



GAIL GAS LTD

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

CNG AND CITY GAS DISTRIBUTION PROJECT

BID DOCUMENT FOR SUPPLY OF FLANGES AND FITTINGS VOLUME – II OF II (TECHNICAL)

(BID DOCUMENT NO: 110290/WGI/GAIL GAS/09-R0)

LIMITED DOMESTIC COMPETITIVE BIDDING



DELIVERS. EVOLVES.

WHOLE LIFE SOLUTIONS FOR PIPELINE AND SUBSEA SYSTEMS

ISSUED BY





**GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT**



MATERIAL REQUISITION FOR FITTINGS & FLANGES					CLIENT JOB NO.		-
					TOTAL SHEETS		10
DOCUMENT NO	11	0290	02	08	06	018	

--	--	--	--	--	--

0	09/11/09	ISSUED FOR TENDER	GV	RM	PKS
B	25/09/09	ISSUED FOR CLIENT'S REVIEW	GV	RM	PKS
A	24/09/09	ISSUED FOR IDC	GV	RM	PKS
REV	DATE	DESCRIPTION	PREP	CHK	APPR

TABLE OF CONTENT

1. SCOPE OF SUPPLY	4
2. DELIVERY LOCATIONS	7
3. REMARKS	8
4. SPECIAL INSTRUCTIONS TO BIDDER	9
5. INFORMATION/ DOCUMENTS/ DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER	9
6. LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY	10

JP KENNY



**MATERIAL REQUISITION
FOR FLANGES AND FITTINGS**

Document No.

11-0290-02-08-06-018

Rev

0

SHEET 2 of 10

LIST OF ATTACHMENTS

S.No.	DOCUMENT TITLE	DOCUMENT NUMBER	No. of Sheets
1.0	TECHNICAL SPECIFICATION FOR SEAMLESS FITTINGS	11-0290-02-08-02-019(Rev 0)	6
2.0	DATA SHEET FITTINGS	11-0290-02-08-03-019 (Rev 0)	2
3.0	QAP FITTINGS	11-0290-02-08-10-019 (Rev 0)	1
4.0	TECHNICAL SPECIFICATION FOR FLANGES	11-0290-02-08-03-018 (Rev 0)	6
5.0	DATA SHEET FLANGES (300#)	11-0290-02-08-03-018 (Rev 0)	2
6.0	DATA SHEET FLANGES (150#)	11-0290-02-08-03-020 (Rev 0)	2
7.0	QAP FLANGES	11-0290-02-08-10-018 (Rev 0)	1
8.0	PIPING MATERIAL SPECIFICATION	11-0290-02-08-02-001(Rev. 0)	18



**MATERIAL REQUISITION
FOR FLANGES AND FITTINGS**

Document No.	Rev
11-0290-02-08-06-018	0
SHEET 3 of 10	

1.0 SCOPE OF SUPPLY

1.1 General

This Specification covers the scope of supply of Fittings and Flanges to be used in the City Gas Distribution Project at DEWAS, SONIPAT, MEERUT AND KOTA.

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 Fittings & Flanges

The type and quantities of Fittings & Flanges are detailed below:

FLANGES

Item No.	<u>WNRF FLANGES</u>	QTY (No.)
1.	10" x 300#, Sch.40 (ASTM A 105)	10
2.	8" x 300#, Sch.40 (ASTM A 105)	40
3.	6" x 300#, Sch.40 (ASTM A 105)	40
4.	4" x 300#, Sch.40 (ASTM A 105)	100
5.	2" x 300#, Sch.XS (ASTM A 105)	200
6.	4" x 150#, Sch.40 (ASTM A 105)	10
7.	2" x 150#, Sch.XS (ASTM A 105)	100

Item No.	<u>BLIND FLANGES</u>	QTY (No.)
8.	10" x 300# (ASTM A 105)	8
9.	8" x 300# (ASTM A 105)	16
10.	6" x 300# (ASTM A 105)	10
11.	4" x 300# (ASTM A 105)	25
12.	2" x 300# (ASTM A 105)	25
13.	4" x 150# (ASTM A 105)	10



MATERIAL REQUISITION
FOR FLANGES AND FITTINGS

Document No.

