TECHNICAL SPECIFICATION

FOR

BALL VALVES

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NOTE: Technical specification shall be read in conjunction with :-

1.0 DATA SHEET FOR RELEVANT BALL VALVE

2.0 QUALITY ASSURANCE PLAN FOR BALL VALVES

1.0 SCOPE

This specification provides minimum requirement for design, manufacturing, inspection, testing and documentation of Carbon Steel Ball Valves covering sizes ½" NB(DN 15) through24" NB(DN 900) for ASME rating class 150# through 900# to be used in cross country Gas pipeline(onshore) and City Gas distribution for handling non-sour hydrocarbon in liquid or gaseous phase.

2.0 REFERENCE DOCUMENTS

The following Codes and Standard includes provision which, through reference in this text constitute provision of this Standard. Latest revision of this standard shall be used unless otherwise specified.

API 6D	:	Specification for Pipeline Valves.
PNGRB	:	Petroleum and Natural Gas Regulatory Board(Technical Standards and Specifications for City and Local Natural Gas Distribution Network) Regulations, 2008
OISD 130	:	Inspection of Piping System
API 6FA	:	Specification for Fire Test for valve
API 5L	:	Specification for Line Pipe.
API 598	:	Valve Inspection and Testing
ASME 16.10	:	Face to Face and End to End Dimensions of Valves
ASME 16.20	:	Metallic gasket for pipe flanges – Ring joint or spiral wounds and jacketed.
ASME 16.21	:	Non Metallic Gaskets for Pipe Flanges.
ASME B 16.5	:	Steel Pipe Flanges and Flanged Fittings.
ASME B 16.34	:	Valves - Flanged, Threaded and Welding Ends.
ASME B 16.47	:	Large Diameter steel Flanges NPS 26 through NPS 60
ASME Sec VIII Div .I/ Div. II	:	Boiler and Pressure Vessel Code – Rules for Construction of Pressure Vessels.
ASTM A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
ASTM B 733	:	Auto catalytic Nickel Phosphorous Coating on Metals.
BS 6755-1	:	Testing of Valves. Specification for production pressure testing requirements.
ASME B 31.3	:	Process Piping.
ASME B 31.8	:	Gas Transmission and Distribution Piping Systems.

EN 1004511	:	Metallic products: Charpy Impact test – test methods (U & V Notches)
BS 5351	:	Steel Ball Valves for Petroleum, petrochemical and allied industries
BS EN 331	:	Manually Operated Ball Valves and Closed Taper Plug Valves for Gas Installations
BS 6755-2	:	Testing of Valves. Specification for fire type-testing requirement.
EN 10204	:	Metallic Materials – Types of Inspection Documents
MSS-SP-6	:	Standard Finishes for Contact Faces of Pipe Flanges and Connecting - end Flanges of Valves and Fittings.
MSS-SP-25	:	Standard marking system for Valves, Fittings, Flanges and Union.
MSS-SP-44	:	Steel Pipeline Flanges.
MSS-SP-53	:	Quality Std for Steel Casting & Forgings for Valves, Flanges & Fittings & Other Piping Components – Magnetic Particle Examination Method.
MSS-SP-55	:	Quality Standard for Steel casting of valves, Flanges, Fittings & other Piping components (Visual Method)
MSS-SP-72	:	Ball Valves with Flanged or Butt welding ends for General Service.
ISO 5208	:	Industrial Valves – Pressure Testing of Valves
ISO 10497	:	Testing of Valves – fire type testing requirements.
ISO 13623	:	Petroleum & Natural Gas Industry – Pipeline Transportation System.
ISO 14313	:	Petroleum & Natural Gas Industry. Pipeline Transportation System – Pipeline Valves
SSPC-VIS-1	:	Steel Structures Painting Council Visual Standard. In case of contradiction the most stringent shall apply.
NACE TM0177-2005	:	Standard test method. Laboratory testing of metals for resistance to specific forms of environmental cracking in H2S environments

3.0 DEFINITIONS

Purchaser	:	The Company which makes Purchase Order.
Manufacturer	:	Manufacturer who receives the Purchase Order.
Shall	:	This verbal form indicates requirements strictly to be followed in order to confirm to the standards and from which no deviation is permitted.

