. Self relieving seatrings shall relieve at a body cavity differential pressure not exceeding 50% of the valve PN (ANSI) pressure rating class. **(Add.)**

2.11 Drain and By-Pass Connections

All double block and bleed valves shall have a vent and a drain. The drain connection shall be at the lowest possible position on the valve body, the vent connection at the highest possible position. DN 100 (NPS 4) valves and smaller may have a combined drain and vent connection, which shall be at the lowest possible position. The drain connection shall have a drain valve. The vent connection shall have a bleed fitting of an anti-blow out design. **(Mod.)**

2.15 Stem and Stuffing Box **(Add.)**

2.15.1 Gate valve DN 50 (NPS 2) and larger with rating PN 50 (ANSI 300) and over shall be equipped with lantern rings in the stuffing box where a DN 8 (NPS ¼) tapped hole completed with plug shall be provided for sealant injection and drain.

2.15.2 Stem sealing should be by mechanically energized "U" or "V" rings with lantern rings included to allow secondary sealant injection.

2.15.3 Diametral clearances of the parts around the stem shall be such that stem can never touch components that may damage the stem.

2.15.4 The rising stem shall be fully enclosed by a dust proof stem protector or Yoke tube and extended with an exposed indicator rod.

2.16 Seat Rings **(Add.)**

2.16.1 Seat rings shall be renewable with the valve in the line and shall provide both a soft seal and a metal-to-metal seal with the gate. The purchase requisition shall state when only a metal-to-metal seal is required.

2.16.2 The seat rings shall be spring energized to ensure upstream sealing at low differential pressures. For sealing at higher differential pressures the seat rings shall be line-pressure energized.

2.16.3 Differential pressure shall also move the gate into the downstream seat to give a downstream seal. The design of seat ring and body shall be such that entrapment of solids present in the fluid will not obstruct free movement of the seat rings and will not reduce any spring action.

2.16.4 Valve shall be capable of being pigged, sphered and scraped regularly without debris being pushed between the valve seats and the gate or into the seat ring assembly. The bore of the valve in the open position shall present as smooth a profile as possible to a passing pig or scraper.

2.17 Buried Valves (Add.)

2.17.1 Valves to be installed under ground may have a stem extension as specified in purchase document. The design of the stem extension shall be subject to the approval by the purchaser. The extension shall be fully enclosed. The enclosure shall be water-proof and have a pressure relief system to prevent pressure-build-up in the event of a stem seal failure.

2.17.2 When extended stem is specified, extension lines for drain, vent and sealant injection shall adequately be clamped to the valve body or stem extension to avoid damage due to vibration and reaction forces of sealant injection or scaping medium. Drain and vent lines shall be the same size as the connection to the valve body. The extension lines shall be suitable for the valve class (or sealant injection pressure for the sealant line, whichever is the higher). Extension lines shall be fully butt-welded according to ANSI/ASME B31.3 and shall allow disconnection at the body cover flange level. For sealant injection lines, unions may be used. The extension lines shall end approximately 100 mm. (4 inches) below the top flange of the stem extension.

2.17.3 Double valving is required in vent and drain lines, one valve close to the connection to the valve body and one valve at the end of the extension line, at the highest possible position. The latter shall be blanked-off. The sealant injection lines shall have a grease fitting at the highest point.

2.18 Bearings (Add.)

Stem yoke nut of DN80 (NPS 3) and larger for PN 420 (ANSI 2500) and DN 150 (NPS 6) and larger for PN 100 (ANSI 600), PN 150 (ANSI 900) and PN 250 (ANSI 1500) shall be equipped with anti friction thrust bearing.

3.3 Non-Metallic Parts

3.3.1 The section size of elastomers in PN 150 (ANSI 900) and above shall be less than 7 mm (0.3 in.) to withstand explosive decompression. An elastomer may only be used for the valve seats in PN 20-100 (ANSI 150-600). **(Add.)**

3.4 Other Parts

3.4.1 The possibility of galling between component of similar metallic composition shall be considered by the manufacturer. **(Add.)**

3.4.2 Where electrolysis nickel plating is specified for corrosion protection, local overlays or bushing may be used as an alternative after Company approves that nickel plating can not be offered. The following areas would need protection:

- Adjacent to seat rings and seat springs (seat pockets)
- Back seat **(Add.)**

4.1.1 Gate Valves

4.1.1.1 Unless otherwise specified, valves shall be of rising stem type. **(Add.)**

SECTION TWO API-600 1987

1.1.1 This Standard applies to flanged and buttwelding end carbon steel, low alloy and high alloy steel, nickel alloy and nickel/copper alloy, soft and metal seated gate valves. **(Mod.)**

1.3.1 The manufacturer shall specify the rated pressure for soft seats at temperature above 50°C. **(Mod.)**

2.1.9.3 Swaged/rolled/pressed in seat rings are not acceptable. Threaded-in seat rings shall be properly secured. **(Add.)**

2.2.5 Bonnet backseat (Mod.)

a) Rolled/pressed-in back seat bushing are only acceptable when additionally secured against loosening. (see 2.12).
b) Threaded-in back seat bushing shall be properly secured. (see 2.12).
c) Flat seating faces are not acceptable.

2.3.8 Gate Seats (Mod.)

a) Rolled-in facing rings are not acceptable.
b) 13 cr and Austenitic stainless steel deposition on carbon steel material, without a buffer layer is not acceptable.
c) Sprayed deposit layers are not acceptable, other method shall be approved by the Purchaser.

2.11 Soft Sealing (Add.)

2.11.1 Soft sealing rings may be placed in either the body seats or the closure member, but the latter option is preferred.

2.11.2 A soft sealing arrangement shall have a secondary or primary metal to metal sealing arrangement incorporated in the design.

2.12 Securing (Add.)

2.12.1 Positively securing against loosening shall primarily be done by means of tack-welding.

2.12.2 When valve parts are made from different materials or when materials are non-weldable other methods of locking may be acceptable depending upon the method and place of execution.

The other methods are:

a) Locking ring
b) Retaining strip or tab
c) Screws with close fit thread
d) Spring tension pins

These methods are subject to approval by the Purchaser.

2.12.3 Screwed-in seat rings of martensitic (13 Cr) material shall be secured by means of a steel tab of which one end is positioned in the driving slot of the seat and the other end welded to the valve body.

2.12.4 Spring tension pins are not allowed for locking of internals.

3.5 Yoke (Mod.)

3.5.1 The yoke shall have provisions for an extended stem or actuator/gear box mounting flange incorporated in the design when applicable or when specified.

3.5.2 When a yoke sleeve is retained to the yoke by means of a retaining nut, the latter shall be secured to the yoke (see 2.12).

3.11 Stem Packing

Packing design temperature should be corrected to 538°C (1000°F). **(Mod.)**

SECTION THREE API-602 1985

1.1.1 This Standard applies to carbon steel, low alloy and high alloy steel, nickel alloy and nickel/copper alloy, flanged, buttwelding, socket welding, threaded end gate valves corresponding to nominal pipe sizes in ANSI B36.10. **(Mod.)**

1.1.3 For nickel/copper alloy valves, API 602 shall be the guidance for design, dimension, marking, inspection and testing. **(Add.)**

2.2 End Connections

2.2.10 End flanges or stubs of nickel/copper alloy valves shall be cast or forged integral with the valve body, unless attachment by welding is approved by the Purchaser. **(Add.)**

2.10 Seat Rings

2.10.1 Screwed-in seat rings shall be properly secured, it shall be done by means of tack-welding. (Add.)

2.10.2 When valve parts are made from different materials or when materials are non-weldable, the following methods of locking may be acceptable.

a) Locking ring
b) Retaining strip or tab
c) Screws with close fit thread **(Add.)**

VOLUME TWO

BALL VALVES

CONTENTS :

PAGE No.