11-0290-02-08-06-018

Rev

0

SHEET 4 of 10

Item No.	BLIND FLANGES	QTY (No.)
14.	2" x 150# (ASTM A 105)	50

FITTINGS

Item No.	WELDOLETS	QTY (No.)
15.	10" X2",Sch. 40 X Sch.XS (ASTM A 105)	50
16.	8" x 2" , Sch. 40 X Sch.XS (ASTM A 105)	50
17.	6" x 2" , Sch. 40 X Sch.XS (ASTM A 105)	50

Item No.	SOCKOLETS	QTY (No.)
18.	10" X 1 ½",Sch. 40 X Sch.XS (ASTM A 105)	5
19.	10" X 1",Sch. 40 X Sch.XXS (ASTM A 105)	20
20.	10" X ¾",Sch. 40 x Sch.XXS (ASTM A 105)	20
21.	8" X 1 ½", Sch. 40 X Sch.XS (ASTM A 105)	5
22.	8" X 1", Sch. 40 X Sch.XXS (ASTM A 105)	20
23.	8" X ¾", Sch. 40 x Sch.XXS (ASTM A 105)	20
24.	6" X 1 ½", Sch. 40 X Sch.XS (ASTM A 105)	5
25.	6" X 1", Sch. 40 X Sch.XXS (ASTM A 105)	20
26.	6" X ¾", Sch. 40 X Sch.XXS (ASTM A 105)	20
27.	4" X 1 ½", Sch. 40 X Sch.XS (ASTM A 105)	5
28.	4" X 1", Sch. 40 X Sch.XXS (ASTM A 105)	20
29.	4" X ¾", Sch. 40 X Sch.XXS (ASTM A 105)	20

Item No.	TEES	QTY (No.)
30.	10" X 10"X10" ,BW, Sch.40 (ASTM A 234 Gr.WPB)	10
31.	10" X 10"X8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
32.	10" X 10"X6" , BW,Sch.40 (ASTM A 234 Gr.WPB)	10
33.	10" X 10"X4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
34.	8" X 8"X8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	40
35.	8" X 8"X6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	60
36.	8" X 8"X4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	60



**MATERIAL REQUISITION
FOR FLANGES AND FITTINGS**

Document No.	Rev
11-0290-02-08-06-018	0
SHEET 5 of 10	

37.	6" X 6"X6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	40
38.	6" X 6"X4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	40
39.	4" X 4"X4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	60
40.	4" X 4"X2" , BW, Sch. 40 X Sch.XS (ASTM A 234 Gr.WPB)	40
41.	2" X 2"X2" , BW, Sch.XS (ASTM A 234 Gr.WPB)	100

Item No.	<u>CONCENTRIC REDUCERS</u>	QTY (No.)
42.	10" x8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
43.	10" x 6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
44.	8" x 6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	30
45.	8"x4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	30
46.	4" x 2" , BW,Sch.40 X Sch.XS (ASTM A 234 Gr.WPB)	25

Item No.	<u>1.5D, 90 Deg. ELBOW</u>	QTY (No.)
47.	10" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
48.	8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
49.	6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	20
50.	4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	50
51.	2" , BW, Sch.XS (ASTM A 234 Gr.WPB)	100

Item No.	<u>1.5D, 45 Deg. ELBOW</u>	QTY (No.)
52.	10" , BW, Sch.40 (ASTM A 234 Gr.WPB)	5
53.	8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	10
54.	6" , BW, Sch.40 (ASTM A 234 Gr.WPB)	20
55.	4" , BW, Sch.40 (ASTM A 234 Gr.WPB)	30
56.	2" , BW, Sch.XS (ASTM A 234 Gr.WPB)	30

Item No.	<u>90 Deg. 3D Bends</u>	QTY (No.)
57.	10" , BW, Sch.40 (ASTM A 234 Gr.WPB)	100
58.	8" , BW, Sch.40 (ASTM A 234 Gr.WPB)	200



**MATERIAL REQUISITION
FOR FLANGES AND FITTINGS**

Document No.

