



## **GAIL GAS LTD**

(A wholly owned subsidiary of GAIL (India) Limited)

# **CNG AND CITY GAS DISTRIBUTION PROJECT IN VADODARA**

## **BID DOCUMENT FOR BALL VALVES VOLUME – II OF II (TECHNICAL)**

**(BID DOCUMENT NO: 110304/WGI/GAIL GAS/05-R0)**

**LIMITED DOMESTIC COMPETITIVE BIDDING**



**DELIVERS. EVOLVES.**

WHOLE LIFE SOLUTIONS FOR PIPELINE AND SUBSEA SYSTEMS

**ISSUED BY**



**JP KENNY**

**GAIL GAS LIMITED  
CITY GAS DISTRIBUTION PROJECT, VADODARA**



**MATERIAL REQUISITION FOR BALL VALVES**

CLIENT JOB NO.

-

TOTAL SHEETS

08

**DOCUMENT NO**

11

0304

02

08

06

016

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REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	25/03/10	ISSUED FOR TENDER	GV	DDS	PKS
B	24/02/10	ISSUED FOR CLIENT'S REVIEW	GV	DDS	PKS
A	21/02/10	ISSUED FOR IDC	GV	DDS	PKS

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**LIST OF ATTACHMENTS**

<b>S.No.</b>	<b>DOCUMENT TITLE</b>	<b>DOCUMENT NUMBER</b>	<b>No. of Sheets</b>
1.0	TECHNICAL SPECIFICATION FOR BALL VALVE	11-0304-02-08-02-002(Rev 0)	16
2.0	DATA SHEET FOR BALL VALVE (2-12",300#)	11-0304-02-08-03-002(Rev 0)	2
3.0	DATA SHEET FOR BALL VALVE (2-12",600#)	11-0304-02-08-03-016(Rev 0)	2
4.0	QUALITY ASSURANCE PLAN FOR BALL VALVE	11-0304-02-08-10-002(Rev.0)	3
8.0	INSTRUCTIONS TO VENDOR FOR QUALITY DATA REQUIREMENT	11-0304-02-05-10-002(Rev.0)	6
9.0	PIPING MATERIAL SPECIFICATION	11-0304-02-08-02-001(Rev. 0)	18

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## 1.0 SCOPE OF SUPPLY

### 1.1 General

This Specification covers the scope of supply of assorted valves to be used in the City Gas Distribution Project for GAIL Gas Ltd.

The scope of supply covers the design, manufacture, inspection, testing, and preparation for shipment and documentation requirements of these items in accordance with the requirements of this Requisition.

### 1.2 Material Delivery Requirements

The finished materials are to be delivered by the Supplier at the nominated delivery point, fixed by the Purchaser/ Purchaser Representative.

The Supplier shall be responsible for all handling and transportation between his production plant and the nominated delivery point in accordance with this specification.

### 1.3 Valves

The type and quantities of valves are detailed below:

Item No.	Description								Qty
	Size		Bore	Ends	ANSI Rating	Stem	UG/AG	Remarks	Nos.
	(mm)	(inch)							
<b>BALL VALVES</b>									
1	273	10	FB	BW	600#	Normal	AG	Manual	02
2	273	10	FB	BW	300#	Normal	UG	Manual	17
3	273	10	FB	BW	300#	Normal	AG	Manual	02
4	219.1	8	FB	BW	300#	Normal	UG	Manual	03
5	168.3	6	FB	BW	300#	Normal	UG	Manual	02
6	114.3	4	FB	BW	300#	Normal	AG	Manual	20

**LEGEND: FB – FULL BORE, RB-REDUCED BORE, RGB-REGULAR BORE, BW – BUTTWELD, FLG-FLANGED, UG-UNDER GROUND, AG-ABOVE GROUND**

## 2.0 DELIVERY LOCATIONS

All material shall be delivered at Company's designated storage yard at Vadodara,Gujarat.

## 3.0 GENERAL NOTES TO MR

3.1 All valves shall be used for Natural Gas service. Accordingly, Impact test and hardness tests as per specification shall be applicable.



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- 3.2 All material shall be delivered at Company's designated storage yard. The destination for delivery of the valves shall be at designated GAIL gas store at as per clause 2.0.
- 3.3 Bidder to include the start up and commissioning spares for valves in the quoted price for Valves. However, list of spares (start up and commissioning) shall be made available without cost as per Form-B.
- 3.4 Bidder must submit duly filled up and signed data sheets and forms (Form-A and B) along with his offer.

In the absence of this information, Purchaser reserves the right to reject bidder's offer without any reference to Bidder in this regard.

**4.0 REMARKS**

4.1 Supplier's Compliance

Supplier shall submit his bid in full compliance with the requirements of this MR and attachments. Bidder shall include the following statement in his bid:

***We certify that our bid is fully complying with your enquiry dated ..... and referenced .....,***

Compliance with this material Requisition in any instance shall not relieve the Vendor of his responsibility to meet the specified performance.

4.2 Compliance with Specification

The supplier shall be completely responsible for the design, materials, fabrication, testing, and inspection, preparation for shipment & transfer of above material to nominated delivery point strictly in accordance with the MR & all attachments thereto.

4.3 Supplier's Scope

Supplier's scope of work includes the equipment with all internals & accessories shown on the data sheets, specifications and all unmentioned parts necessary for a satisfactory operation & testing except those which are indicated to be out of Supplier's supply.

4.4 Inspection

Supplier shall submit with his bid a list of 3 well known international Third Party inspection Agencies as per enclosed vendor list, which he intends to use for inspection. This agency will issue all relevant certificates as per specification & codes.

Inspection shall also be performed by a designated Third Party Inspection agency and/or purchaser as set out & specified in the codes & particular documents forming this MR.

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Form – A

**LIST OF COMMISSIONING SPARES & ACCESSORIES FOR START UP & COMMISSIONING FOR VALVES**

S.No.	Item No.	Description	Quantity

**Note: Bidder to include the start up and commissioning spares for valves in the quoted price for Valves.**

**To be filled, signed and stamped by Bidder.**

**Bidder's Seal**

**Signature of Bidder**

**Form - B**

**LIST OF SPARES AND ACCESSORIES FOR TWO YEARS OF NORMAL OPERATION FOR VALVES**



S.No.	Item No.	Description	Quantity

**Note: Bidder shall quote separately spares for two years normal operation for valves & actuators as per price schedule Performa.**

**To be filled, signed and stamped by Bidder.**

**Bidder's Seal**

**Signature of Bidder**

LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY								
S.NO	ITEM	NAME OF VENDOR	CONTACT PERSON	ADDRESS	PHONE NO	FAX NO	QUALIFIED FOR SIZE	
1	Third Party Inspection Agency	THIRD PARTY INSPECTION AGENCY						
		Tata Projects Ltd.		22, Sarvodaya Society, Nizampura, Bandra-390002	0265-2392863	0265-2785952		
		Indian Register of Shipping						
		Bax counsel Insepection Bureau Pvt. Ltd.		303, Madhava, Bandra Kurla Complex, Bandra(E), Mumbai-400051	022-26591526, 022-26590236	022-26591526		
		Bureau VeritasQI		The Leela Galleria, 5th floor, Andheri-Kurla Road, Andheri(E), Mumbai-400059	022-26956300	022-26956309		
		Germanischer Lloyd		304-305, Anna Salai, Teyanampet, Chennai-600018	044-24320335	044-24328186		
		Velosi Certification Services, Mumbai		Velosi Certification Services(I) Pvt. Ltd., 21 2, Shivkrupa Complex Centre, Off Ghokhale Road, Navpada Thane(W)-400602	022-25376770	022-25426777		
		ABS Industrial Verification Ltd., Mumbai		404, Mayuresh Chambers, Sector-11, CBD Belapur(E), Navi Mumbai-400614	022-27578780 / 1 / 2	022-27578784 / 5		
		Certification Engineers International Ltd.		EIL Bhavan, 5th floor, 1, Bhikaji Camma Place, New Delhi-110066	011-26167539, 26102121	011-26101419		
		Dalal Mott MacDonald		501, Sakar -II, Ellisbridge, Ahmedabad-380006	079-26575550	079-6575558		
		International Certification Systems		E-7, Chand Society, Juhu Road, Juhu, Mumbai-400049	022-26245747	022-226248167		
SGS		SGS India Pvt. Ltd., SGS House, 4B, A.S. Marg, Vikhroli(W), Mumbai-	022-25798421 to 28	022-25798431 to 33				
<p>Note: The details of Vendors indicated in this list are based on the information available with WGI, Vendor shall verify capabilities of each vendor for producing the quantity with proper Quality. Owner does not take any responsibility on the performance of the Vendor</p>								
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CITY GAS DISTRIBUTION PROJECT, VADODARA**



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					<b>TOTAL SHEETS</b> 16	
<b>DOCUMENT NO</b>	11	0304	02	08	02	002

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0	25/03/10	ISSUED FOR TENDER	GV	DDS	PKS
B	24/02/10	ISSUED FOR APPROVAL	GV	DDS	PKS
A	21/02/10	ISSUED FOR IDC	GV	DDS	PKS
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PREP</b>	<b>CHK</b>	<b>APPR</b>

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## 1.0 SCOPE

This specification provides minimum requirement for design, manufacturing, Inspection, Testing and supply of Carbon steel Ball Valves covering sizes ½" NB through 36"NB( 900mm) for ANSI pressure classes # 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 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.
API 605	:	Large Diameter Carbon steel Flanges.
API 6FA	:	Specification for Fire Test for Valves.
API 5L	:	Specification for Line Pipe.
API 1104	:	Specification for Welding Pipelines and related facilities.
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 16.25	:	Butt Welding Ends.
ASME B 16.5	:	Steel Pipe Flanges and Flanged Fittings.
ASME B 31.3	:	Process Piping.
ASME B 31.8	:	Gas Transmission and Distribution Piping Systems.
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.