Should	: This verbal form indicates that among several possibilities one is particularly suitable without mentioning or excluding others or that a certain course of action is preferred but not necessarily required.
May	: This verbal form indicates a course of action permissible within the limits of this standard
Can	: This verbal form used for statements of possibility & capability, whether material, physical or casual.

4.0 INSTRUCTIONS TO BIDDER:

4.1 Manufacturer to supply ball valves meeting the requirements of this specification for the fluid/service specified by the purchaser on Valve Data Sheet.

4.2 Eventual Interpretations and deviations to this specification by the manufacturer shall be requested in writing in his offer with detailed justification and shall be approved by the purchaser or purchaser's representative before the eventual order to the manufacturer.

4.3 The manufacturer shall list all probable Sub-Contractors (such as forging plant, casting plant, and fabrication unit etc.) and also mention the specification of steel used, in his offer. No changes of any kind shall be accepted thereafter. However, if under the conditions justifiable the requested changes shall be supported by a legitimate technical document submitted to the purchaser/purchaser's representative for approval.

4.4 The manufacturer shall provide technical document describing the manufacturing methods that might influence the quality of material.

4.5 The purchaser/purchaser's representative reserves the right to audit the manufacturer's and sub-contractor's manufacturing and quality control methods.

4.6 The purchaser/ purchaser's representative shall reserve any time free access to all parts of the manufacturer's facilities and to all his sub contractors involved in the order manufacturing.

4.7 A copy of ISO 9001 Certificate shall be included in the offer.

4.8 An approval of documents can never be considered as acceptance of deviations or relaxation to requirements. A deviation is only possible after specific request to purchaser and purchaser's representative.

4.9 The manufacturer shall be responsible for complying with all of the applicable requirements of this specification. It shall be permissible for the purchaser to make any investigation necessary in order to be assured of compliance by the manufacturer and to reject material that does not comply by this specification.

5.0 MATERIALS

5.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. In addition, the material shall also meet the requirements specified herein. Other components shall be as per Manufacturer's standard (suitable for service conditions as indicated in valve data sheet), which shall be subjected to approval by Purchaser / Purchaser's representative.

5.2 Carbon steel used for the manufacture of valves shall be fully killed.

5.3 The chemical composition of carbon steel shall be as per API 6D. If the Carbon Content is greater than 0.12 %, then Carbon Equivalent (IIW) shall not exceed 0.40 for each heat of steel used, as calculated the following formula:

$$CE = C + \frac{Mn}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Ni + Cu)}{15}$$

If carbon content is less than 0.12% in product analysis; the CE (Pcm) shall not exceed 0.20%.

$$CE\ (Pcm) = C + \frac{Ni}{60} + \frac{Si}{30} + \frac{(Mn + Cu + Cr)}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B$$

5.4 When the ball of valve is manufactured out of C.S, it shall be subjected to 75µm (0.003") thick Electrolysis nickel plating as per ASTM B733 with following classification SC2, type II, class-2. For Ball made of S.S material, ENP is not mandatory. The hardness of plating shall be minimum 50 RC.

5.5 For valves specified to be used for Gas service or High Vapor Pressure (HVP) liquid service; Charpy V-Notch test on each heat of base material shall be conducted as per API 6D, clause 8.5 for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Charpy V- notch test Absorbed Energy shall be as per standard to which MOC comply.

5.6 Valves shall be subjected to hardness test on base material for each heat for pressure containing parts. The maximum hardness shall not exceed the values mentioned in standard to which MOC comply.

6.0 DESIGN AND CONSTRUCTION

6.1

a) Valve shall be designed as per API 6D and ASME B 16.34 suitable for the process conditions indicated in the Data Sheet. Allowable stress requirements shall comply with the provisions of ASME B31.3 and B31.8. In addition, corrosion allowance indicated in Valve Data Sheet shall be considered in valve design. However, the minimum wall thickness shall not be less than the minimum requirement of ASME B16.34.

b) Valves, flanges, fittings made of cast iron /ductile iron as per ASTM A 395 shall not be used.

c) Valves used in service lines of size NPS 2 and below shall conform to BS EN 331.

d) All studs bolts and nuts used shall be hot dipped galvanized as per ASTM A 153.

e) The manufacturer shall have valid license to use API monogram on valves manufactured as per API 6D.

6.2 Fully welded valves shall be used for main line aboveground/underground services. Other above ground valves may be of welded or bolted type with 2 piece/3 piece construction. Threaded body joints shall not be accepted.