1. SCOPE

This Standard covers minimum requirements for purchasing ball valves.

2. REFERENCES

Throughout this Standard the following standards and codes, with the supplement as applicable, are referred to. The editions of these standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standard and codes that occur after the date of this Standard shall be mutually agreed upon by the purchaser and the manufacture.

3. PRESSURE/TEMPERATURE RATINGS

Ball valves pressure/temperature ratings shall conform to the following standards:

ANSI/ASME-B16.34	"Steel and Nickel Base Valves"
ANSI/ASME-B16.42	"Ductile Iron Valves"
ANSI/ASME-B16.1	"Cast Iron Valves"

4. DESIGN AND CONSTRUCTION

Design and construction of ball-valves shall generally meet the requirements of the following standards:

4.1 Steel and nickel base ball valves flanged and butt welding ends.

PN 20 (ANSI 150) and PN 50 (ANSI 300) up to DN 300 (NPS12) incl.:

	API 6D	
	API 608	As Applicable
	BS 351	

DN 50 (NPS 2) and larger PN 20 (ANSI 150) up to PN 420 (ANSI 2500):

	API 6D	
	BS 6351	As Applicable
PN 100 (ANSI 600) and over	API 6D	
All Pipeline Valves	API 6D	

4.1.2 Steel and nickel base ball valves, threaded ends and socket welding ends:

Per	BS-5351	
	MSS-SP-84	As Applicable

4.1.3 Cast Iron Valves Per BS-5159

4.14 Ball valves for water services up to 20 bar (300 PSI) CWP per ANSI/AWWA-C-507.

4.2 Fire-safe or Fire-tested Design

The following terminology shall be used:

Fire-tested Design: A design subjected successfully to fire testing.
Fire-safe Design: A design that by nature of its feature and material is capable of passing a fire test.

Fire testing shall be done in accordance with API 6FA or BS 6755. Each valve fire tested, qualifies a valve of the same type and materials up to twice the size, down to half the size, and one pressure rating up and down A DN 400 (NPS 8) valve qualifies all larger sizes.

Soft seated valves shall have a fire-tested design. Metal seated valves shall have a fire-safe design. Any special provision for protecting actuator system against fire shall be stated in the purchase requisition.

5. SUPPLEMENT TO BALL VALVES (API 6D - 1994)

5.1 Scope

5.1.1 Modification to coverage (1.1)

This specification applies to soft and metal seated ball valves, full and reduced bore, anti-static design, double block and bleed facility, with flanged or butt welding ends, in nominal size DN50 (NPS 2) and larger in PN20 (ANSI 150) to PN420 (ANSI 2500), designed and manufactured to API 6D-1994. This document is a supplement to API 6D and shall be governed where conflict occurs with API 6D.

5.1.2 Add to code, specification and standards (1.2)

Bracketed numbers of this document refers to relevant paragraph in API 6D-1994. Word "Add" represents addition to API-paragraph and word "Mod" represents the modification of the paragraph.

5.2 General

5.2.1 "Mod" to valve classes (2.1)

Valve covered by this Standard shall be furnished in the following pressure ratings:

ANSI RATING	PN RATING
150	20
300	50
400	64
600	100
900	150
1500	250
2500	420

5.2.2 Overall addition to API 6D (Body Construction)

5.2.2.1 The body construction shall be one of the following types:

a) Top entry with flanged or butt-welding ends. Joint material shall be approved by the Purchaser.

b) Split type with one or more bolted flanged joints and with flanged ends joint material shall be approved by the Purchaser.

c) Fully welded spherical body with flanged ends. Fabrication from plate is not permitted.

5.2.2.2 Two or three piece body forgings are only acceptable if the manufacturer can demonstrate by flange calculations to a national standard acceptable to the Purchaser that the valve shows no relevant detrimental distortion under load.

5.2.2.3 The valve body shall have sufficient rigidity to withstand a comprehensive axial thrust exerted by the connected piping, equal to the design pressure multiplied by the area of the maximum valve bore, without permanent distortion of the body or affecting the free movement of the ball and sealing of the seats.

5.2.2.4 Bolted covers shall have at least four bolts or other fasteners. Other methods of attachment shall be subject to prior approval of the Purchaser.

5.2.2.5 Bolting of split body flanges shall be studbolts or other fasteners with prior approval of the Purchaser.

5.2.2.6 Ball valve having the ball extending past the flange face are unacceptable without prior Purchaser approval.

5.2.3 "Add" to end flanges (2.5)

5.2.3.1 The body end flanges shall be integrally cast, forged, or butt welded to the body or end adaptors.

5.2.3.2 Studded ends are only permitted with prior approval of the Purchaser.

5.2.4 Add to welding ends (2.6)

5.2.4.1 The supplier shall ensure that weld ends of valve are physically and chemically compatible with the adjoining pipe.

5.2.4.2 Where valve weld ends are not chemically compatible or are of a bevel thickness exceeding 1.5 times the pipe wall thickness, transition pieces having physical and chemical characteristics compatible with the adjoining pipe shall be provided as per 5.2.4.1 thru 5.2.4.4 of this Standard.

5.2.4.3 The manufacturer of valves with soft seals shall advise on the field welding of valves with shorter pup pieces. The purchase requisition shall state the required dimensions and materials of the pup pieces and whether or not they will be supplied free issue.

5.2.4.4 The manufacturer shall advise on the suitability of proposed pup pieces with regard to pressure testing.

5.2.4.5 There shall be a smooth ID transition between welding end and pup piece. For full-bore valves the transition taper shall be at least 1:4.

5.2.4.6 Post weld heat treatment, if required, shall be conducted after welding of transition pieces and before pressure testing.

5.2.5 "Mod" to body connections (2.11, 2.12)

Drain, vent or pressure relief connections to the valve body cavity shall be one of the following methods:

- Fully welded to the body
- Flanged to the body
- NPT Threaded, provided that the thread is protected by an "O" ring above and below the thread.
- NPSC Threaded, provided that the tread is protected by a gasket or "O" ring above and below the thread. The connector shall be secured by an acceptable method such as a locking ring retaining strip or locking pin.

All fittings shall be rated to at least the hydrostatic shell test pressure of the valve.

Note:

NPSC stands for. National Pipe Straight Coarse.

5.2.6 Add to drain and bypass connections (2.12)

5.2.6.1 Unless otherwise specified, valves of DN150 (NPS 6) and larger shall have sealant injection point to seats and stem seal, connected to the body by one of the approved threading methods (NPT, NPSC).

5.2.6.2 All sealant injection connections shall incorporate an internal non-return valve, a giant button head and a cover with vent holes that seals-off the fitting by plugging the sealant injection port.

5.2.6.3 Add to (2.11) all Trunnion-mounted valves shall have a vent and drain. The drain connection shall be at the lowest possible position on the Valve body, and the vent connection at the highest possible position. DN 100 (NPS 4) valves and smaller may have a combined drain and vent connection, which shall be at the lowest possible position.

5.2.6.4 The sealant injection position shall be to the manufacturer's recommendation but subject to the purchaser approval.

5.2.6.5 The vent connections shall have a bleed fitting of an anti-blow out design. The drain connections shall have a drain plug or blind flange.