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BS 6755-1	:	Testing of Valves. Specification for production pressure testing requirements.
EN 1004511	:	Metallic products: Charpy Impact test – test methods (U & V Notches)
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.

### 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.



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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

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

4.2 The specifications of the steel used shall be mentioned by the material manufacturer and all potential sub contractors (such as forging plant, casting plant and fabrication unit etc) will be described in the offer. After order no change will be accepted except for justified. In that case the asked changes shall be supported by a technical file submitted to the purchaser and the purchaser's representative for approval.

4.3 The manufacturer shall provide a technical description of the manufacturing methods that might influence the quality of material.

4.4 The purchaser/ purchaser's representative keeps the right to audit the manufacturer's and sub contractors manufacturing and control methods. All costs for such an audit shall be borne by the manufacturer except the wages, travel expenditure, lodging and boarding of the auditors supported by the purchaser/ purchaser's representative.

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

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

4.7 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.

4.8 Purchaser/ purchaser's representative may verify the control equipment of the manufacturer, its calibration and the points at which it is located. If during the production certain problem arises, the purchaser/ purchaser's representative may demand supplementary tests.

#### 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 carbon equivalent (CE) of valve end connections which are subject to further field welding by Purchaser shall not exceed 0.45% on check analysis for each heat of steel used and shall be calculated by the following formula:

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



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- 5.4 The steel used shall be suitable for field welding to pipes, flanges or fittings manufactured under ASTM – 53, A – 105, A – 106, A – 234, A – 350, A – 352, A – 694, A – 420, A – 333, and API – 5L etc.
- 5.5 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.
- 5.6 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 7.5 for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0°C. The Charpy V-notch test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of plate or forging. The minimum average absorbed energy per set of three specimens shall be 35 J with an individual minimum per specimen of 27J. Test procedure shall conform to ASTM A 370 or ISO 148.
- For valves specified to be used for other hydrocarbon services, the Charpy V-notch requirements stated above are not applicable, unless required by the specified material standard as a mandatory requirement.
- When Low Temperature Carbon Steel (LTCS) materials are specified in Valve Data Sheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.
- 5.7 Valves shall be subjected to hardness test on base material for each heat for pressure containing parts. A full thickness cross section shall be taken for this purpose and the maximum hardness shall not exceed 248 HV<sub>10</sub> based on minimum four (4) measurements representing the entire thickness.
- 6.0 DESIGN AND CONSTRUCTION**
- 6.1 a) Valve design shall be as per API 6D and suitable for the process conditions indicated in the Data Sheet. The ASME Boiler & Pressure Vessel Code, Section VIII, Division 1 shall be used to design the valve body. 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) Corrosion Allowance for all valves to be used in sweet gas services shall be considered nil.
- c) 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 underground services. Aboveground 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 Valves shall be Full bore or Reduce bore . 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



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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 All valves 4"NB and above shall be trunion mounting type. Valves below 4" shall be floating type unless specifically mentioned in data sheet otherwise.
- 6.7 Valve seats shall be with primary metal to metal contact for valves of sizes 4" and above . O - Rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it can not 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. Seat design with PTFE inserts is not acceptable for valves of sizes 4" and above.
- 6.8 All valves of sizes 4" and above shall have two seating surfaces which in close position blocks the flow from both ends. The cavity between the seating surfaces is vented through a bleed connection provided on the body cavity i.e. the valves shall be Double Block & Bleed (DBB).
- 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 200 mm (8") NB & 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 of size 4" and above 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 6.11 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, if specified shall have dimensions as per ASME B 16.5 for valve sizes up to DN 600 mm (24") excluding DN 550 mm (22") and as per MSS-SP-44/ASME B16.47Series A for Valve sizes DN 550 mm (22 inches) and for DN 650mm (26") and above. Flange face shall be either raised face or ring joint type as indicated in Valve Data Sheet. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN. All flanged face shall have concentric serration with 125 AARH finish.
  - d) Butt welding end preparation shall confirm to ASME B 16.25. Incase 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. The end preparation shall take care of outside diameter of connecting pipe, wall thickness, material grade, SMYS & Special chemistry of welded material as indicated in the data sheet.

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- 6.14 The temperature and pressure range of the valves shall be in accordance with the indicated values on the relevant piping specification and valve data sheet.
- 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-weld 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. After installation during 24 hours when the ball is partially or fully open at a pressure level
 

$P = 1.4 \times \text{MOP}$   
 $P = \text{hydrostatic test pressure (bar)}$   
 $\text{MOP} = \text{Maximum operating pressure at } 38 \text{ }^\circ\text{C}$
- 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 nominal size, DN 200 mm (8") and larger, 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 minimum. The lifting lugs shall be stamped with safe working load.
- 6.18 In order to avoid stress induced crack and soft seat damage 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 When indicated in Material Requisition, valves shall have locking devices to lock the valve either in full open (LO) or full close (LC) positions. 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  $\leq 3\text{bar}$ .
- 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

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maximum output torque of the operating mechanism. The valve Manufacturer shall guarantee that the breakaway torque after long periods of non- movement can not 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.
- 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 operator, valve sizes, 100 mm (NPS 4") and below shall be wrench/ lever operated. For Valves from 6" - 12" 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 exceed 350N. 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.
- 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.

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- 6.25 Welding including repair welding of pressure retaining parts shall be as per welding procedure qualification specified in ASME Section IX. The procedure qualification shall also include impact test and hardness test when required as per Clause 5.6, 5.7, 7.5 and 7.6 of this specification and shall meet the requirements as specified therein.
- 6.26 The welders involved in welding shall be qualified in accordance with ASME Section IX.
- 6.27 Repair by welding is not permitted for forged body valves. However repair by welding as per ASME B 16.34 is permitted for cast body valves. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test when required as per Clause 5.6, 5.7, 7.5 and 7.6 of this specification and shall meet the requirements as specified therein.
- 6.28 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.
- 6.29 When specified on the Valve Datasheet, Ball Valves shall be "fire safe" in accordance with API 6FA/API 607, for which qualifying certificates, covering the range of items offered, shall be supplied by the Manufacturer.

**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 The valve manufacturer must deliver a Certificate EN 10204 3.2 stating the quality, the mechanical properties (yield strength, tensile strength, and impact test at 0 ° C), the chemical analysis the process of manufacture and the marking (for ex: - heat number of material)  
  
A new chemical analysis (upgradation) shall be done on specimen of valve in presence of TPIA.
- 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 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.
- 7.5 Pressure containing parts of all valves such as body, bonnet, flange, welding ends and balls etc shall be subjected to impact test on each heat of base material as per API 6D CL.7.5.
- 7.6 Notch toughness properties Charpy V: The standard impact test temperature is 0 °C. The average value per series of 3 test specimen shall be equal to 35 J/cm<sup>2</sup>. The minimum value per test specimen shall be equal to 27 J/cm<sup>2</sup>; this value may drop to 27 J/cm<sup>2</sup> per test specimen per series.
- 7.7 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. All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with MSS-SP-53.
  - 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.

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c) All forgings shall be ultrasonically examined in accordance with the procedure and acceptance standard of Annexure E of ASME B 16.34. All forgings shall be subjected to wet magnetic particle inspection on 100% of the internal surfaces. Method and acceptance shall comply with MSS-SP-53.

d) Bodies and bonnets made by welded assembly of segments of castings, forgings, combinations thereof shall be examined, as applicable, by methods of 7.7 (b) for cast components or 7.7 (c) for forged components and plates.

7.8 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.

7.9

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. Rejectable defects must be removed. Weld repair of bevel surface is not permitted.

7.10

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. The body cavity self-relieving feature meeting the requirements of clause 6.8 of this specification shall also be checked.

7.11

A supplementary air seat test as per API 6D, Appendix C, Para C3.3 Type II shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

7.12

Valves shall be subjected to Operational Torque Test as per Appendix C, Para C.6, API 6D under hydraulic pressure equal to maximum differential pressure corresponding to the valve rating. For manually operated valves, it shall be established that the force required to operate the valve does not exceed the requirements stated in section 6.24 (c) of this specification.

7.13

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.

7.14

Subsequent to successful testing as specified in clause 7.10, 7.11, 7.12 and 7.13 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.