6.3 Ball shall be of single piece, solid type construction.

6.4 Full bore valves shall be suitable for the passage of all types of pipeline scraper and inspection pigs on regular basis without causing damage to either the valve component or the pig. The full bore valve shall provide an unobstructed profile for pigging operations in either direction. Full bore valves shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded.

6.5 Reduced bore valves shall be provided if specifically mentioned in data sheet. Valve body shall be manufactured by casting or forging.

6.6 For class 150 # and 300#, 4"NB and above size valves shall be trunion mounting type and Valves below 4" shall be floating type unless specifically mentioned in data sheet otherwise. For 600#, all valves of size 2" and above shall be trunioun mounted.

6.7 Valve seats shall be with primary metal to metal contact. O - Rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it cannot be removed from seat ring and there is no extrusion during opening or closing operation at maximum differential pressure. The seat rings shall be designed so as to ensure sealing at low as well as high differential pressures.

Soft seated valves in service line are not permitted as per PNGRB Regulation 2008.

6.8 Valves 4" and above shall be fitted double block and bleed (DBB) facility. For 600#, 2" and above shall be fitted with double block and bleed facility.

6.9 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) milli-bar in both open and closed positions.

6.10 All valves of nominal valve size DN 200 (8") NPS & above shall have provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connections shall be provided with an internal Non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure.

6.11 All valves shall be provided with a vent and drain connection. These connections shall be welded type as per Fig. 6.11 A/B. Body vent and drain shall be provided with valves (Ball or Plug type). All these vents & drain connection shall be provided with isolation ball valve as shown in Fig A/B. The end connection of vent & drain line to valve body or isolation valves shall be welded type at underground location and threaded type for above ground location.

6.12 Valve design shall ensure repair of stem seals/packing under full line pressure.

6.13 a) Valve ends shall be either flanged/or butt welded or one end flanged and one end butt welded as indicated in the Valve Data Sheet. Flanges of the flanged end cast/forged body valves shall be integrally cast/ forged with the body of the valve. Face to face/end to end dimensions shall conform to API 6D.

b) The length of butt welding ends shall be sufficient to allow welding and heat treatment without damage of the internal parts of the valves.

c) Flanged end valves shall be as per API 6D with Flanges confirming to ASME B 16.5.

d) Butt welding end preparation shall confirm to ASME B 16.25. In case of difference in thickness of valve body & mating pipelines, the bevel end of valve shall be as per ASME B 31.8 or ASME B 31.4 as applicable.

6.14 The temperature and pressure rating of the valves shall be in accordance with API 600/ ASME B 16.34.

6.15 Wall thickness of parts used for the welding connection with the line pipe shall meet the following requirements:

a) The maximum allowable stress in the material of butt-welds connection for butt welding shall be equal to 50% of the minimum yield strength guaranteed by the specification of steel used.

b) The minimum wall thickness for butt welding connection must be greater than or equal to the largest value of either the calculated minimum thickness of butt welding connections or the nominal thickness of pipe as indicated on data sheet.

c) If the butt welding connections has a yield strength lower than the yield strength of the pipe to which it is intended to be welded, the wall thickness in each zone of the butt welding connection is at least equal to the specified pipe wall thickness times the ratio of minimum yield strength guaranteed by the specification of the steel of the pipe to minimum yield strength guaranteed by the specification of the steel of the butt welding connection.

d) The specified pipe wall thickness and grade with which the valve is intended to be used is specified in the data sheet.

e) All valves under this specification shall be designed to withstand a field hydrostatic test pressure with non corrosive water. Test pressure shall be in accordance to API 6D and/or PNGRB Regulation 2008.

6.16 Valve shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions.

6.17 Valves of weight 50 kg and above shall be equipped with support foot and lifting lugs. Tapped holes and eyebolts shall not be used for lifting lugs. Height of support foot shall be kept to minimum. The lifting lugs shall be stamped with safe working load.

6.18 In order to avoid stress induced crack and during direct field welding operation to valve body, all valves shall be supplied with welded pups at both ends which shall be considered as an integral part of the valves and also the ID of the pup shall match with pipe ID. The pup piece welding shall be carried out in controlled condition of temperature at manufacturer's workshop. Field welding of pup piece shall not be allowed. Material & length of pup piece shall be as per Data sheet.