5.2.6.6 No vent or drain are needed for floating ball valves.

5.2.7 Overall addition to API 6D (Buried Valves)

5.2.7.1 Valves to be installed in buried lines shall be supplied with a stem extension, long enough for the operator, to be approximately 1.5 meter above the grade level. The cover depth (from top of the pipe to grade level) shall be given in the purchase requisition

The design of the stem extension shall be subject to approval by the Purchaser. Operating force, operator weight and soil loading shall be considered.

5.2.7.2 The extension shall be fully enclosed. The enclosure shall be water-proof and have a pressure relief system to prevent pressure built up of a stem seal failure.

5.2.7.3 When a relief valve is fitted on a buried installation, the relief valve should be located above ground and discharged in accordance with ANSI B31.4/31.8.

5.2.7.4 Extension lines for drain and sealant injection, adequately clamped to the valve body or stem extension to avoid damage due to vibration and reaction forces of sealant injection or escaping medium.

5.2.7.5 For sealant injection lines, unions may be used.

5.2.7.6 The extension lines shall end approximately 100 mm (4 inches) below the top flange of the stem extension.

5.2.7.7 Double valving is required in vent and drain lines, one valve close to the connection to the valve body and one valve at the end of the extension line, at the highest position; the valve on the extension line shall be blanked-off. The drain valves shall be located above ground and discharged in accordance with ANSI B31.4 or B3.18 as applicable.

5.2.7.8 The sealant injection line shall have a grease fitting at the highest point.

5.2.7.9 All exterior surfaces of valves and operators shall be carefully protected against the harmful effects and ingress of water, sand, saline compounds, and any other atmospheric agent.

5.2.8 Overall addition to API 6D (Ball)

5.2.8.1 The ball shall be one piece casting or a forging. The ball port shall be cylindrical.

5.2.8.2 When hard chromium or electroless nickel plating is specified, it shall have final mirror finish preparation and min. Thickness of 25 μm according to ASTM B650 and ASTM B656 respectively.

5.2.8.3 A pressure-equalizing path between valve cavity and bore in the open position is not preferred, because the possibility of seat testing in the open position in service is lost. The presence of such a connection shall be indicated in the purchase requisition.

5.2.8.4 Unless otherwise agreed with the Purchaser, the ball shall be trunnion mounted, for bore size DN80 (NPS 3) and larger.

5.2.9 Overall addition to API 6D (Seat Rings)

5.2.9.1 Seat rings shall be renewable and may be one of the following types:

a) Ring with a soft insert positively locked in position.
b) Composite assembly with an "O" ring or soft insert confined between separate rings which are positively locked together.

5.2.9.2 Seat seals shall be:

a) Tight in normal operation.
b) Capable of continued metal to metal operation in event of exposure to fire.
c) Fitted with facility for injection of sealant for continued operation on failure of primary seal.

5.2.9.3 The seat rings shall be spring energized to ensure sealing at low differential pressure. For sealing at higher differential pressure the seat rings shall be line pressure energized.

5.2.9.4 The design of seat ring and body shall be such that entrapment of solids present in the fluid don't obstruct free movement of the seat rings and not reduce any spring action.

5.2.9.5 Full bore valves shall be capable of being pigged, sphered and scraped, regularly without debris being pushed between the valve seats and the ball or into the seating assembly.

5.2.9.6 When more consistent wear pattern is desired and also for helping the secondary sealant to be worked fully around the sealing area of the valve after injection, rotating seat rings shall be used with prior Purchaser approval.

5.2.10 "Add" to body cavity relief (2.10, A4)

5.2.10.1 Body cavity over-pressure shall be prevented by self-relieving seat rings/assemblies unless otherwise specified.

5.2.10.2 A pressure relief hole in the ball is not allowed, unless otherwise specified or agreed by the Purchaser.

5.2.10.3 Self-relieving seat rings shall relieve a body cavity differential pressure not exceeding 50% of the valve class rating pressure.

5.2.11 Overall addition to API 6D (Stem and stem seal)

5.2.11.1 The stem shall be sized such that both its smallest cross section and connection to the ball shall withstand the maximum side loads and operating torque needed to seal and to operate against the maximum class differential pressure (applied to one or both sides of the valve, whichever case needs the higher torque).

5.2.11.2 The stem of actuator-operated valves shall be sized to withstand the maximum output torque of the actuator in addition to side loads due to differential pressure.

5.2.11.3 Valve design shall have provision for mounting an extended stem and/or an actuator.

5.2.11.4 The stem may be integral with the ball or separate. A separate stem shall be held by a bonnet or cover flange and designed such that a blow-out can not take place.

5.2.11.5 Stem retaining parts shall be capable of withstanding the full internal pressure/temperature rating of the valve and the hydrostatic shell test pressure.

5.2.11.6 The drive mechanism between stem and ball shall be one of the following methods:

- Slot and tongue
- Drive pins
- Interference fit (shrink fit)
- Interference fit (shrink fit) and drive pins
- Splines

5.2.11.7 It shall be impossible to re-assemble the ball and stem such that the stem is 90° out of phase with the ball.

5.2.11.8 Diametral clearances of the parts around the stem shall be such that the stem can never touch components that may damage the stem.

5.2.11.9 For wrench operated valves, the stem head shall be circular and either have two flats parallel to the valve bore or a keyway in line with the valve bore. Square heads are not allowed. Other construction requires Purchaser approval.

5.2.11.10 The method of stem sealing shall be approved by the purchaser. "U" or "V" seals shall be spring energized. Stem seal shall be designed for easy replacement while the valve is in the open position.

5.2.11.11 Add to (2.12). Valve stem extension shall be detachable for easy replacement.

5.2.12 Operation

5.2.12.1 Mod to (2.14)

Valves shall be furnished with a position indicator, showing open position in the direction of flow and close position perpendicular to the direction of flow. The shut and upon terms (in English) shall be permanently indicated in a visible location. Position indicator shall also show the intermediate positions.

5.2.12.2 The fully open position of the ball bore shall be within 1° of percent alignment at the valve body bore.

5.2.12.3 Add to (2.12). Valve wrench length shall be less than twice the face to face length of the valve.

5.3 Overall Addition to "Material" Section 3

5.3.1 Section size of elastomers for resistance to explosive decompression in PN150 (ANSI 900) and above services shall be less than 7 mm.

5.3.2 For lower than PN150 (ANSI 900) high grade teflon filled or teflon seating against 18:10:3 (A316) stainless standard trim ball and stem (except as otherwise specified) and to be generally in accordance with Purchaser's requirement.

5.3.3 Valves made from casting shall be of X-ray quality Class 2 as defined by ASTM E-446 and ASTM E-112.

5.3.4 Where electroless nickel plating is specified on the body and bonnet for corrosion protection, local overlays or bushing may be used as an alternative after the Purchaser approval. The following areas would need protection:

- Adjacent to seat rings and seat springs (seat pockets)
- Adjacent to stem seal (if seal is an "O" ring).

6. SUPPLEMENT TO BALL VALVES (BS 5351: 1986 AMDT 1990)

6.1 Scope

6.1.1 Mod to scope (1)

This specification applies to flanged, B.W. and threaded end ball valves, reduced and full bore, soft and metal seated, carbon steel, low and high alloy steel nickel alloy, nickel/copper alloy, aluminum alloy and copper alloy valves in nominal size and PN (ANSI) rating, generally in accordance with BS 5351. This document is a supplement to the pertaining design standard and shall be governing where conflict occurs.

The requirement of this Standard shall be considered to be part of the description of the valves when referred to in a requisition.

6.1.2 For nickel alloy, nickel/copper alloy, aluminum alloy and cooper alloy valves, BS 5351 and this supplement shall only be the guidance for the design, dimension and marking.