11-0290-02-08-06-018

Rev

0

SHEET 6 of 10

59.	6", BW, Sch.40 (ASTM A 234 Gr.WPB)	80
60.	4", BW, Sch.40 (ASTM A 234 Gr.WPB)	150

Item No.	<u>45 Deg. 3D Bends</u>	QTY (No.)
61.	10", BW, Sch.40 (ASTM A 234 Gr.WPB)	50
62.	8", BW, Sch.40 (ASTM A 234 Gr.WPB)	100
63.	6", BW, Sch.40 (ASTM A 234 Gr.WPB)	50
64.	4", BW, Sch.40 (ASTM A 234 Gr.WPB)	100

LEGEND: BW-Butt Welded

2.0 DELIVERY LOCATIONS:

Item No.	Total Quantity	City wise Quantity			
		Dewas	Sonipat	Kota	CWC GHZB
1.	10	2	2	4	2
2.	40	8	4	10	18
3.	40	4	10	10	16
4.	100	20	10	30	40
5.	200	25	10	85	80
6.	10	2	2	3	3
7.	100	20	10	30	40
8.	8	2	2	2	2
9.	16	4	2	6	4
10.	10	2	2	2	4
11.	25	6	3	4	12
12.	25	6	3	4	12
13.	10	2	2	2	4
14.	50	8	4	20	18
15.	50	Nil	5	25	20
16.	50	12	5	15	18
17.	50	12	5	15	18
18.	5	Nil	2	2	1
19.	20	Nil	5	10	5
20.	20	Nil	5	10	5
21.	5	1	1	1	2
22.	20	5	5	5	5
23.	20	5	5	5	5
24.	5	1	1	1	2
25.	20	5	5	5	5
26.	20	5	5	5	5
27.	5	1	1	1	1
28.	20	5	5	5	5
29.	20	5	5	5	5
30.	10	Nil	2	4	4
31.	10	Nil	3	4	3
32.	10	Nil	3	4	3
33.	10	Nil	4	3	3
34.	40	10	4	10	16



MATERIAL REQUISITION FOR FLANGES AND FITTINGS

Document No.

11-0290-02-08-06-018

Rev

0

SHEET 7 of 10

35.	60	10	10	20	20
36.	60	10	10	22	20
37.	40	10	5	10	15
38.	40	10	5	10	15
39.	60	10	10	20	20
40.	40	10	5	10	15
41.	100	30	10	30	30
42.	10	Nil	2	4	4
43.	10	Nil	2	4	4
44.	30	8	4	10	8
45.	30	8	4	10	8
46.	25	6	4	6	9
47.	10	2	2	2	4
48.	10	2	1	2	5
49.	20	5	5	5	5
50.	50	10	4	16	20
51.	100	30	10	30	30
52.	5	1	1	2	1
53.	10	2	2	2	4
54.	20	4	6	4	6
55.	30	8	4	8	10
56.	30	8	4	8	10
57.	100	Nil	30	30	40
58.	200	60	20	60	60
59.	80	16	10	25	29
60.	150	40	20	50	40
61.	50	Nil	12	18	20
62.	100	20	19	26	35
63.	50	15	10	10	15
64.	100	15	15	30	40

3.0 REMARKS

3.1 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.

3.2 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.

3.3 Supplier's Scope

Supplier's scope of work includes design, manufacture & Testing and Supply of Fittings and flanges as per attached specification.

3.4 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

 	MATERIAL REQUISITION FOR FLANGES AND FITTINGS	Document No.	Rev
		11-0290-02-08-06-018	0
		SHEET 8 of 10	

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.

4.0 SPECIAL INSTRUCTIONS TO BIDDERS

- 4.1 Bidder to note that no correspondence shall be entered into or entertained after the bid submission.
- 4.2 Bidder shall furnish quotation only in case he can supply material strictly as per this Material Requisition and specification/data sheets forming part of Material Requisition.
- 4.3 If the offer contains any technical deviations or clarifications or stipulates any technical specifications (even if in line with MR requirements) and does not include complete scope & technical/ performance data required to be submitted with the offer, the offer shall be liable for rejection.
- 4.4 The submission of prices by the Bidder shall be construed to mean that he has confirmed compliance with all technical specifications of the corresponding item(s).
- 4.5 Bidder must submit all documents as listed in checklist along with his offer.
- 4.6 Supplier must note that stage wise inspection for complete fabrication, testing including the raw material inspection to be carried out.