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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.

7.15 Purchaser reserves the right to perform stage wise inspection and witness tests as indicated in clauses 7.1 to 7.14 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.

**8.0 TEST CERTIFICATES**

Manufacturer shall submit the following certificates:

- 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) Test report on operation of valves conforming to clause 7.12, 7.13 and 7.14 of this specification.
- e) Fire safe test certificate as per API 6FA.
- f) 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.

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- 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:
- a) Order Number
  - b) Manufacturer's Name
  - c) Valve size and rating
  - d) Tag Number
  - e) Serial Number

**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.

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- 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.

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:

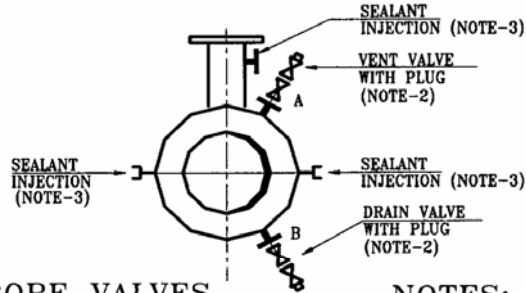
- a) Test certificates as per clause 8.0 of this specification.
- b) Manual for installation, erection, maintenance and operation instructions including a list of recommended spares for the valves.

11.4 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.

11.5 All documents shall be in English language only.

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### 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**

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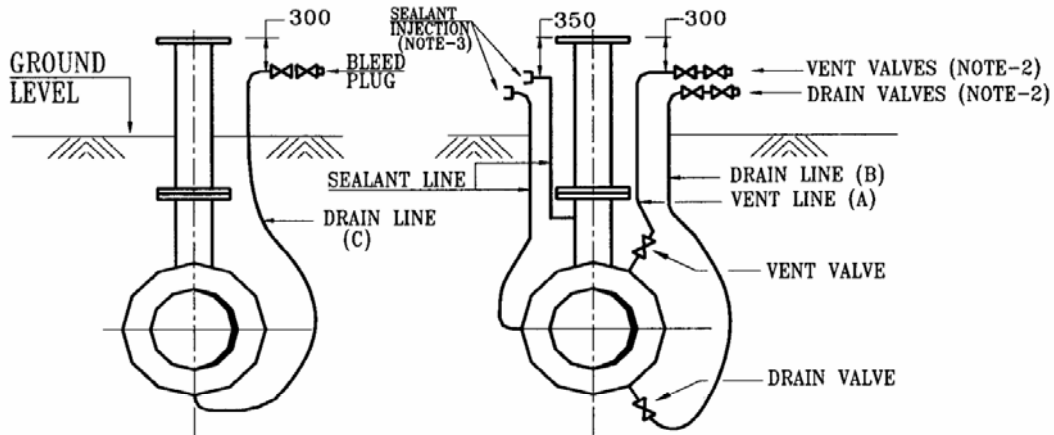
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## UNDERGROUND INSTALLATION



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

FB VALVES  $\geq$  DN 200 mm(8")  
 RB VALVES  $\geq$  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**

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<b>SIZE/QUANTITY</b>	**		
<b>GENERAL SPECIFICATION</b>			
<b>Process Fluid</b>	NG	<b>ANSI Rating</b>	300#
<b>Design Temperature</b>	( 0 to 60 deg C)	<b>Design Pressure</b>	49 barg
<b>Design Standard</b>	API 6D	<b>Piping Class</b>	3A1
<b>Size, mm (inch)</b>	2" to 12"		
<b>Body Type</b>	Full Bore		
<b>End Connection Type</b>	**	<b>Standard</b>	ASME B16.25/ASME B16.5
<b>Flange Face Finish</b>	RF 125AARH	<b>Special Requirement</b>	Vent, drain & Sealant connection Anti Blow out system
<b>Locking Device Reqd</b>	As per Technical Spec.		
<b>VALVE DESIGN CONDITIONS</b>			
<b>Corrosion Allowance</b>	0.5 mm	<b>Design Factor</b>	0.5
<b>Installation</b>	**	<b>Stem Ext Length, mm</b>	Not Applicable
<b>CONNECTING PIPE DETAILS</b>			
<b>Diameter, mm (inch)</b>	10"/8"/6"	<b>MATERIAL</b>	API 5L Gr X52(6.4mm thickness)
<b>Diameter, mm (inch)</b>		<b>MATERIAL</b>	
<b>VALVE OPERATION</b>			
<b>Actuation Type</b>	As per Technical Spec.		
<b>Type of Actuator</b>	Not Applicable		
<b>VALVE MATERIAL SPECIFICATION</b>			
<b>PART DISCRPTION</b>	<b>SPECIFIED</b>		
<b>Body</b>	A 216 Gr. WCB		
<b>Ball</b>	(A 216 Gr. WCB) + 0.003" ENP		
<b>Seat Rings</b>	AISI 4140 + 75 micrometer (0.003") ENP/ AISI 410		
<b>Seat Seal</b>	VITON		
<b>Stem</b>	AISI 4140 + 75 micrometer (0.003") ENP/ AISI 410		
<b>Stem Seal</b>	PTFE/ VITON		
<b>Stud Bolts</b>	ASTM A 193 Gr. B7		
<b>Nuts</b>	A194 Gr. 2H		
<b>TESTING REQUIREMENT</b>			
<b>Hydrostatic Test Pressure</b>	Body: 74 barg	Seat: 54 barg	
<b>Air Test Pressure</b>	7barg		
<b>Anti-Static Testing Requirement</b>	As per API 6D Latest Edition		
<b>Hardness Test</b>	248 HV10		
<b>Charpy Impact Test/ Temperature</b>	Yes (at 0 deg C)		
	<b>DATA SHEET FOR BALL VALVES</b> <b>(2"-12," 300#)</b>		<b>Document No.</b>
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<b>CLIENT</b>	GAIL GAS LIMITED	<b>PROJECT:CITY GAS DISTRIBUTION PROJECT,VADODARA</b>	
<b>SIZE/QUANTITY</b>	**		
<b>GENERAL SPECIFICATION</b>			
<b>Process Fluid</b>	NG	<b>ANSI Rating</b>	600#
<b>Design Temperature</b>	( 0 to 60 deg C)	<b>Design Pressure</b>	98 barg
<b>Design Standard</b>	API 6D	<b>Piping Class</b>	3A1
<b>Size, mm (inch)</b>	2" to 12"		
<b>Body Type</b>	Full Bore		
<b>End Connection Type</b>	**	<b>Standard</b>	ASME B16.25/ASME B16.5
<b>Flange Face Finish</b>	RF 125AARH	<b>Special Requirement</b>	Vent, drain & Sealant connection Anti Blow out system
<b>Locking Device Req'd</b>	As per Technical Spec.		
<b>VALVE DESIGN CONDITIONS</b>			
<b>Corrosion Allowance</b>	0.5 mm	<b>Design Factor</b>	0.5
<b>Installation</b>	**	<b>Stem Ext Length, mm</b>	Not Applicable
<b>CONNECTING PIPE DETAILS</b>			
<b>Diameter, mm (inch)</b>	10"	<b>MATERIAL</b>	API 5L Gr X52(6.4mm thickness)
<b>Diameter, mm (inch)</b>		<b>MATERIAL</b>	
<b>VALVE OPERATION</b>			
<b>Actuation Type</b>	As per Technical Spec.		
<b>Type of Actuator</b>	Not Applicable		
<b>VALVE MATERIAL SPECIFICATION</b>			
<b>PART DISCRPTION</b>	<b>SPECIFIED</b>		
<b>Body</b>	A 216 Gr. WCB		
<b>Ball</b>	(A 216 Gr. WCB) + 0.003" ENP		
<b>Seat Rings</b>	AISI 4140 + 75 micrometer (0.003") ENP/ AISI 410		
<b>Seat Seal</b>	VITON		
<b>Stem</b>	AISI 4140 + 75 micrometer (0.003") ENP/ AISI 410		
<b>Stem Seal</b>	PTFE/ VITON		
<b>Stud Bolts</b>	ASTM A 193 Gr. B7		
<b>Nuts</b>	A194 Gr. 2H		
<b>TESTING REQUIREMENT</b>			
<b>Hydrostatic Test Pressure</b>	Body: 147 barg	Seat: 108 barg	
<b>Air Test Pressure</b>	7barg		
<b>Anti-Static Testing Requirement</b>	As per API 6D Latest Edition		
<b>Hardness Test</b>	248 HV10		
<b>Charpy Impact Test/ Temperature</b>	Yes (at 0 deg C)		
	<b>DATA SHEET FOR BALL VALVES</b> <b>(2"-12," 600#)</b>		<b>Document No.</b>
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			<b>Rev.</b>
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		<b>PROJECT:</b> CITY GAS DISTRIBUTION PROJECT,VADODARA <b>CLIENT:</b> GAIL GAS LIMITED <b>CONSULTANT:</b> WGI <b>VENDOR:</b>				<b>QAP NO:</b> 11-0304-02-08-10-002 <b>REV NO:</b> 0 <b>ITEM DESCRIPTION/ QUANTITY:</b> BALL VALVE <b>JOB NO.:</b> 110304 <b>PAGE NO:</b> 1 of 3			
SR. NO.	COMPONENTS & OPERATIONS	TYPES OF CHECK	QUANTAM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION		
							SUBVENDOR/ VENDOR	TPI	WGI/GGL
1	<b>RAW MATERIAL</b>								
	<b>1. BODY &amp; BONET ( REFER NOTE-1)</b>	<b>CHEM. TEST</b>	PER HEAT	MOC	MOC	3.2 Certificate	P/R	R	R
		<b>PHY. TEST</b>	PER HEAT	MOC	MOC	3.2 Certificate	P/W	W	W
		<b>VISUAL</b>	100%	MSS-SP-75	-	INTERNAL Q.C	P/W	R	R
		<b>IMPACT TEST ( 0 DEG C )</b>	PER HEAT	ASTM A 370	35J AVERAGE VALUE / 28J (ONE SPECIMEN)	T.C.	P/W	W	W
		<b>RADIOGRAPHY</b>	100%	ASTM A 16.34	ASTM A 16.34	INSPECTION REPORT/RT FILMS	P/W	R	R
		<b>MPT</b>	100%	ASTM A 16.34	ASTM A 16.34	INSPECTION REPORT	P/W	W	R
	<b>2. DISC &amp; SEAT RING</b>	<b>CHEM. TEST</b>	PER HEAT	MOC	MOC	SUPPLIER T.C.	P/W	R	R
		<b>PHY. TEST</b>	PER HEAT	MOC	MOC	SUPPLIER T.C.	P/W	W	W
		<b>VISUAL</b>	10% WITNESS & 100% REVIEW	-			P/W	W	R
		<b>IMPACT TEST ( 0 DEG C )</b>	PER HEAT	ASTM A 370	35J AVERAGE VALUE / 28J (ONE SPECIMEN)	INSPECTION REPORT	P/W	W	RW
	<b>3. SPINDLE</b>	<b>CHEM. TEST</b>	PER HEAT	MOC	MOC	LAB T.C.	P/R	R	R
		<b>PHY. TEST</b>	PER HEAT	MOC	MOC	LAB T.C.	P/W	W	R