6.1.3 The numbers between brackets, in this Standard, refer to the relevant paragraph in BS 5351:1986 Amdt:1990.

SECTION TWO : DESIGN

6.2 General Design Criteria

6.2.1 Pressure class, size range and body construction carbon steel, low alloy and high alloy steel:

ENDS	BORE	PRESSURE RATING PN (ANSI RATING)	NOM. SIZE DN (NPS)	BODY
Flanged	Red	20-50-100 (150-300-600)	15 up to incl. 250 (½-10)	One piece
		20-50-100 (150-300-600)	50 up to incl. 300 (2-12)	One or two pieces
	Full	20-50-100 (150-300-600)	15 up to incl. 300 (½-12)	One or two pieces
B.W.	Red or Full	20-50-100 (150-300-600)	50 up to incl. 300 (2-12)	One or two pieces
Threaded	Red	(800)	8 up to incl. 40 (¼-1¼)	One piece

6.2.2 NICKEL ALLOY AND NICKEL / COPPER ALLOY

Flanged	Red	20-50 (150-300)	15 up to incl. 250 (½-10)	One piece
		20-50 (150-300)	150 up to incl. 300 (6-12)	One or two pieces
	Full	20-50 (150-300)	15 up to incl. 300 (½-12)	One or two pieces
Threaded	Red	(600/800)	8 up to incl. 40 (¼-1½)	One piece

6.2.3 ALUMINUM ALLOY

Flanged	Red	20 (150)	15 up to incl. 150 (½-6)	One piece

6.2.4 COPPER ALLOY

			15 up to incl. 40 (½-1½)	One piece
Flanged	Red	20 (150)	50 up to incl. 150 (2-6)	One or two pieces
Threaded	Red	64 (400)	8 up to incl. 40 (¼-1½)	One piece

6.3 Overall Addition to Pressure / Temperature Rating - seat (6.0)

Seat for all metal seated and soft (resilient) seated of trunnion mounted valves shall be capable of withstanding in either flow direction.

6.4 Overall Addition to Design (8.1)

For split body construction.

6.4.1 The body split shall be outside the plane of the stem protrusion, unless symmetrical body splits are approved by the Purchaser.

6.4.2 Body insert shall be of the threaded type and shall have a primary seal close to the seat and a secondary seal at the landing with the body. The landing arrangement shall be such that assembly tolerances are eliminated.

6.4.3 Bodies fabricated from plate material are not acceptable.

6.4.4 Screwed body/cover connection are not acceptable.

6.5 Overall Addition to BS (Body Cavity Relief)

6.5.1 Trunnion mounted valves shall have the construction of the body seat rings or ring assemblies such that body cavity relief is possible unless otherwise specified.

6.5.2 Self-relieving seat rings shall relieve at a body cavity differential pressure not exceeding 33% of the rated pressure at maximum design temperature as per the appropriate class.

6.5.3 A pressure relief hole in the ball, body or seat is not allowed, unless otherwise specified.

6.6 Add to Flanged and Extended Weld Ends (8.4)

6.6.1 End flanges or stubs of nickel alloy, nickel/copper alloy, aluminum alloy and copper alloy valves shall be cast or forged integral with the body or body connector, unless attachment by welding is approved by the Purchaser.

6.7 Add to Stems Ball Shanks, Stem Extensions

6.7.1 Provisions for mounting an extended stem, an extended bonnet or an actuator/gearbox shall be incorporated in the design for valves DN50 (NPS2) and larger.

6.7.2 The stem shall be sized such that both its smallest cross section and connection to the ball are capable of withstanding the maximum torque required to operate the valve against the maximum specified differential pressure.

6.7.3 The design of valve stem, ball and operating mechanism shall be such that ball and operating mechanism have only "one" unique position after assembly. Any stem extension or actuator shall not influence this requirement.

6.8 Add to Stem retention (8.6)

6.8.1 The anti blow-out stem/body configuration shall be capable of withstanding the full internal pressure of the valve as per the appropriate class.

6.8.2 Stem retention by means of body/stem thread is not acceptable.

6.8.3 The stem retainer ring or collar shall be integral with the stem.

6.8.4 The stem retention shall be designed as a proper (axial) bearing, unless a proper bearing has been incorporated in a different manner.

6.9 Add to Gland (8.7)

6.9.1 A lantern ring is not allowed, unless specified otherwise.

6.9.2 The dimension of a stuffing box shall be based on square section packing of a nominal width of not less than 3 mm and shall have a minimum depth to two packing rings.

6.9.3 The bottom of a stuffing box shall be flat.

6.9.4 The gland shall be adjustable.

6.9.5 The maximum diametral clearance between the stuffing box diameter and the outside diameter of the gland (follower) shall be half the actual diametral clearance between the inside diameter of the gland (follower) and the stem diameter.

6.10 Add Ball (8.9)

6.10.1 The ball shall be of a trunnion mounted or other individually supported design in the following sizes:

BORE (REDUCED OR FULL)	PN (ANSI RATING)	NOM. DIAMETER DN (NPS)
Reduced bore	20 and 50 (150 and 300)	300 and larger (12 and larger)
Full bore	20 and 50 (150 and 300)	250 and larger (10 and larger)
Reduced bore	100 (600)	100 and larger (4 and larger)
Full bore	100 (600)	100 and larger (4 and larger)

6.10.2 Unless specified otherwise in the purchase order, the ball shall be provided with a pressure balance hole or equivalent feature. A pressure balance hole shall equalize the pressure between the cavity and the bore when the valve is in the open position.

6.10.3 The ball shall be capable of withstanding the maximum differential pressure, in either flow direction, as per the appropriate class.

6.10.4 Reduced bore valves shall have a circular or cylindrical ball port.

6.10.5 Balls shall be of the solid type, unless other types are approved by the Purchaser.

6.10.6 An integral ball/stem design for seat supported (floating) ball valve is not acceptable.

6.11 Add to Wrenches and Handwheels (8.10)

6.11.1 Wrenches shall have a fixing bolt and/or nut.

6.11.2 Provision for mounting a "Leverlock" type wrench, shall be incorporated in the valve design. This wrench shall be interchangeable with the standard non-locking wrench.

6.11.3 A wrench shall not be longer than twice the face to face or end to end length of the valve.

VOLUME THREE

GLOBE VALVES

PART II

CONTENTS :

PAGE No.

1. SCOPE

This Standard covers minimum requirements for design, fabrication, material inspection and tests of globe valves to be installed both in on-plot and off-plot piping.

For the valves within the scope of this Standard specification, the limitation stated in the following standards, as applicable, shall govern.

ANSI-ASME-B31.1	"Power Piping"
ANSI-ASME-B31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI-ASME-B31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohol"
ANSI-ASME-B31.8	"Gas Transmission and Distribution System"

2. REFERENCES

For the valves within the scope of this Standard specification, the following references with the supplement, which will be discussed thereafter, shall be used.

BSI (BRITISH STANDARDIZATION INSTITUTE)

BS-1873/1975	"Specification for Steel Globe and Globe Stop and Check Valves (Flanged and But-Welding Ends) for the Petroleum, Petrochemical and Allied Industries"
BS-5154/1989	"Specification for Copper Alloy Globe, Globe Stop and Check Valves"
BS-5352	"Specification for Steel Wedge Gate, Globe and Check Valves DN50 and Smaller, for the Petroleum, Petrochemical and Allied Industries"
BS-5152	"Specification for Cost Iron Globe and Globe Stop and Check Valves for General Purposes"

3. DIMENSIONS AND PRESSURE / TEMPERATURE RATINGS

3.1 Face to face/end to end dimension of valves shall be as per related standards.

3.2 Valves having dimensions not listed in the related standards shall be per manufacturer standard with prior approval of the Purchaser.