6.19 Valves shall have locking devices to lock the valve either in full open (LO) or full close (LC) positions as provided in the Valve Data Sheet. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve. Locking device shall be such that the valve shall operate when the differential pressure across the valve is ≤ 3bar.

6.20 Valve design shall be such as to avoid bimetallic corrosion between carbon steel and high alloy steel components in the assembly. Accordingly, suitable insulation shall be provided as required.

6.21 The valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure as per the appropriate class.

The combined stress shall not exceed the maximum allowable stresses specified in ASME Section VIII, Division 1. The design shall take into account a safety factor of 1.5 based on the maximum output torque of the operating mechanism. The valve Manufacturer shall guarantee that the breakaway torque after long periods of non- movement cannot exceed the normal short term breakaway torque by a factor more than 1.25, and that the safety factor specified above is not compromised.

6.22 The valve stem shall have anti-blowout feature with antistatic device conforming to BS 5351

6.23 When stem extension requirement is indicated in Valve Data Sheet, the valves shall have the following provisions:

a) Valves provided with stem extension shall have water proof outer casing. The Length of stem extension shall be as indicated on the Valve Data Sheet. The length indicated corresponds to the distance between centerline of the valve opening and the centerline of the rim of the hand wheel on a vertical shaft or centerline of the hand wheel on a horizontal shaft. All the tubing and ferrule connection shall be made of SS316 material only and the same shall be capable to operate at 600 #.

b) Manual override devices shall be provided on all valves

c) Vent, drain and sealant connections shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body.

d) The stem extension shall be self relieving.

e) Outer casing of stem extension shall have 3/8" or 1/2" NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion

6.24 Operating Devices

a) All valves of size > 12"NB shall be manually operated & hydraulically actuated. In case of manual operated valves; valve with sizes, DN 100 (NPS 4") and below shall be wrench/ lever operated. Valves with sizes NPS 6" to NPS12" shall be gear operated.

Valve design shall be such that damage due to malfunctioning of the operator or its control gear train or power cylinder and other damaged parts can be replaced without the valve cover being removed.

b) The power actuator shall be in accordance with the Purchaser Specification issued for the purpose and as indicated in the Valve and Actuator Data Sheet. Operating time shall be as indicated in Valve Data Sheet. Valve operating time shall correspond to full close to full open/ full open to full close under maximum differential pressure corresponding to the valve rating. For actuated valves, the actuator's rated torque output shall be 1.25 times the break torque required to operate the ball valve under the maximum differential pressure corresponding to the Valve Class Rating.

c) For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed360N(80lbf). Manufacturer shall also indicate the number of turns of hand wheel (In case of gear operators) required for operating the valve from full open to full close position. The wrench length or hand wheel diameter shall be in accordance with API 6D requirements. The manufacturer shall indicate the number of turns of the hand wheel (for gear operators), required for operating the valve from fully open to the fully closed position.

d) Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes (except for valve size DN 40 and smaller).

e) Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/splash proof enclosure and shall be filled with suitable grease.

6.25 Repair on parent metal by welding is not permitted

6.26 The tolerance on internal diameter and out of roundness at the ends for welded ends valves shall be as per connected pipe specification as indicated in the Valve Data Sheet.

6.27 When specified on the Valve Datasheet, Ball Valves shall be "fire safe" in accordance with API 6FA, for which qualifying certificates, covering the range of items offered, shall be supplied by the Manufacturer.

6.28 Hand-wheel diameter(s) shall not exceed the face-to-face or end-to-end length of the valve or 1 000 mm, whichever is smaller, unless otherwise agreed. Except for valve sizes DN 40 (NPS 1½) and smaller, spokes shall not extend beyond the perimeter of the hand-wheel unless otherwise agreed.

6.29 Wrenches that are of integral design (not loose) shall not be longer than twice the face-to-face or end-to-end dimension unless otherwise agreed

7.0 INSPECTION AND TESTS

The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment, at his Works. Such inspection and tests shall be, but not limited to, the following:

7.1 A new chemical analysis (up gradation) shall be done on specimen of valve in presence of TPIA. Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

7.2 All valves shall be visually inspected. The external and internal surfaces of the valves shall be free from any arc strikes, gouges and other detrimental defects.