		<b>PROJECT:</b> CITY GAS DISTRIBUTION PROJECT,VADODARA <b>CLIENT:</b> GAIL GAS LTD. <b>CONSULTANT:</b> WGI <b>VENDOR:</b>				<b>QAP NO:</b> 11-0304-02-08-10-002 <b>REV NO:</b> 0 <b>ITEM DESCRIPTION/ QUANTITY:</b> BALL VALVE <b>JOB NO.:</b> 110304 <b>PAGE NO:</b> 2 of 3			
SR. NO.	COMPONENTS & OPERATIONS	TYPES OF CHECK	QUANTAM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION		
							SUBVENDOR /VENDOR	TPI	WGI/GGL
2	<b><u>INPROCESS INP</u></b>								
	1. BODY & BONET	TRANSFER OF HEAT NO.	100%	-	-	INSPECTION REPORT	P/W	W	R
		DIMENSIONS	100%	APPVD.DRG	APPVD.DRG	INSPECTION REPORT	P/W	W	R
	2. DISC & SEAT RING	DIMENSIONS	100%	-DO-	-DO-	-DO-	P/W	R	R
	3. SPINDLE	DIMENSIONS	100%	-DO-	-DO-	-DO-	P/W	R	R
	4. HARD FACING	HARDNESS & D.P.	100%	ASTM B 16.34	ASTM B 16.34 350 to 450 BHN	INSPECTION REPORT	P/W	W	RW
3	<b><u>BROUGHTOUT ITEM</u></b>								
1. FASTNERS	CHEMICAL	PER LOT	ASTM A 193 Gr. B7 & A 194 Gr. 2H	ASTM A 193 Gr. B7 & A 194 Gr. 2H	INSPECTION REPORT 3.2 Certificate	P	R	R	
	PHYSICAL	PER LOT	ASTM A 193 Gr. B7 & A 194 Gr. 2H	ASTM A 193 Gr. B7 & A 194 Gr. 2H		P	R	R	
	DIMENSIONS	10%	-	-		P	R	R	
	IMPACT TEST (0 DEG C)	PER LOT	ASTM A 370	35J AVERAGE VALUE / 28J (ONE SPECIMEN)		P	W	R	

SR. NO.		COMPONENTS & OPERATIONS	TYPES OF CHECK	QUANTAM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION			
								SUBVENDOR/ VENDOR	TPI	WGI/GGL	
4		<b>FINAL INSPECTION</b>									
		<b>ASPER API 598 ( REF.ANNEXURE-1 )</b>	VISUAL	100%	-	-	-	P	W	R	
			DIMENSIONS	100%	APPVD.DRG & API 598	APPVD.DRG & API 598	INSPECTION REPORT	P/W	W	RW	
			HYD. BODY TEST	100%	APPVD.DRG & API 598	APPVD.DRG & API 598	-DO-	P/W	W	RW	
			HIGH PRESSURE CLOSER ( SEAT) TEST	100%	APPVD.DRG & API 598	APPVD.DRG & API 598	-DO-	P/W	W	RW	
			LOW PRESSURE CLOSER (SEAT) TEST	100%	APPVD.DRG & API 598	APPVD.DRG & API 598	-DO-	P/W	W	R	
			HIGH PRESSURE PNEUMATIC SHELL TEST	100%	API 598	API 598	-DO-	P/W	W	RW	
5		<b>PAINTING</b>	VISUAL	10% WITNESS & 100% REVIEW	-	-	-	P	R	R	
			SURFACE PREPARATION SA 2 <sup>1/2</sup>	100%	SPEC	SPEC 60-80μ ROUGH	INSPECTION REPORT	P	W	R	
			PRIMER & FINISH COAT (EACH TWO COAT)	100%	SPEC	SPEC 60-80μ EACH COAT & TOTAL WITHIN 300μ	PAINT. INSP. REPORT	P	W	R	
6		<b>FINAL DOCUMENTS</b>	REVIEW	100%	AS PER SPEC./APPD.DRG.	AS PER SPEC./APPD.DRG.	Final dossier - IRN, 3.2 Certificate, Insp & test report, Drawing etc	P	R	R	
			MARKING/TAG DETAILS	100%	AS PER SPEC./MSS SP25	AS PER SPEC./MSS SP 25		P	R	R	
<b>LEGEND: W - WITNESS, R - REVIEW, TPI - THIRD PARTY INSPECTION, RW - RANDOM WITNESS, MOC-MATERIAL OF CONSTRUCTION</b> <b>NOTES : 1. ALL INSTRUMENTS &amp; EQUIPMENT SHALL HAVE VALID CALIBRATION CERTIFICATE TO BE REVIEWED BY TPI.</b> <b>2. MATERIAL TEST CERTIFICATE OF CASTING AND FASTENERS SHALL BE IN 3.2 AS PER EN-10204.</b> <b>3. TPIA TO ISSUE 3.2 CERTIFICATE AS PER EN 10204 SPEC.</b>											



**GAIL GAS LIMITED  
CITY GAS DISTRIBUTION PROJECT ,VADODARA**



**INSTRUCTIONS TO VENDOR FOR  
QUALITY DATA REQUIREMENTS**

**CLIENT JOB NO.**

-

**TOTAL SHEETS**

6

**DOCUMENT NO**

11

0304

02

08

10

016

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REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	25/03/10	ISSUED FOR TENDER	GV	DDS	PKS
B	24/02/10	ISSUED FOR APPROVAL	GV	DDS	PKS
A	21/02/10	ISSUED FOR IDC	GV	DDS	PKS

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3. SCOPE	3
4. DEFINITIONS	3
5. INSTRUCTIONS	4
6. ATTACHMENTS	6

## 1.0 INTRODUCTION

- 1.1 As a part of services rendered to the Client, WGI purchases Products/Services for Projects on behalf of Client (including in house projects) from various vendors.

## 2.0 PURPOSE

- 2.1 The purpose of this standard is to describe the vendor Quality Data Requirements which shall form a part of every Material Requisition (MR)/Purchase Requisition (PR) released by WGI, so as to ensure that all purchased products/services consistently conform to planned Quality, project's stated and implied needs met to the total satisfaction of Client.

## 3.0 SCOPE

The requirements of this standard are applicable to all Vendors for supply of Packages, Equipments and Materials which are:

- a) Purchased on behalf of Clients for Projects handled by WGI.
- b) Purchased for WGI' s in house projects.