3.3 End flanges dimensions shall conform to the following standards:

3.3.1 Steel and nicked base flanges — Per ANSI/ASME-B16.5

3.3.2 Cast Iron flanges — Per ANSI/ASME-B16.1

3.3.3 Bronze flanges — Per ANSI-B16.24

3.4 Flanges surface finishing shall conform to standard MSS-SP-6.

3.4.1 Where a smooth finish is specified, the gasket contact surface roughness shall be 100-150 AARH in accordance with MSS-SP-6.

3.5 Butt-welding ends shall conform to standards — ANSI-ASME-B16.25/31.1/31.3/31.4/31.8 as Applicable.

3.6 Socket welding ends shall conform to standard — ANSI-B16.11

3.7 Threaded ends shall conform to the following standards:

3.7.1 Steel and nickel base valves — Per ANSI/ASME-B1.20.1

3.7.2 Cast Iron valves — Per ANSI/ASME-B16.4

3.7.3 Bronze valves — Per ANSI/ASME-B16.15

3.8 Globe valves pressure-temperature ratings shall conform to the following standards:

3.8.1 Steel and nickel base valves — Per ANSI/ASME-B16.34

3.8.2 Ductile Iron valves — Per ANSI/ASME-B16.42

3.8.3 Other ferrous valves — Per ANSI/ASME-B16.1

3.8.4 Copper alloy valves — Per BS 5154-1989

4. DESIGN AND CONSTRUCTION

4.1 Design and construction of globe valves shall generally meet the requirements of the following standards:

4.1.1 Carbon and alloy steel and nickel base flanged ends and butt-welding ends
Per BS 1873

4.1.2 Carbon and alloy steel socket welding, threaded, flanged and butt welding ends up to DN50
Per BS 5352

4.1.3 Cast Iron, flanged ends — Per BS 5152

4.1.4 Copper alloy, flanged and screwed ends up to DN100
Per BS 5154

4.2 Unless otherwise specified in data sheet, all steel globe valves shall have fire safe design and capability of meeting the requirements of the API 6FA, BS6755 Part 2 and API607 as applicable.

4.2.1 The following terminology shall be used:

a) Fire safe design

A design that by nature of its features and properties is capable of passing a fire test.

b) Fire tested design

A design subjected successfully to fire testing

4.2.2 Soft-seated valves shall have a fire-tested design. Metal-seated valves shall have a fire-safe design.

A handwheel or gear operator shall have a fire-safe design.

4.2.3 Fire testing shall be done in accordance with API 6FA, BS 6755 Part 2 or API 607. Existing certificates to these standards is acceptable.

5. SUPPLEMENT TO REFERENCE STANDARD (BS 1873-1975)

5.1 For ease of reference, the clause or section numbering of reference standard has been used.

5.2 For the purpose of this Standard, the following definitions shall hold:

Sub. (substitution): "The Clause in reference Standard is deleted and replaced by a new Clause"

Del. (Deletion): "The Clause in reference Standard is deleted without any replacement"

Add. (Addition): "A new Clause with a new number is added"

Mod.(Modification): "Part of reference Standard Clause is modified and/or a new description and/or Statement is added to that Clause".

1. SCOPE

Unless otherwise specified, globe valves shall be straight pattern type. **(Mod.)**

8. BODY DESIGN

8.9 Tapped holes shall be provided with hexagonal head steel plugs. **(Mod.)**

8.10.1 Rolled in seat rings are not acceptable for DN80 (NPS 3) and larger **(Add.)**

8.10.2 Screwed-in seat rings of 13% chromium seat material shall be secured by means of a steel tab of which one end is positioned in the driving slot of the seat and the other end welded to the valve body. **(Add.)**

18. SOFT SEAL RINGS

18.1 Soft sealing rings may be placed in either the body seat or the closure member, but the following would be preferred:

Flow to open in the body seat
Flow to close in the closure member **(Mod.)**

VOLUME FOUR

PLUG VALVES

PART II

CONTENTS :

PAGE No.

1. SCOPE

This Standard covers the minimum requirements for design, fabrication, material inspection and tests of plug valves to be installed both in on-plot and off-plot piping.

The size of valves within the scope of this standard specification are those specified in reference standards.

For the valves within the scope of this Standard specification, the limitation stated in the following standards, as applicable, shall govern.

ANSI B16.42	"Ductile Iron Pipe Flanges and Flanged Fittings Class 150 & 300"
ANSI-ASME-B 31.1	"Power Piping"
ANSI-ASME-B 31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI-ASME-B 31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohol"
ANSI-ASME-B 36.10	"Welded and Seamless Wrought Steel Pipe"

2. REFERENCES

For the valves within the scope of this Standard specification, the following references with the supplement, which will be discussed thereafter, shall be used.

API-SPEC-6D	"Specification for Pipeline Valves"
API-STD-599	"Steel and Ductile Iron Plug Valves"
API-STD-602	"Compact Steel Gate Valves"
API-STD-606	"Compact Carbon Steel Gate Valves-Extended Body"
MSS-SP-78	"Cast Iron Plug Valves, Flanged and Threaded Ends"
MSS-SP-84	"Steel Valves, Socket Welding and Threaded Ends"

Other standard and codes referred to in this Standard are as follows:

ANSI / ASME (AMERICAN NATIONAL STANDARD INSTITUTE / AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ANSI/ASME B1.20.1	"Pipe Threads, General Purpose"
ANSI/ASME B 16.1	"Cast-Iron Pipe Flanges and Flanged Fittings"
ANSI/ASME B 16.4	"Cast-Iron Threaded Fittings Classes 125 and 250"
ANSI/ASME B 16.5	"Pipe Flanges and Flanged Fittings"
ANSI/ASME B 16.10	"Face-to-Face and End-to-End Dimensions of Valves"
ANSI/ASME B 16.11	"Forged Fittings, Socket-Welding and Threaded"
ANSI/ASME B 16.15	"Cast Bronze Threaded Fittings, Classes 125 and 250"
ANSI/ASME B 16.24	"Cast Copper Alloy Pipe Flanges and Flanged Fittings"
ANSI/ASME B 16.25	"Buttwelding Ends"
ANSI/ASME B 16.34	"Valves-Flanged, Threaded and Welding End"
ANSI/ASME B 16.42	"Ductile Iron Pipe Flanges and Flanged Fittings"
ANSI/ASME B 31.1	"Power Piping"
ANSI/ASME B 31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI/ASME B 36.10	"Welded and Seamless Wrought Steel Pipes"
ANSI/ASME B 31.4	"Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alchohol"

API (AMERICAN PETROLEUM INSTITUTE)

API STD 605	"Large-Diameter Carbon Steel Flanges"

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

MSS-SP-44	"Steel Pipeline Flanges"
MSS-SP-6	"Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings"

3. DIMENSIONS AND PRESSURE/TEMPERATURE RATINGS

Dimensions and pressure/temperature ratings of plug valves shall meet the requirement(s) of the following standards:

3.1 End to end dimensions of plug valves shall conform to the following standards.

3.1.1 Steel pipeline valves	Per API-6D
3.1.2 Compact carbon and alloy steel plug valves up to 3"	Per API 602/606 As Applicable.
3.1.3 Other valves	ANSI/ASME B16.10

3.1.4 Valves having dimensions not listed in the above mentioned standards shall be per manufacturer standard with prior approval of the purchaser.