7.3 Dimensional check on all valves shall be carried out as per the Purchaser's approved drawings.

7.4 Non Destructive Examination

a) Non-destructive examination of individual valve material and component consisting of but not limited to castings, forgings, plates and assembly welds shall be carried out by the Manufacturer.

b) Body castings of all valves shall be radio graphically examined as per ASME B16.34. Procedure and acceptance criteria shall be as per ASME B 16.34. For all sizes, body casting shall be subjected to 100% radiography.

c) All forgings shall be ultrasonically examined in accordance with the procedure and acceptance standard of Annexure E of ASME B 16.34.

d) Bodies and bonnets made by welded assembly of segments of castings, forgings, combinations thereof shall be examined, as applicable, by methods of 7.4 (b) for cast components or 7.4 (c) for forged components and plates.

7.5 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per ASME B 31.3 or ASME B31.8 as applicable and API 1104.

7.6 a) All finished weld ends subject to welding in field shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from the end. Laminations shall not be acceptable.

b) Weld ends of all cast valves subject to welding in field shall be 100% radio graphically examined and acceptance criteria shall be as per ASME B16.34.

c) After final machining, all bevel surfaces shall be inspected by dye penetrate or wet - magnetic particle methods. All defects longer than 6.35 mm shall be rejected. Reject able defects must be removed. Weld repair of bevel surface is not permitted.

7.7 All valves shall be tested in compliance with the requirements of API 6D. During pressure testing, valves shall not have sealant lines and other cavities filled with sealant, grease or other foreign material. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. No leakage is permissible during hydrostatic testing.

7.8 A supplementary air seat test as per API 6D, Annexure- B, Para B 3.3 Type II shall be carried out for all valves.

7.9 Valves shall be subjected to Operational Torque Test as per Appendix B, Para B.6, API 6D under hydraulic pressure equal to maximum differential pressure corresponding to the valve rating.

7.10 Power actuated valves shall be tested after assembly of the valve and actuator, at the valve Manufacturer's works. At least five Open-Close-Open cycles without internal pressure and five Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating shall be performed on the valve actuator assembly. The time for Full Open to Full Close shall be recorded during testing. If required, the actuator shall be adjusted to ensure that the opening and closing time is within the limits stated in Valve Data Sheet. The Hand operator provided on the actuator shall also be checked after the cyclic testing, for satisfactory manual over-ride performance.

These tests shall be conducted on minimum one valve out of a lot of five (5) valves of the same size, rating and the actuator model/type. In case, the tests do not meet the requirements, retesting/rejection of the lot shall be decided by the Purchaser's Inspector.

7.11 Subsequent to successful testing as specified in clause 7.7, 7.8,7.9 and 7.10 above, one(1) valve out of the total ordered quantity shall be randomly selected by the Company Representative for cyclic testing as mentioned below:

a) The valve shall be subjected to at least 5 Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating.

b) Subsequent to the above, the valve shall be subjected to hydrostatic test and supplementary air seat test in accordance with clause 7.10 and 7.11.

In case this valve fails to pass these tests, the valve shall be rejected and two more valves shall be selected randomly and subjected to testing as indicated above. If both valves pass these tests, all valves manufactured for the order (except the valve that failed) shall be deemed acceptable. If either of the two valves fails to pass these tests, all valves shall be rejected or each valve shall be tested at the option of manufacturer.
Previously carried out prototype test of similar nature shall not be considered acceptable in place of this test.

7.12 Purchaser reserves the right to perform stage wise inspection and witness tests as indicated in clauses 7.1 to 7.11 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Purchaser. Purchaser or Purchaser's representative reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be borne to Manufacturer.

In no case shall any action of Purchaser or his inspector shall relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.

Inspection and tests performed/witnessed by the Purchaser's Inspector shall in no way relieve the manufacturer's obligation to perform the required inspection and tests.