## 4.0 DEFINITIONS

- 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 is used for statements of possibility & capability, whether material, physical or casual.
- Vendor : The person(s), firm, company, organisation from whom WGI procures products/services on behalf of Client, as a part of services rendered to the Client for Projects handled by WGI, or for its in house projects.  
"Contractor", "Sub-Contractor", "Sub-vendor", "Supplier", "Seller", "Agents" are considered synonymous to "Vendor",

## 5.0 INSTRUCTIONS

### 5.1 Quality Assurance Plan

Vendor during bidding stage, shall confirm compliance to his QUALITY ASSURANCE (QA) Plans (consisting of relevant Procedures covering various activities like design and engineering, material procurement, manufacture, inspection and testing, documentation, dispatch to site, erection and commissioning where applicable and maintenance of Quality records) which have already been approved at the time of vendor enlistment. In the post order stage, the vendor shall confirm the validity of their QA Plans and submit only revisions/deviations if any to these plans, to the concerned WGI Inspection office/Third Party Inspection Agency for approval within 2 weeks from the date of receipt of PR.

## 5.2 **Inspection & Test Plan**

Vendor shall submit Inspection and Test plan for approval within 2 weeks of PR and before commencement of manufacture to concerned WGI Inspection Office/Third Party Inspection Agency. The Inspection and Test Plan shall also cover "bought out" items from sub-vendors.

## 5.3 **Drawing Schedule**

Vendor shall submit index of drawings and documents required for review/records based on the Vendor Data Requirement given in the PR along with the scheduled date of submission of each drawing/document within 2 weeks from Telefax/Letter of Intent. The Drawing schedule shall be specific with regard to drawing/document No., the exact title and the size of the drawings/documents.

## 5.4 **Progress Report and Schedule**

Vendor shall submit Monthly Progress Report and updated procurement, engineering and Manufacturing Schedule every month, beginning within 2 weeks from Telefax/Letter of Intent.

## 5.5 **Waiver & Deviation**

Vendor shall strictly comply with PR stipulations and no deviations shall be permitted. However, if the need for deviation arises under exceptional circumstances, on the post-order stage, such deviation shall be subjected to the approval of WGI/OWNER and shall be submitted through WGI Inspection Office in the prescribed "WAIVER/DEVIATION REQUEST" format

## 5.6 **Procurement of Bought out Materials**

All critical materials such as casting, forging, fittings, pressure holding parts, electrical and instrument accessories, etc. shall be purchased by the Vendor from WGI approved suppliers meeting Qualification Criteria stipulated if any. Vendor shall submit a list of bought out materials and sub-vendors for these bought out materials for WGI approval within 2 weeks from Telefax/Letter of Intent.

## 5.7 **Calibration Records**

Vendor shall use only calibrated measuring and test instruments and maintain calibration records. Vendor shall furnish records of calibration of measuring and test instruments including recalibration records to concerned WGI Inspection Office/Third Party Inspection Agency.

## 5.8 **Inspection Test Status**

Inspection and Test status of products shall be identified by using markings, authorized stamps, tags. Route cards, inspection records etc. during the course of manufacture to clearly indicate acceptance/rejection of tests/stages of inspection performed during its manufacturing cycle. The identification of inspection and test status shall be maintained and records thereof shall be submitted as and when demanded by WGI Inspection Engineer or Third Party Inspection Agency approved by WGI.

## 5.9 **Quality Records**

Vendor shall maintain quality records as per his procedures. Inspection Reports & Test Record copies shall be furnished to WGI Inspection Engineer or Third Party Inspection Agency approved by WGI.

## 5.10 **Identification and Traceability**

Vendor shall establish and maintain a standard written procedure for identifying the products from applicable drawings, specification or other documents during all stages of production, delivery and installation. A copy of this Standard procedure shall be made available at concerned WGI Inspection

office. On job to job basis, vendor shall confirm its validity and only revisions/deviations if any shall be submitted for approval. The vendor shall ensure that each product which is going in the process of fabrication / manufacture/construction/erection has proper identification throughout the process including the final output.

5.11 Vendor Documents for WGI Review/records

General

- i) All Documents shall be in ENGLISH language and in M.K.S. system of units.
- ii) Review of the vendor Drawings by WGI would be only to review the compatibility with basic designs and concepts and in no way absolve the vendor of his responsibility to comply with PR requirements, applicable codes, specifications and statutory rules/regulations.
- iii) Unless otherwise agreed, submission of Documents for Review/Records shall commence within 4 weeks from the date of Telefax/Letter of Intent.
- iv) Unless otherwise agreed, vendor shall submit all Drawings and Documents in number of copies, as stipulated in the Vendor Data Requirement Form, along with Document Index. The Documents shall be supplied in soft copies where specified.

5.11.1 A blank space duly marked measuring 75 mm (W) x 38 mm (H) shall be provided on the body of all Vendor Drawings for marking of Review Codes by WGI.

5.11.2 Documents for Review and Documents for Records shall be submitted in separate folders with separate covering letter to facilitate expeditious processing at WGI.

5.11.3 Before forwarding the drawings and documents, vendor shall ensure that the following information is properly entered in each drawing:

- PURCHASE REQUISITION :
- NAME OF EQUIPMENT :
- EQUIPMENT TAG NO. :
- NAME OF PROJECT :
- CLIENT :
- DRAWING/DOCUMENT TITLE :
- DRAWING/DOCUMENT NO. :
- REVISION AND DATE :

5.11.4 The Drawing/Documents shall be checked, approved and duly signed/stamped by vendor before submission. Revision Number shall be changed during submission of the revised Vendor Documents and all revisions shall be highlighted by clouds. Before submitting any sub-vendor drawings for review by WGI, the vendor shall ensure that these sub-vendor drawings have been reviewed, commented and stamped by the vendor. Direct submission of sub-vendor's drawings without vendor's review shall not be entertained.

- 5.11.5 While resubmitting the Drawings/Documents, the vendor shall submit a comment compliance note with justification.
- 5.11.6 Multi-sheet Documents other than Drawings shall be submitted in their entirety in the event of a resubmission even if only few sheets are revised.

5.11.7 Vendor shall forward all Drawings/Documents related to manufacturing and testing of Ball valve with transmittals to purchaser/ purchaser's representative.

5.11.8 Documents under Review Category

Following review codes shall be used for review of Vendor Drawings/Documents:

Review Code A - Approval

Review Code B - Approved subject to incorporation of comments for construction and fabrication.

Review Code C - Not Approved.

Review Code D - For information

5.11.9 Documents under Records Category

Documents under this category are meant for WGI Records and would not be returned to vendor. However, comments, if any, will be communicated to vendor.

5.12 Final Documentation

5.12.1 Final Drawings/documents consisting of Technical Data Manual/Mechanical Catalogue is compilation of "as built" certified, drawings and data, manufacturing and test records, installation, operating and maintenance instructions. For drawings where Purchaser's approval is required, the final certified drawings shall be included. Final Documents shall be legible photocopies in A4, A3 or A2 size only. The Purchase Requisition shall also form a part of the final documentation.

5.12.2 Final Documentation shall be bound in Hard board folder(s) of size 265 mm x 315 mm (10 & a half inch x 12 and a half inch) and shall not be more than 90 mm thickness, it may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume.

5.12.3 Each volume shall contain a Title Block indicating Equipment Tag No., Equipment Name P.O./Purchase Requisition No., Name of Project and Name of Client.

6.0 ATTACHMENT

WAIVER & DEVIATION REQUEST, which shall be subjected to approval by Purchaser.

**ATTACHMENT**

Report No.:  
Date:

**WAIVER / DEVIATION FORMAT**  
(TO BE RAISED BY CONTRACTOR / VENDOR)

Project :  
Client :  
Consultant :  
Third Party Insp. Agency :  
Order / Contract No. :  
Contractor :  
Originator :

Requirement as per Specification / Drawing	Description of Waiver / Deviation sought
<u>Why the Waiver / deviation is required?</u>	
Contractual implications if Waiver/Deviation is granted	
<ul style="list-style-type: none"><li>Time taken shall be More / Less / No Change</li><li>Cost of Item Shall be More / Less / No Change</li></ul> <p style="text-align: right;">Note: Detailed break up of cost benefit to be attached if More / Less</p>	
<ul style="list-style-type: none"><li>Performance requirement shall be satisfied / not satisfied</li></ul> <p>Under present constraints requested waiver/deviation is most optimum for the Project and does not involve any security and safety hazard.</p> <p>Date: <span style="float: right;">Signature of Originator Name and seal:</span></p>	
<u>Recommended by TPIA (when required):</u> Comments:	
Date: <span style="float: right;">Signature Name and Seal:</span>	

Recommended by Consultant(Site):

Date:

Signature:  
Name:

Recommended by Owner (Site):

Date:

Signature:  
Name:

Justification by Consultant (HO):

Date:

Signature:  
Name:

Final Approval by PM / Owner:

Date:

Signature:  
Name:

Acceptance by Contractor / Vendor:

Date:

Signature:  
Name & Seal:



**GAIL GAS LIMITED  
CITY GAS DISTRIBUTION PROJECT  
VADODARA**



<b>PIPING MATERIAL SPECIFICATION</b>					<b>CLIENT JOB NO.</b>	-
					<b>TOTAL SHEETS</b>	6
<b>DOCUMENT NO</b>	11	0 304	02	08	02	001

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0	25.03.10	ISSUED FOR TENDER	GV	DDS	PKS
B	08.02.10	ISSUED FOR CLIENT'S REVIEW	GV	DDS	PKS
A	05.02.10	ISSUED FOR IDC	GV	DDS	PKS
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>PREP</b>	<b>CHK</b>	<b>APPR</b>

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**JP KENNY**



**PIPING MATERIAL SPECIFICATION**

**Document No.**

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## 1.0 GENERAL NOTES

This specification describes the minimum requirements for the design, furnishing of materials, fabrication, and inspection and testing of pipes, fittings and valves.