3.2 End flange dimensions shall conform to the following standards:

3.2.1 Steel and nickel base flanges up to DN 600(NPS 24)	Per ANSI-B 16.5
3.2.2 Steel and nickel base flanges over DN 600 (NPS 24)	Per MSS-SP-44 or API 605 As Applicable
3.2.3 Cast iron flanges	Per ANSI-B 16.11
3.2.4 Bronze flanges	Per ANSI-B 16.24
3.3 Flange surface finishing shall conform to	API 599/MSS-SP-6 As Applicable
3.4 Buttwelding ends shall conform to standard	ANSI-B 16.25
3.5 Socket welding ends shall conform to standard	ANSI-B 16.11

3.6 Threaded ends shall conform to the following standards.

3.6.1 Steel and nickel base valves	ANSI/ASME B 1.20.1
3.6.2 Cast iron valves	ANSI/ASME-B 16.4
3.6.3 Bronze valves	ANSI/ASME-B 16.15

3.7 Plug valves pressure/temperature ratings shall conform to the following standards:

Steel and nickel base flanges	Per ANSI/ASME-B 16.34
Compact carbon and alloy steel valves (up to 3")	API 602
Ductile iron valves	Per ANSI/ASME B 16.42
Other ferrous valves	Per ANSI/ASME-B 16.1
Non-ferrous valves	Per ANSI/ASME-B 16.24

4. DESIGN AND CONSTRUCTION

4.1 Design and construction of plug valves shall generally meet the requirements of the following standards except for those noted in this specification.

4.1.1 Steel and nickel base valves, flanged and buttwelding ends	Per API-STD-599
4.1.2 Steel and socket welding end threaded ends	Per MSS-SP-84 or API 602 when specified
4.1.3 Steel pipeline valves flanged and buttwelding ends	Per API-6D
4.1.4 Ductile iron plug valves, flanged ends	Per API-599
4.1.5 Cast iron plug valves	Per MSS-SP-78

4.2 Fire Safe Design

Unless otherwise specified in data sheet steel plug valves shall have fire safe design and capability of meeting the requirements of API6FA.

4.2.1 The following terminology shall be used:

a) Fire safe design : A design that by nature of its features and properties is capable of passing a fire test.
b) Fire tested design: A design subjected successfully to fire testing.

4.2.2 Soft seated valves shall have a fire-tested design. Metal seated valves shall have a fire safe design. A handwheel or gear operator shall have a fire-safe design.

4.2.3 Any special provision for protecting actuator system against fire shall be stated in the purchase requisition.

4.3 Unless otherwise specified in the item description, Lubricated plug valves shall be suitable for the following temperatures.

4.3.1 Standard taper plug type to 176°C (350°F).

4.3.2 Inverted taper plug type to 260°C (500°F).

4.4 Unless otherwise specified in the item description, inverted lubricated plug valves shall have the following stem type.

SIZE	PRESSURE CLASS PN (ANSI RATING)	STEM TYPE
DN ≤ 100 (NPS 4)	20 & 50 (150 & 300)	PLAIN
150-600 (NPS 6-24)	20 & 50 (150 & 300)	THREADED
40-500 (NPS1½-20)	150 (900)	THREADED
40-400 (NPS1½-16)	250 (1500)	THREADED
40-100 (NPS1½-4)	420 (2500)	THREADED
15-25 (NPS ½-1)	ALL CLASSES	THREADED STEM AND COVER

4.5 Dynamic balanced plugs require prior Purchaser approval.

4.6 Unless otherwise specified in the item description, the plugs shall be equipped with and bush bearings at the top and bottom.

4.7 Top or bottom plate shall be provided for in-line maintenance without removing valve body from the line.

5. SUPPLEMENT TO API-6D 1994

The following clauses/sections of API 599-1987 shall be considered as part of the API 6D-1994 for plug valves specifications.

2.2 Cover

2.3 Plug stem

2.4 Gland

2.5 Bolting

2.6 Operation

3.0 Material

Note:

Clause 3.1 of API 6D has preference to clause 3.1 of API 599 for pipeline plug valves.

VOLUME FIVE

BUTTERFLY VALVES

PART II

CONTENTS :

PAGE No.

1. SCOPE

This Standard covers minimum requirements for design, fabrication, material, inspection and tests of butterfly valves to be installed both in on-plot and off-plot piping.

For the valves within the scope of this Standard specifications, the limitation stated in the following standards, as applicable, shall govern.

ANSI-ASME-B 31.1	"Power Piping"
ANSI-ASME-B 31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI-ASME-B 31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia and Alchohol"
ANSI-ASME-B 31.8	"Gas Transmission and Distribution Systems"

2. REFERENCES

For the valves within the scope of this Standard specifications, the following references with the supplement, which will be discussed thereafter, shall be used.

API-STD-609	"Butterfly Valves, Lug Types and Wafer Types"
ANSI-AWWA-STD-C504	"Rubber Seated Butterfly Valves"
BS-5155	"Specifications for Butterfly Valves"

Other standards and codes referred to throughout this Standard are as follows:

ANSI / ASME (AMERICAN NATIONAL STANDARD INSTITUTE / AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ANSI/ASME B 16.1	"Cast-Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, 250 and 800"
ANSI/ASME B 16.24	"Cast Copper Alloy Pipe Flanges and Flanged Fittings"
ANSI/ASME B 16.5	"Pipe Flanges and Flanged Fittings"
ANSI/ASME B 16.4	"Cast-Iron Threaded Fittings, Classes 125 and 250"
ANSI/ASME B 16.15	"Cast Bronze Threaded Fittings, Classes 125 and 250"
ANSI/ASME B 16.11	"Forged Fittings, Socket-Welding and Threaded"
ANSI/ASME B 16.25	"Buttwelding Ends"
ANSI/ASME B 16.34	"Valves-Flanged, Threaded and Welding End"
ANSI/ASME B 16.42	"Ductile Iron Pipe Flanges and Flanged Fittings"
ANSI/ASME B.1.20.1	"Pipe Threads, General Purpose"
ANSI/ASME B 31.1	"Power Piping"
ANSI/ASME B 31.3	"Chemical Plant and Petroleum Refinery Piping"
ANSI/ASME B 31.8	"Gas Transmission and Distribution Systems"
ANSI/ASME B 31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia and Alchohol"

API (AMERICAN PETROLEUM INSTITUTE)

API-STD-607	"Fire Test for Soft-Seated Quarter-Turn Valves"
API-SPEC-6FA	"Specification for Fire Test for Valves"

BSI (BRITISH STANDARDIZATION INSTITUTE)

BS 6755 Part 2	"Specification for Fire-Type Testing Requirements"

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

MSS-SP 6	"Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings"
MSS-SP 44	"Steel Pipeline Flanges"

3. DIMENSIONS AND PRESSURE/TEMPERATURE RATINGS

3.1 Face to face/end to end dimensions of valves shall be as per related standards.

3.2 Valve having dimensions not listed in the related standards, shall be per manufacturer standard with prior approval of the purchaser.

3.3 All wafer and lug type butterfly valves shall be capable to be installed between flanges as per ANSI-ASME-B 16.1 for cast iron valves and per ANSI-ASME-B 16.24, for bronze valves and ANSI-ASME-B 16.5 [or MSS-SP-44 for sizes over DN 600 (NPS 24)] for steel valves.