7.13 Following test shall be carried out on ball valves:

a) Hydrostatic body test at 1.5 x Design Pressure
b) Hydrostatic Seat Leak test at 1.1 x Design Pressure
c) Air Seat Test at 7 KG/CM2
d) High Pressure Pneumatic (N2) Shall test at 1.1 x Design Pressure
e) External leak test at 7 KG/CM^2
f) Double Block and Bleed Test
g) Anti Static Test
h) Performance Test (Opening & Closing)
i) Operational Torque test

8.0 TEST CERTIFICATES

Manufacturer shall submit the following certificates:

The valve manufacturer must deliver a Certificate EN 10204 3.2 stating the quality, the mechanical properties (yield strength, tensile strength, and impact test, the chemical analysis the process of manufacture and the marking.

a) Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for the valve construction as per the relevant standards.

b) Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.

c) Test reports of radiograph and ultrasonic inspection.

d) All other test reports and certificates as required by API 6D, this specification and data sheets. The certificates shall be valid only when signed by Purchaser's Inspector. Only those valves which have been certified by Purchaser's Inspector shall be dispatched from Manufacturer's works.

9.0 PAINTING, MARKING AND SHIPMENT

9.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP- 6 in accordance with "Steel Structures Painting Council - Visual Standard SSPC-VIS-1". For the valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of buried portion of the valve shall be painted with three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.

9.2 All valves shall be marked as per API 6D. The units of marking shall be metric except nominal diameter, which shall be in inches.

9.3 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic or high impact plastic bevel protectors.

9.4 All sealant lines and other cavities of the valve shall be filled with sealant before shipment.

9.5 Packaging and shipping instructions shall be as per API 6D and procurement documentation. All valves shall be transported with ball in the fully open condition.

9.6 On packages, following shall be marked legibly with suitable marking ink:

- Valve tag no.;
- Nominal Valve Size;
- Rating;
- Body material;
- Manufacturer's name and/or make;
- Part number, year of manufacture and/or order number;
- API monogram;
- API class designation;
- Maximum Operating Pressure;
- Weight of Valve;
- Face to face Dimension or End to end Dimension.

10.0 SPARES AND ACCESSORIES

10.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning.

10.2 Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of valves.

10.3 Manufacturer shall quote for spares and accessories as per Material Requisition.

11.0 DOCUMENTATION

11.1 At the time of bidding, Manufacturer shall submit the following documents:

a) Filled in Data Sheet

b) General arrangement/assembly drawings showing all features and relative positions and sizes of vents, drains, gear operator/ actuator, painting, coating and other external parts together with overall dimension.

c) Sectional drawing showing major parts with reference numbers and material specification. In particular a blow up drawing of ball-seat assembly shall be furnished complying with the requirement of Clause 6.7 of this specification.

d) Reference list of similar ball valves manufactured and supplied in last five years indicating all relevant details including project, year, client, location, size, rating, service etc.

e) Torque curves for the power actuated valves along with the break torque and maximum allowable stem torque. In addition, sizing criteria and torque calculations shall also be submitted for power actuated valves.

f) Clause wise list of deviations from this specification, if any.

g) Descriptive technical catalogues of the manufacturer.

h) Installation, Operational and Maintenance Manual.

i) Copy of valid API 6D Certificate.

j) Details of support foot including dimensions and distance from valve centerline to bottom of support foot.

11.2 Within three weeks of placement of order, the Manufacturer shall submit four copies of, but not limited to, the following drawings, documents and specifications for Purchaser's approval:

a) Detailed sectional drawings showing all parts with reference numbers and material specifications.

b) Assembly drawings with overall dimensions and features. Drawing shall also indicate the number of turns of hand wheel (in case of gear operators) required for operating the valve from full open to full close position and the painting scheme. Complete dimensional details of support foot (where applicable) shall be indicated in these drawings.

c) Welding, heat treatment and testing procedures (Quality Assurance Plan)

d) Details of corrosion resistant paint to be applied on the valves.

e) Manufacturing of valves shall commence only after approval of the above documents. Once the approval has been given by Purchaser, any changes in design, material and method of manufacture shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the valve is manufactured.

11.3 Prior to shipment, Manufacturer shall submit to Purchaser one reproducible and six copies of the following:

a) Test certificates as per clause 8.0 of this specification.
b) Manual for installation, erection, maintenance and operation instructions including a list of recommended spares for the valves.

1.1 CD containing all docs in 11.2 & 11.3 shall be submitted within 30 days from the approval date, Manufacturer shall submit to Purchaser one reproducible and six copies of the approved drawings, documents and specifications as listed in clause 11.2 above.