All material shall confirm to ASTM, API or BS standards. Design and fabrication shall confirm to ASME for pressure piping, ASME B 31.3 – Chemical Plant and petroleum Refinery Piping, and ASME B 31.8 – Gas transmission and Distribution piping system.

## 2.0 DEFINITIONS

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 is used for statements of possibility & capability, whether material, physical or casual.

## 3.0 CODES AND STANDARDS

The latest revision of the following shall be considered as part of this specification.

ASME B 16.5	Steel Pipe Flanges and Flanged Fittings
ASME B 16.9	Factory made Wrought Steel Buttwelding Fittings
ASME B 16.10	Face to Face/ End to End dimension of valves.
ASME B 16.11	Forged Steel Fittings, Socket Welding and Threaded.
ASME B 16.20	Metallic Gaskets for Pipe Flanges.
ASME B 16.21	Non-Metallic Flat Gasket for Pipe Flanges
ASME B 16.47	Large Diameter Steel Flanges (26" throu 60")
ASME B 31.3	Process Piping
ASME B 31.4	Pipeline Transportation system for Liquid hydrocarbons & other Liquids
ASME B 31.8	Gas Transmissions and Distribution Piping System
ASME B 36.10	Welded and Seamless Wrought Steel Pipe
ASME B 46.1	Surface Texture
API 5L	Line Pipe

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API 6D	Pipeline Valves
API 590	Steel Line Blank
API 600	Steel Gate Valves Flanges and Buttwelding Ends
API 602	Compact Steel Gate Valves
MSS SP 44	Steel Pipe line Flanges
MSS SP 75	Specification for High Test Wrought Butt Welding Fittings
MSS SP 97	Integrally Reinforced Forged Branch Outlet Fitting – Socket Welding, Threaded and Buttwelding Ends
ASTM A 105	Forging, Carbon Steel for Piping Components
ASTM A 193	Alloy Steel and Stainless Steel bolting Materials for High temp Service.
ASTM A 194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 320	Standard Specification for Alloy Steel and Stainless Steel Bolting Materials
ASTM A 216	Steel Casting, Carbon, Suitable for Fusion Welding, for High Temperature Service.
ASTM A 234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature
ASTM A 694	Forging, Carbon and Alloy Steel, for Pipe Flanges, Fitting, Valves and Parts for High Pressure Transmission Service.
ASTM A 333	Low temperature service seamless pipe.
ASTM A 350	Forged Carbon and Low Alloy Steel requiring Notch Toughness Testing for Piping Components
ASTM A 420	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low Temperature Service.
ASTM A 860	Standard Specification for Wrought High Strength Low Alloy Steel Butt Welding Fittings

#### 4.0 ABBREVIATIONS

##### 4.1 Flange Facing

RTJ	-	Ring Type Joint
FF	-	Flat Face
RF	-	Raised Face



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#### 4.2 Fittings

PE	-	Plain End
BE	-	Bevel End
BW	-	Butt Weld
PBE	-	Plain Both End
POE	-	Plain One End
TBE	-	Threaded Both End
TOE	-	Threaded One End
LR	-	Long Radius
SR	-	Short Radius

#### 4.3 Connections

BW	-	Butt-Weld
FLGD	-	Flanged
SCRD	-	Screwed
SO	-	Slip-On
SW	-	Socket Weld
THRD	-	Threaded
WN	-	Weld Neck

#### 4.4 Wall Thickness

SCH	-	Schedule in accordance with ASME B 36.10 or B 36.19
STD	-	Standard Weight Wall Thickness
XS	-	Extra Strong Wall Thickness
XXS	-	Double Extra Strong Wall Thickness

#### 4.5 Valve Description

BC	-	Bolted Cap
BB	-	Bolted Bonnet
ES	-	Extension Stem
FB	-	Full Bore
MO	-	Motor Operated
GO	-	Gear Operated
NRS	-	Non-Rising Stem (with inside screw)
OS&Y	-	Outside Screw and Yoke
RB	-	Reducer Bore
RS	-	Rising Stem
SC	-	Screwed Cap
UB	-	Union Bonnet
UC	-	Union Cap
WB	-	Welded Bonnet

#### 4.6 Pipes Description

BE	-	Beveled End
CS	-	Carbon Steel
ERW	-	Electric Resistance Welded
EFW	-	Electric Fusion Welded
FS	-	Forged Steel
HFI	-	High Frequency Induction
KCS	-	Killed Carbon Steel
KFS	-	Killed Forged Steel

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OH - Open Hearth  
 SAW - Submerged Arc Welded  
 SMLS - Seamless

**5.0 PIPING CLASSES DESCRIPTION**

Piping Classes assigned for the project are based on the following 2-digit system.

**First Digit**

Numerical, denoting the basic system rating or flange class

i.e.            1        = ASME Class 150  
                   3        = ASME Class 300  
                   6        = ASME Class 600  
                   9        = ASME Class 900

**Second Digit**

Letter, denoting the material

A - Carbon Steel  
 C - Stainless Steel  
 F - Fiberglass Reinforced plastic/epoxy (FRP)  
 G - Galvanized  
 P - Plastic (PEHD)  
 S - Stainless Steel  
 V - PVC

**Third Digit**

Sequential number to differentiate two or more piping classes of the same rating and same material but presenting some difference related to the handled fluid.

**Fourth Digit**

Letter, denoting the aboveground and underground

U = Underground

**JP KENNY**



**PIPING MATERIAL SPECIFICATION**


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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING	150#
1A1							CODE	ANSI B 31.8
TEMPERATURE ( 0 TO 60 °C)							BASIC MATERIAL	
PRESSURE (18.75 bar g)							CORROSION ALL. 0.5 mm	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS	
PIPELINE	PL	4"-8"	BE	6.4 mm	API 5L	API 5L Gr. X42	4"-6" :Seamless	
		10"	BE	6.4 mm	API 5L	API 5L Gr. X52	8" :Electric Welded	
PIPES	P	0.50" - 1.50"	PE, SEAMLESS	S160	ASME B36-10	ASTM A 106 Gr.B		
		2"	BE, SEAMLESS	XS	ASME B36-10	ASTM A 106 Gr.B		
		3" - 16"	BE, SEAMLESS	S40	ASME B36-10	ASTM A 106 Gr.B		
ELBOWS 90 LR	E	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105		
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB		
ELBOWS 45 LR	E45	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105		
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB		
LR Bends 90°	LR B	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB		
LR Bends 45°	LR B 45	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB		
REDUCERS CONCENTRIC	RC	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB		
REDUCERS ECCENTRIC	RE	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB		
TEES EQUAL	T	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105		
		2" - 16"	BW	M	ASME B16.9	ASTM A 234 Gr WPB		
TEES RED	TR	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105		
		2" - 16"	BW	M X M	ASME B16.9	ASTM A 234 Gr WPB		
SOCKOLET	S	0.50" - 1.50"	SW	3000#	MSS-SP 75	ASTM A105		
WELDOLETS	W	2" - 16"	BW - ASME B16-25	M X M	MSS-SP 75	ASTM A105		
CAPS	C	0.50" - 1.50"	SCRF	3000#	ASME B16.11	ASTM A105		
		2" - 16"	BW	M	ASME B16-9	ASTM A 234 Gr WPB		
NIPPLES FULL COUPLINGS	NA	0.50" - 1.50"	PBE, SEAMLESS	M	ASME B36-10	ASTM A 106 Gr.B		
COUPLINGS	FC	0.50" - 1.50"	SW	3000#	ASME B16-11	ASTM A105		
HALF COUPLINGS	HC	0.50" - 1.50"	SW	3000#	ASME B16-11	ASTM A105		
<b>NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS</b>								
		<b>PIPING MATERIAL SPECIFICATION</b>				Document No.		Rev
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<b>PIPING SPECIFICATION</b>			<b>GAIL GAS LIMITED</b>				<b>RATING</b>	<b>150#</b>		
<b>1A1</b>							<b>CODE</b>	<b>ANSI B 31.8</b>		
<b>TEMPERATURE (0 TO 60 °C)</b>							<b>BASIC MATERIAL</b>			
<b>PRESSURE (18.75 bar g)</b>							<b>CORROSION ALLOWANCE 0.5 mm</b>			

ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS
WN FLANGES	FW	0.50"-16"	RF,125 AARH	150#	ASME B16-5	ASTM A105	
BLIND FLANGE	FB	0.50"-16"	RF,125 AARH	150#	ASMEB16-5	ASTM A105	
FLANGES FIG 8	FF	0.5" - 16"	RF,125 AARH	150#	ASME B16-48	ASTM A105	
SPCR & BLND	FSB	16"	RF,125 AARH	150#	ASME B16-48	ASTM A105	
STUD BOLTS	B	0.5" - 16"			ASME B18-2	Bolt: A193 B7 Nut: A194 Gr.2H	
GASKETS SPIRAL WOUND	G	0.5" - 16"		150#, SPIRAL	B-16.20 - ASME B16.5	SP. WND metallic with Graphite Filler (5 mm thick)	
GATE VALVE	VG	0.50 - 1.50	SW , B16.11	800#	API 602	ASTM A105	
		2"-16"	FLG, B16.5, RF/125 AARH	150#	API 600	ASTM A 216 Gr WCB	
PLUG VALVE	PV	0.50 - 1.50	SW,BS-5353	800#	ASME B16.10	ASTM A105	
		2"-16"	FLG/BW,API6D	150#	ASME B16.10	ASTM A 216 Gr WCB	

NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS

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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING			
1A1							CODE		150#	
TEMPERATURE ( 0 TO 60 °C)							ANSI B 31.8		BASIC MATERIAL	
PRESSURE (18.75 bar g)							CORROSION ALLOWANCE		0.5 mm	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS			
BALL VALVES	VBA	0.50" - 1.50"	SW:ASME B16-11	800#	ASME B16-10	BODY: ASTM A105 BALL: SS 316	FULL BORE FIRE SAFE WRENCH OPERATED.			
		2"-3"	BW:ASME B16-5	150#	ASME B16-10	BODY: ASTM A216 Gr. WCB BALL: (A 216 Gr. WCB) + 0.003" ENP	FULL BORE FIRE SAFE WRENCH OPERATED.			
		4"-16"	BW:ASME B16-5	150 #	ASME B16-10	BODY: ASTM A216 Gr. WCB BALL: (A 216 Gr. WCB) + 0.003" ENP	FULL BORE FIRE SAFE GEAR OPERATED.			
GLOBE VALVES	VGL	0.50" - 1.50"	SW ASME B16-11	800#	ASME B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
		2" - 16"	FLGD RF ASME B16-5	150#	ASME B16-10	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
LIFT CHECK VALVES	VCH	0.50" - 1.50"	SW ASME B16-11	800#	ASME B16-10	BODY: ASTM A 105 TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION			
SWING CHECK VALVE		2"-16"	FLGD RF ASME B16-5	150#	ASME B16-10	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS			
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
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<b>PIPING SPECIFICATION</b>	<b>GAIL GAS LIMITED</b>	<b>RATING</b>	<b>150#</b>
<b>1A1</b>		<b>CODE</b>	<b>ANSI B 31.8</b>
<b>TEMPERATURE ( 0 TO 60 °C)</b>		<b>BASIC MATERIAL</b>	
<b>PRESSURE (18.75 bar g)</b>		<b>CORROSION ALW</b>	<b>0.5 mm</b>

BRANCH TABLE


		B R A N C H S I Z E															
		1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"			
<b>H E A D E R S I Z E</b>	1/2"	T															
	3/4"	T	T														
	1"	T	T	T													
	1.1/2"	T	T	T	T												
	2"	S	T	T	T	T											
	3"	S	S	S	S	T	T										
	4"	S	S	S	S	T	T	T									
	6"	S	S	S	S	W	T	T	T								
	8"	S	S	S	S	W	W	T	T	T							
	10"	S	S	S	S	W	W	T	T	T	T						
	12"	S	S	S	S	W	W	W	T	T	T	T					
	14"	S	S	S	S	W	W	W	T	T	T	T	T				
	16"	S	S	S	S	W	W	W	T	T	T	T	T	T			


**LEGEND**


T : TEE


S: SOCKOLET - SW

W : WELDOLET - BW

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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING	300#		
3A1							CODE	ANSI B 31.8		
TEMPERATURE ( 0 TO 60 °C)							BASIC MATERIAL			
PRESSURE (49 bar g)							CORROSION ALLOWANCE 0.5 mm			
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS			
PIPELINE	PL	4"-8"	BE	6.4 mm	API 5L	API 5L Gr. X42	4"-6" :Seamless			
		10"	BE	6.4 mm	API 5L	API 5L Gr. X52	8" :Electric Welded			
PIPES	P	0.50" - 1."	PE, SEAMLESS	XXS	ASME B36-10	ASTM A 106 Gr.B	Electric Welded			
		1.5"	PE, SEAMLESS	XS	ASME B36-10	ASTM A 106 Gr.B				
		2"	BE, SEAMLESS	XS	ASME B36-10	ASTM A 106 Gr.B				
		3" - 16"	BE, SEAMLESS	S40	ASME B36-10	ASTM A 106 Gr.B				
ELBOWS 90 LR	E	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105				
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
ELBOWS 45 LR	E45	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105				
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 90°	LR B	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 45°	LR B 45	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
REDUCERS CONCENTRIC	RC	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
REDUCERS ECCENTRIC	RE	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
TEES EQUAL	T	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105				
		2" - 16"	BW	M X M	ASME B16.9	ASTM A 234 Gr WPB				
TEES RED	TR	0.50" - 1.50"	SW	3000#	ASME B16.11	ASTM A105				
		2" - 16"	BW	M X M	ASME B16.9	ASTM A 234 Gr WPB				
SOCKOLET	S	0.50" - 1.50"	SW	3000#	MSS-SP 75	ASTM A105				
WELDOLETS	W	2" - 16"	BW - ASME B16-25	M X M	MSS-SP 75	ASTM A105				
CAPS	C	2" - 16"	BW	M	ASME B16-9	ASTM A 234 Gr WPB				
NIPPLES	NA	0.50" - 1.50"	PBE, SEAMLESS	M	ASME B36-10	ASTM A 106 Gr.B				
FULL COUPLINGS	FC	0.50" - 1.50"	SW	3000#	ASME B16-11	ASTM A105				
HALF COUPLINGS	HC	0.50" - 1.50"	SW	3000#	ASME B16-11	ASTM A105				
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING	300#
3A1							CODE	ANSI B 31.8
TEMPERATURE (0 TO 60 °C)							BASIC MATERIAL	
PRESSURE (49 bar g)							CORROSION ALLOWANCE	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS	
WN FLANGES	FW	2"-16"	RF, 125 AARH	300#	ASME B16-5	ASTM A105		
FLG SW	FS	0.50 - 1.50	RF, 125 AARH	300#	ASME B16-5	ASTM A105		
BLIND FLANGE	FB	0.50"-16"	RF, 125 AARH	300#	ASME B16-5	ASTM A105		
FLANGES FIG 8	FF	0.5" - 16"	FF, 125 AARH	300#	ASME B16-48	ASTM A105		
SPCR & BLND	FSB	16"	FF, 125 AARH	300#	ASME B16-48	ASTM A105		
STUD BOLTS	B	0.50" - 16"			ASME B18-2	Bolt: A193 B7 Nut: A194 Gr.2H		
GASKETS SPIRAL WOUND	G	0.5" - 16"		SPIRAL, 300#	B-16.20 - ASME B16.5	SP. WND metallic with Graphite Filler  (5 mm thick)		
GATE VALVE	VG	0.50 - 1.50	SW B16.11	800#	API 602	ASTM A105		
		2" - 16"	FLGD, B-16.5, RF/125 AARH	300#	API 600	ASTM A 216 Gr WCB		
PLUG VALVE	VP	0.50" - 1.50"	SW, BS -5353	800#	ASME B16-10	ASTM A105		
		2" - 16"	FLG/ BW, API 6D	300#	ASME B16-10	ASTM A 216 Gr WCB		
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS								
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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING			
3A1							CODE		300#	
TEMPERATURE ( 0 TO 60 °C)							BASIC MATERIAL		ANSI B 31.8	
PRESSURE (49 bar g)							CORROSION ALLOWANCE		0.5 mm	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS			
BALL VALVES	VBA	0.50 - 1.50	SW, ASME B16-11	300#	ASME B16-10 BS 5351	BODY: ASTM A105 BALL:SS 316 BODY SEAT: RPTFE	FULL BORE FIRE SAFE WRENCH OPERATED.			
		2"	FLGD RF:ASME B16-5 or BW :ASME B16-5	300#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB BALL: (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	FULL BORE, FIRE SAFE, WRENCH OPERATED			
		3" - 4"	FLGD RF:ASME B16-5 or BW :ASME B16-5	300#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	DOUBLE BLOCK AND BLEED FULL BORE FIRE SAFE WRENCH OPERATED.			
		6"-16"	FLGD RF:ASME B16-5 or BW :ASME B16-5	300#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	DOUBLE BLOCK AND BLEED FULL BORE FIRE SAFE GEAR OPERATED.			
GLOBE VALVES	VGL	0.50 - 1.50	SW, ASME B16-11	300#	ASME B16-10 BS 5352	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
		2" - 4"	FLGD RF:ASME B16-5	300#	ASME B16-10 BS 1873	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
		6" - 16"	FLGD RF:ASME B16-5	300#	ASME B16-10 BS 1873	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	GEAR OPERATED FIRE SAFE			
LIFT CHECK VALVES	VCH	0.50 - 1.50	SW, ASME B16-11	300#	ASME B16-10 BS 5352	BODY: ASTM A 105 TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION			
SWING CHECK VALVE		2"-16"	FLGD RF:ASME B16-5	300#	ASME B16-10 BS 1868	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS			
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
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PIPING SPECIFICATION	<b>GAIL GAS LIMITED</b>	RATING	300#
<b>3A1</b>		CODE	ANSI B 31.8
TEMPERATURE ( 0 TO 60 °C)		BASIC MATERIAL	
PRESSURE (49 bar g)		CORROSION ALW	0.5 mm