3.4 End flanges dimensions for flanged ends type butterfly valves shall comform to the following standards:

3.4.1 Steel and nickel base flanges up to DN 600 (NPS 24)	Per ANSI-ASME-B 16.5
3.4.2 Steel and nickel base flanges over DN 600 (NPS 24)	Per MSS-SP-44
3.4.3 Cast iron flanges	Per ANSI/ASME-B 16.1
3.4.4 Bronze flanges	Per ANSI/ASME-B 16.24

3.5 Valves connecting faces finishing shall conform to standard MSS-SP-6.

3.5.1 Where a smooth finish is specified, the gasket contact surface finish roughness shall be 100-150 Ra in accordance with MSS-SP-6.

3.6 Buttwelding ends shall conform to standard	ANSI/ASME-B 16.25/31.1/31.3/31.4/31.8 as Applicable
3.7 Socket welding ends shall conform to standard:	ANSI/ASME-B 16.11

3.8 Threaded ends shall conform to the following standards:

3.8.1 Steel and nickel base valves	Per ANSI/ASME-B 1.20.1
3.8.2 Cast iron valves	Per ANSI/ASME-B 16.4
3.8.3 Bronze valves	Per ANSI/ASME-B 16.15

3.9 Butterfly valves pressure temperature rating shall conform to the following standards:

3.9.1 Steel and nickel base valves	Per ANSI/ASME-B 16.34
3.9.2 Ductile iron valves	Per ANSI/ASME-B 16.42
3.9.3 Cast iron valves	Per ANSI/ASME-B 16.1

4. DESIGN AND CONSTRUCTION

4.1 General Requirements

Design and construction of butterfly valves shall generally meet the requirements of the following standards:

4.1.1 Double flanged, low-leakage rate and regulating valves BS 5155.

4.1.2 Lug type (single flange) API 609.

4.1.3 Wafer type API 609 and when specified BS 5155.

4.1.4 Rubber seated butterfly valves for water services Per ANSI/AWWA C-504

4.2 Fire Safe Design

Unless otherwise specified in data sheet, all steel and nickel base butterfly valves shall have fire safe design and capability of meeting the requirements of API 6 FA, BS 6755 Part 2 and API 607 as applicable.

4.2.1 The following terminology shall be used:

a) Fire safe design: A design that by nature of its features and properties is capable of passing a fire test.
b) Fire tested design: A design subjected successfully to fire testing.

4.2.2 Industrial soft-seated valves shall have a fire-tested design. Metal-seated valves shall have a fire-safe design. A handwheel or gear operator shall have a fire-safe design.

4.2.3 Any special provision for protecting actuator system against fire shall be stated in the Purchase requisition.

4.2.4 Fire testing shall be done in accordance with API 6FA, BS 6755 Part 2 or API 607. Existing certificates to these standards is acceptable.

5. SUPPLEMENT TO REFERENCE STANDARD API 609-1978 (BUTTERFLY VALVES, LUG-TYPE AND WAFER-TYPE)

5.1 For ease of reference, the clause or section numbering of the reference standard has been used.

5.2 For the purpose of this Standard, the following definitions shall hold:

Sub. (Substitution): "The Clause in Reference Standard is Deleted and Replaced by a New Clause"
Del. (Deletion): "The Clause in Reference Standard is Deleted Without Any Replacement"
Add.(Addition): "A New Clause With a New Number is Added"
Mod. (Modification): "Part of Reference Standard Clause is Modified and/or A New Description and/or Statement is Added to that Clause"

1.1.5 Unless otherwise specified valve shall be of top and bottom guided. **(Add.)**

2.1.1 Both wafer and lug valve styles shall have one-piece cast bodies to provided sufficient strength to resist pipeline stresses. **(Mod.)**

2.3.4 Separate seat rings-mechanically retained metal. **(Add.)**

a) The seat retaining ring shall securely hold the seat in place and provide maximum surface face gasket contact.

b) The retaining ring shall be held in place with machine screws to assure positive seat alignment both before and after installation.

c) The retaining ring on the lug style bodies shall be mechanically fastened to body to provide a fully rated shut off on dead end service in either direction.

d) Retaining ring and contact face of the body shall have a phonograph finish faces.

2.3.5 Drive pins

Drive pins shall be locked in place to provide a strong and rigid disc-to-shaft connection. **(Add.)**

2.3.6 Thrust bearings **(Add.)**

a) Rugged, low friction thrust bearings shall be provided for positive centering of the disc in the seat.
b) Thrust bearings shall be located at the top and bottom of the disc to withstand shaft thrust in either direction.

2.3.7 Shaft journal bearings **(Add.)**

a) Bearings shall be located on top and bottom of the disc to support shaft loads.

b) The bearings shall provide maximum corrosion resistance, withstand high loads and assure lasting, easy operation of the valve.

c) The manufacturer shall demonstrate any necessary lubrication provision in the proposal.

2.3.8 Disc **(Add.)**

a) Unless otherwise specified duc face shall have concave feature to reduce turbulence and minimizing dynamic torque.

b) Disc shall be cast and carbon steel disc shall have a nickel edge.

2.3.9 Seat **(Add.)**

Seat design shall have the following features:

1) **Protected in open position:** Seat shall be out of the flow path and protected by the retaining ring.

2) **Positive shut off:** As the disc closes, it shall move into the seat and expand the seat rings to provide a positive seal.

Non-metallic seats shall be elastically supported to assure lasting tight shut off.

3) **Pressure sealing:** It shall provide a tighter sealing as pressure increases in either direction.

2.3.10 Shaft **(Add.)**

a) Shaft shall be ground finish to minimize bearing and packing wear.
b) Unless otherwise specified, shaft shall be of one-piece design to provide continuously contact through the disc to assure maximum strength and rigidity.

2.5 Packing **(Mod.)**

a) Each valve shall be equipped with multiple ring, packing follower, packing gland flange.
b) Gland flange shall be easily adjustable without disassembling of the valve or removal of the actuator.

2.7.4 Each valve shall have a rugged, universal actuator mounting bracket to allow field interchangeability of all manual and powered actuators. **(Add.)**

2.7.5 Actuator bracket bearing

a) Lubricated, corrosion resistant bearing shall be provided into the actuator mounting bracket to support the valve shaft and assure smooth and easy valve operation. **(Add.)**

2.7.6 Actuator drive shaft

It shall be equipped with radial and thrust bearings and shall demonstrate the arrangement and any provision for lubrication in the proposal. **(Add.)**

2.7.7 Manual valve

Unless otherwise specified, double lead threads shall be provided to reduce the number of turns to operate the manual valves. **(Add.)**

2.7.8 Stop nut **(Add.)**

a) A threaded traveling nut shall be provided to move along the shaft which, as the actuator drive shaft rotates it reaches the actuator housing. **(Add.)**

b) Contact between the nut and housing shall provide a positive adjustable stop to any desired open position. **(Add.)**

c) A guide rail shall also be provided to prevent the stop nut from rotating on the input shaft. **(Add.)**

d) Stop nut shall be easily adjustable when guide rail is removed. **(Add.)**

2.7.9 Actuator drive arm **(Add.)**

a) A steel drive arm shall be provided and keyed to the valve shaft. **(Add.)**

b) The threaded drive arm nut shall be provided and supported with bearings. **(Add.)**

2.7.10 Valve position indicator shall be provided. **(Add.)**

VOLUME SIX

CHECK VALVES

PART II

CONTENTS :

PAGE No.

1. SCOPE

This Standard covers minimum requirement for design, fabrication, material, inspection and tests of check valves to be installed both in on-plot and off-plot piping.

For the valves within the scope of this Standard specification, the limitations stated in the following standards, as applicable, shall govern.