1.2 All documents shall be in English language

12.0 DIMENSIONS OF VALVES:

Table 1: Face to Face and End to End dimensions of Ball Valves of various classes and

Table 2: Nominal Bore of Ball valves of Various Diameters as per API 6D

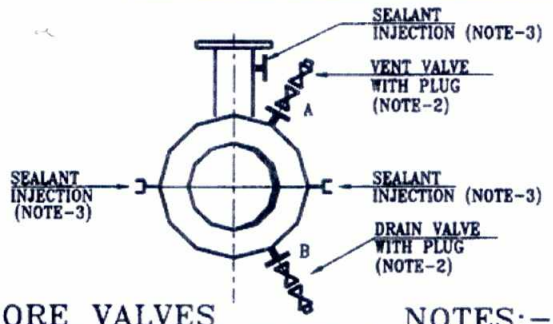
Table 1:

		PN 20 (class 150)		PN 50 (class 300)		PN 100 (class 600)	
DN	**NPS**	**Raised Face**	**Welding end**	**Raised Face**	**Welding end**	**Raised Face**	**Welding end**
50	**2**	178	216	216	216	292	292
65	**2½**	191	241	241	241	330	330
80	**3**	203	283	283	283	356	356
100	**4**	229	305	305	305	432	432
150	**6**	394	457	403	457	559	559
200	**8**	457	521	502	521	660	660
250	**10**	533	559	568	559	787	787
300	**12**	610	635	648	635	838	838

Table 2:

Minimum bore by class		
DN	**NPS**	**(Class 150 to 600)**
15	**½**	13
20	**¾**	19
25	**1**	25
32	**1¼**	32
40	**1½**	38
50	**2**	49
65	**2½**	62
80	**3**	74
100	**4**	100
150	**6**	150
200	**8**	201
250	**10**	252
300	**12**	303

ABOVE GROUND INSTALLATION



FULL BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 AND 150	–	15
200 TO 600	15	25
650 & ABOVE	15	50

REDUCED BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 AND 200	–	15
250 TO 750	15	25
ABOVE 750	15	50

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.

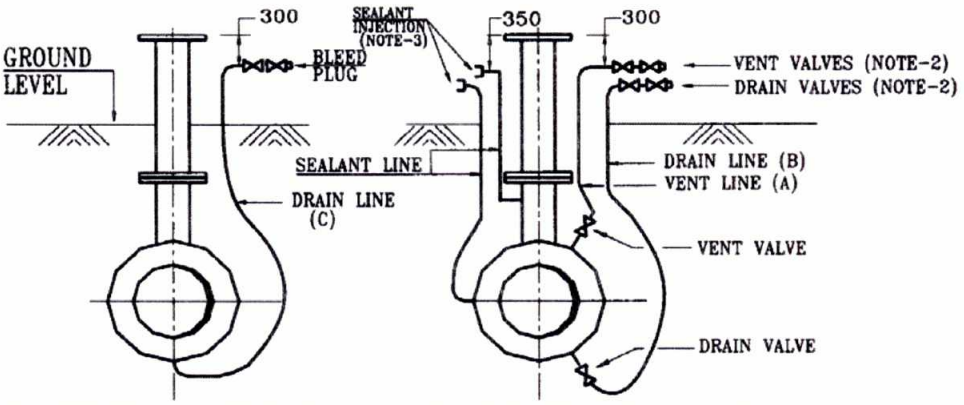
2 VALVES OF SIZE 50 mm SHALL BE MANUFACTURED AS PER API-6D.

3 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE.

4 ALL VENT/DRAIN CONNECTION SHALL BE WELDED WITH THE BODY.

FIG - 6.11 A

UNDERGROUND INSTALLATION



FB VALVES DN 50 mm(2") TO DN 150 mm(6") FB VALVES ≥ DN 200 mm(8")
RB VALVES DN 50 mm(2") TO DN 200 mm(8") RB VALVES ≥ DN 250 mm(10")

FULL BORE (FB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 AND 150	–	–	15
200 TO 300	25	25	–
350 TO 600	25	25	–
650 & ABOVE	50	50	–

REDUCED BORE (RB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 AND 200	–	–	15
250 TO 400	25	25	–
450 TO 750	25	25	–
800 & ABOVE	50	50	–

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.

2 VALVES OF SIZE 50 mm SHALL BE MANUFACTURED AS PER API-6D.

3 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE

4 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION.

FIG - 6.11 B