**BRANCH TABLE**

**B R A N C H S I Z E**

	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"						
<b>H E A D E R  S I Z E</b>	1/2"	T																	
	3/4"	T	T																
	1"	T	T	T															
	1.1/2"	T	T	T	T														
	2"	S	T	T	T	T													
	3"	S	S	S	S	T	T												
	4"	S	S	S	S	T	T	T											
	6"	S	S	S	S	W	T	T	T										
	8"	S	S	S	S	W	W	T	T	T									
	10"	S	S	S	S	W	W	T	T	T	T								
	12"	S	S	S	S	W	W	W	T	T	T	T							
	14"	S	S	S	S	W	W	W	T	T	T	T	T						
	16"	S	S	S	S	W	W	W	T	T	T	T	T	T					


**LEGEND**  
T : TEE  
S: SOCKOLET -SW  
W : WELDOLET- BW


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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING	600#		
6A1							CODE	ANSI B 31.8		
TEMPERATURE ( 0 TO 60 °C)							BASIC MATERIAL			
PRESSURE (98 bar g)							CORROSION ALLOWANCE 0.5 mm			
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS			
PIPELINE	PL	4"-8"	BE	6.4 mm	API 5L	API 5L Gr. X42	4"-6" :Seamless			
		10"	BE	6.4 mm	API 5L	API 5L Gr. X52	8" :Electric Welded			
PIPES	P	0.50" - 1.5"	PE, SEAMLESS	XXS	ASME B36-10	ASTM A 106 Gr.B	Electric Welded			
		2" - 10"	BE, SEAMLESS	XS	ASME B36-10	ASTM A 106 Gr.B				
		12" - 16"	BE, SEAMLESS	S60	ASME B36-10	ASTM A 106 Gr.B				
ELBOWS 90 LR	E	0.50" - 1.50"	SW	6000#	ASME B16.11	ASTM A105				
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
ELBOWS 45 LR	E45	0.50" - 1.50"	SW	6000#	ASME B16.11	ASTM A105				
		2" - 16"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 90°	LR B	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 45°	LR B 45	4-16"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
REDUCERS CONCENTRIC	RC	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
REDUCERS ECCENTRIC	RE	2" - 16"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
TEES EQUAL	T	0.50" - 1.50"	SW	6000#	ASME B16.11	ASTM A105				
		2" - 16"	BW	M X M	ASME B16.9	ASTM A 234 Gr WPB				
TEES RED	TR	0.50" - 1.50"	SW	6000#	ASME B16.11	ASTM A105				
		2" - 16"	BW	M X M	ASME B16.9	ASTM A 234 Gr WPB				
SOCKOLET	S	0.50" - 1.50"	SW	6000#	MSS-SP 97	ASTM A105				
WELDOLETS	W	2" - 16"	BW - ASME B16-25	M X M	MSS-SP 97	ASTM A105				
CAPS	C	2" - 16"	BW	M	ASME B16-9	ASTM A 234 Gr WPB				
NIPPLES	NA	0.50" - 1.50"	PBE, SEAMLESS	M	ASME B36-10	ASTM A 106 Gr.B				
FULL COUPLINGS	FC	0.50" - 1.50"	SW	6000#	ASME B16-11	ASTM A105				
HALF COUPLINGS	HC	0.50" - 1.50"	SW	6000#	ASME B16-11	ASTM A105				
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING	600#
6A1							CODE	ANSI B 31.8
TEMPERATURE (0 TO 60 °C)							BASIC MATERIAL	
PRESSURE (98 bar g)							CORROSION ALLOWANCE	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS	
WN FLANGES	FW	2"-16"	RF, 125 AARH	600#	ASME B16-5	ASTM A105		
FLG SW	FS	0.50 - 1.50	RF, 125 AARH	600#	ASME B16-5	ASTM A105		
BLIND FLANGE	FB	0.50"-16"	RF, 125 AARH	600#	ASME B16-5	ASTM A105		
FLANGES FIG 8	FF	0.5" - 16"	FF, 125 AARH	600#	ASME B16-48	ASTM A105		
SPCR & BLND	FSB	16"	FF, 125 AARH	600#	ASME B16-48	ASTM A105		
STUD BOLTS	B	0.50" - 16"			ASME B18-2	Bolt: A193 B7 Nut: A194 Gr.2H		
GASKETS SPIRAL WOUND	G	0.5" - 16"		SPIRAL, 600#	B-16.20 - ASME B16.5	SP. WND metallic with Graphite Filler (5 mm thick)		
GATE VALVE	VG	0.50 - 1.50	SW B16.11	800#	API 602	ASTM A105		
		2" - 16"	FLGD, B-16.5, RF/125 AARH	600#	API 600	ASTM A 216 Gr WCB		
PLUG VALVE	VP	0.50" - 1.50"	SW, BS -5353	800#	ASME B16-10	ASTM A105		
		2" - 16"	FLG/ BW, API 6D	600#	ASME B16-10	ASTM A 216 Gr WCB		

NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS

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PIPING SPECIFICATION			GAIL GAS LIMITED				RATING			
6A1							CODE		600#	
TEMPERATURE ( 0 TO 60 °C)							ANSI B 31.8		BASIC MATERIAL	
PRESSURE (98 bar g)							CORROSION ALLOWANCE		0.5 mm	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS			
BALL VALVES	VBA	0.50 - 1.50	SW, ASME B16-11	600#	ASME B16-10 BS 5351	BODY: ASTM A105 BALL:SS 316 BODY SEAT: RPTFE	FULL BORE FIRE SAFE WRENCH OPERATED.			
		2"	FLGD RF:ASME B16-5 or BW :ASME B16-5	600#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB BALL: (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	FULL BORE, FIRE SAFE, WRENCH OPERATED			
		3" - 4"	FLGD RF:ASME B16-5 or BW :ASME B16-5	600#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	DOUBLE BLOCK AND BLEED FULL BORE FIRE SAFE WRENCH OPERATED.			
		6"-16"	FLGD RF:ASME B16-5 or BW :ASME B16-5	600#	ASME B16-10 BS 5351	BODY: ASTM A216 Gr. WCB (A 216 Gr. WCB) + 0.003" ENP BODY SEAT: RPTFE	DOUBLE BLOCK AND BLEED FULL BORE FIRE SAFE GEAR OPERATED.			
GLOBE VALVES	VGL	0.50 - 1.50	SW, ASME B16-11	600#	ASME B16-10 BS 5352	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
		2" - 4"	FLGD RF:ASME B16-5	600#	ASME B16-10 BS 1873	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HANDWHEEL FIRE SAFE			
		6" - 16"	FLGD RF:ASME B16-5	600#	ASME B16-10 BS 1873	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	GEAR OPERATED FIRE SAFE			
LIFT CHECK VALVES	VCH	0.50 - 1.50	SW, ASME B16-11	600#	ASME B16-10 BS 5352	BODY: ASTM A 105 TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION			
SWING CHECK VALVE		2"-16"	FLGD RF:ASME B16-5	600#	ASME B16-10 BS 1868	BODY: ASTM A 216 Gr. WCB TRIM: ASTM A182 F6	HORIZONTAL INSTALLATION VERTICAL INSTALLATION FLOW UPWARDS			
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
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PIPING SPECIFICATION	<b>GAIL GAS LIMITED</b>	RATING	600#
<b>6A1</b>		CODE	ANSI B 31.8
TEMPERATURE ( 0 TO 60 °C)		BASIC MATERIAL	
PRESSURE (98 bar g)		CORROSION ALW	0.5 mm

**BRANCH TABLE**

**B R A N C H S I Z E**


	1/2"	3/4"	1"	1.1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"						
<b>H E A D E R  S I Z E</b>	1/2"	T																	
	3/4"	T	T																
	1"	T	T	T															
	1.1/2"	T	T	T	T														
	2"	S	T	T	T	T													
	3"	S	S	S	S	T	T												
	4"	S	S	S	S	T	T	T											
	6"	S	S	S	S	W	T	T	T										
	8"	S	S	S	S	W	W	T	T	T									
	10"	S	S	S	S	W	W	T	T	T	T								
	12"	S	S	S	S	W	W	W	T	T	T	T							
	14"	S	S	S	S	W	W	W	T	T	T	T	T						
	16"	S	S	S	S	W	W	W	T	T	T	T	T	T					

**LEGEND**

T : TEE

S: SOCKOLET -SW

W : WELDOLET- BW

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