ANSI-ASME-B 31.1	"Power Piping"
ANSI-ASME-B 31.3	"Chemical Plant and Petroleum Piping"
ANSI-ASME-B 31.4	"Liquid Transportation Systems for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohol"
ANSI-ASME-B 31.8	"Gas Transmission and Distribution Systems"

2. REFERENCES

For the valves within the scope of this Standard specification, the following sources and references with the supplement, which will be discussed thereafter, shall be used:

API (AMERICAN PETROLEUM INSTITUTE)

API-6D	"Specification for Pipeline Valves"
API 6FA	"Specification for Fire Test for Valves"
API 594	"Wafer Check Valves"

BSI (BRITISH STANDARDIZATION INSTITUTE)

BS-1868	"Specification for Steel Check Valves (Flanged and Butt-welding Ends) for the Petroleum, Petrochemical and Allied Industries"
BS-5153	"Specification for Cast Iron Check Valves for General Purposes"
BS-5154	"Specification for Copper Alloy Globe, Globe Stop and Check, Check and Gate Valves"
BS-5352	"Specification for Steel Wedge Gate, Globe and Check Valves 50 mm and Smaller for the Petroleum, Petrochemical and Allied Industries"

ANSI / ASME (AMERICAN NATIONAL STANDARD INSTITUTE / AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

B 16.11	"Forged Fittings"
B 16.5	"Pipe Flanges and Flanged Fittings"
B 16.1	"Cast-Iron Pipe Flanges and Flanged Fittings"
B 16.24	"Cast Copper Alloy Pipe Flanges and Flanged Fittings"
B 31.1	"Power Piping"
B 31.3	"Chemical Plant and Petroleum Refinery Piping"

B 31.4	"Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alchohol"
B 31.8	"Gas Transmission and Distribution Piping Systems"
B 1.20.1	"Pipe Threads, General Purpose"
B 16.4	"Cast-Iron Threaded Fittings, Classes 125 and 250"
B 16.15	"Cast Bronze Threaded Fittings, Classes 125 and 250"
B 16.34	"Valves-Flanged, Threaded and Welding End"
B 16.42	"Ductile Iron Pipe Flanges and Flanged Fittings"

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

SP-6	"Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings"

3. DIMENSIONS AND PRESSURE/TEMPERATURE RATINGS

3.1 Face to face/end to end dimension of valves shall be as per related standards.

3.2 Valves having dimensions not listed in the related standards, shall be per manufacturer standard with prior approval of the purchaser.

3.3 End flanges dimensions shall conform to the following standards:

3.3.1 Steel and nickel base flanges up to DN 600 (NPS 24)	Per ANSI/ASME-B 16.5
3.3.2 Steel and nickel base flanges over DN 600 (NPS 24)	Per MSS-SP-44
3.3.3 Cast Iron flanges	Per ANSI/ASME-B 16.1
3.3.4 Bronze flanges	Per ANSI/ASME-B 16.24
3.4 Flanges surface finishing shall conform to	MSS-SP-6
3.4.1 Where a smooth finish is specified, the gasket contact surface roughness shall be 100-150 AARH in accordance with	MSS-SP-6
3.5 Buttwelding ends shall conform to standard	ANSI/ASME-B 16.15/31.1/31.3/31.4/31.8 as Applicable
3.6 Socket welding ends shall conform to standard	ANSI/ASME-B 16.11

3.7 Threaded ends shall conform to the following standards:

3.7.1 Steel and nickel base valves	Per ANSI/ASME- B 1.20.1
3.7.2 Cast iron valves	Per ANSI/ASME- B 16.4
3.7.3 Bronze valves	Per ANSI/ASME- B 16.15

3.8 Check valves pressure-temperature rating shall conform to the following standards:

3.8.1 Steel and nickel base valves	Per ANSI/ASME-B 16.34 or API 6D as Applicable
3.8.2 Ductile iron valves	Per ANSI/ASME-B 16.42
3.8.3 Cast iron valves	Per ANSI/ASME B 16.1

4. DESIGN AND CONSTRUCTION OF CHECK VALVES

4.1 Design and construction of check valves shall generally meet the requirements of the following standards:

4.1.1 Steel and nickel base swing type pipeline check valves flanged and buttwelding ends or wafer type:
Per API-SPEC-6D

4.1.2 Carbon steel and alloy steel, wafer, single-and dual-plate check valves
Per API 594

4.1.3 Steel and nickel base, screwed and socket welding ends, piston, ball, disk type
up to DN 50 (NPS 2) 1868, BS-5352 As Applicable

4.1.4 Steel and nickel base, flanged and buttwelding ends, swing type check valve

up to DN 400 (NPS 16) BS-1868
up to DN 50 (NPS 2) BS-5352

4.1.5 Cast iron, swing type and lift type check valves

up to DN 400 (NPS 16) Per BS-5153

4.1.6 Copper alloy, flanged, screwed, capillary and compression ends, swing, piston and disk type check valve

up to DN 100 (NPS 4) Per BS-5154

4.1.7 Cast iron check valves for water services, swing type, flanged and mechanical joints:
Per ANSI/AWWA C-508

4.2 Fire Safe Design

Unless otherwise specified in data sheet, all steel check valves shall have fire safe design and capability of meeting the requirement of API-STD 6FA/BS 6755 part 2 and API 607 As Applicable.

4.2.1 The following terminology shall be used:

a) Fire safe design: A design that by nature of its features and properties is capable of passing a fire test.
b) Fire tested design: A design subjected successfully to fire testing.

4.2.2 Soft-seated valves shall have a fire-tested design. Metal-seated valves shall have a fire-safe design.

4.2.3 Fire testing shall be done in accordance with API 6FA, BS 6755 part 2 or API 607. Existing certificates to these standards is acceptable.

5. SUPPLEMENT TO REFERENCE STANDARD (API 6D-1994)

5.1 For ease of reference, the clause or section numbering of the reference standard has been used.

5.2 For the purpose of this standard, the following definitions shall hold:

Sub. (Substitution): "The Clause in Reference Standard is Deleted and Replaced by a new Clause"

Del. (Deletion): "The Clause in Reference Standard is Deleted Without any Replacement"

Add. (Addition): "A New Clause With a New Number is Added"

Mod. (Modification): "Part of Reference Standard Clause is Modified and/or a New Description and/or Statement is Added to that Clause"

2.15 Seat Rings (Add.)

2.15.1 Unless otherwise specified, seat rings shall be replaceable in the field without removing valve body from the line except for the following cases:

a) Austenitic steel valves may have integral seats.
b) Austenitic or hard-facing (body) seat material may be deposited only on separate steel seat rings. The minimum finished thickness of the deposit shall be 1.6 mm.

2.15.2 Body seat shall be inclined at an angle of approximately 5° from the vertical to facilitate closing and to prevent chatter.

2.15.3 Seat rings may be shoulder or bottom seated and may be screwed in, welded in or, with prior approval of the purchaser, rolled in.

2.15.4 Threaded seat rings shall be provided with lugs or slots to facilitate removal.

2.15.5 A resilient seat shall be bonded or molded into the seat ring.

2.16 Disk spindle shall be chrome plated and equipped with bush bearing complete with cage. **(Add.)**

2.18 Outside Attachment (Add.)

2.18.1 If specified in the purchase order and if the design permits, the hinge pin may be extended through the body of the valve.

2.18.2 An outside lever with adjustable weight, damping device, fusible link or locking device shall be provided to control the movement of the disk.

2.19 Loading Spring (Add.)

Consideration should be given to providing stiffer spring to ensure positive closing of the valve where there is a low differential pressure or when the process fluid is highly viscous.