5.0 INFORMATION/ DOCUMENTS/ DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER

Successful Bidder shall submit six copies unless noted otherwise, each of the following:

- 5.1 Inspection & test reports for all mandatory tests as per the applicable code as well as test reports for any supplementary tests, in nicely bound volumes.
- 5.2 Material test certificates (physical property, chemical composition, make, heat treatment report, etc.) as applicable for items in nicely bound volumes.
- 5.3 Statutory test certificates, as applicable.
- 5.4 Filled in Quality Assurance Plan (QAP) for Purchaser's/ Consultant's approval. These QAPs shall be submitted in four copies with in 15 days from LOI/ FOI.
- 5.5 WPS & PQR, as required.
- 5.6 Within two (2) weeks of placement of order, the detailed fabrication drawings for Purchaser's/Consultant's approval.
- 5.7 Detailed completion schedule activity wise (Bar Chart), within one week of placement of order.
- 5.8 Weekly & fortnightly progress reports for all activities including procurement.
- 5.9 Purchase orders of bought out items soon after placement of order.
- 5.10 All approved drawings as well as inspection and test reports for Owner's/ Consultants reference/ record in nicely category-wise bound volumes separately.
- 5.11 A list of documents to be furnished along with supply.


Note: All drawings, instructions, catalogues, etc., shall be in English language and all dimensions shall be metric units.

	MATERIAL REQUISITION FOR FLANGES AND FITTINGS	Document No.	Rev
		11-0290-02-08-06-018	0
		SHEET 9 of 10	

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.,212,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,Ahemedabad-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				

Note: The details of Vendors indicated in this list are based on the information available with WGI. Contractor 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

	MATERIAL REQUISITION FOR FLANGES & FITTINGS	Document No.	Rev.
		11-0290-02-08-06-018	0
		SHEET 10 of 10	



**GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT**



**TECHNICAL SPECIFICATION
FOR SEAMLESS FITTINGS**

CLIENT JOB NO.

TOTAL SHEETS

06

DOCUMENT NO

11

0290

02

08

02

019



0	08/11/09	ISSUED FOR TENDER	GV	RM	DDS
B	27/08/09	ISSUED FOR CLIENT'S COMMENTS	GV	RM	DDS
A	26/08/09	ISSUED FOR IDC	GV	RM	DDS
REV	DATE	DESCRIPTION	PREP	CHK	APPR

TABLE OF CONTENTS

1.0 SCOPE	3
2.0 REFERENCE DOCUMENTS	3
3.0 MANUFACTURE'S QUALIFICATION	3
4.0 MATERIAL	4
5.0 DESIGN AND MANUFACTURE	4
6.0 INSPECTION AND TESTS	4
7.0 TEST CERTIFICATES	5
8.0 PAINTING, MARKING AND SHIPMENT	5
9.0 WARRANTY	6
10.0 DOCUMENTATION	6

J P KENNY



TECHNICAL SPECIFICATION
FOR SEAMLESS FITTINGS

Document No.

Rev

11-0290-02-08-02-019

0

SHEET 2 of 6

1.0 SCOPE

1.1 This specification covers the minimum requirements for the design, manufacture and supply of following fittings in size NB 600mm and smaller to be installed in natural gas or liquid hydrocarbon pipelines and piping system

1.1.1 Fittings such as tees, elbows, caps etc. shall conform to the requirements of MSS-SP-75, latest edition. Dimensions standard for Screwed/SW fittings shall be as per ANSI B16.11.

1.2 All requirements contained in the above standards shall be fully valid unless cancelled, replaced or amended by more requirements as stated in this specification.

This specification does not cover the above-mentioned items, which are to be installed in pipeline handling sour hydrocarbon (liquid/gas) service as defined in NACE standard MR-0175-98.

2.0 REFERENCE DOCUMENTS

2.1 Reference has also been made in this specification to the latest edition of the following codes, standards and specifications:

- a) ASME B 31.8 : Gas Transmission and Distribution Piping System
- b) ASME B 31.4 : Liquid transportation system for hydrocarbon liquid petroleum gas, anhydrous ammonia and alcohols
- c) ANSI B 16.25 : Butt – Welding Ends
- d) ASME B 16.9 : Factory made wrought steel butt welding fittings
- e) ASME B 16.11 : Forged Steel Fittings, Socket Welding and Threaded
- f) ASTM A 370 : Mechanical Testing of Steel Products
- g) ASTM Part-1 : Steel Piping, Tubing, Fittings
- h) MSS-SP-25 : Standard marking system for valves, fittings, flanges and unions.
- i) MSS-SP-75 : Specification for High Test Wrought Welding Fittings
- j) MSS-SP-97 : Forged carbon steel branch outlet fittings – socket welding, threaded and butt welding ends.

2.2 In case of conflict between the requirement of MSS-SP-75, & above reference documents and this specification, the requirements of this specification shall govern.

3.0 MANUFACTURE'S QUALIFICATION

Manufacturer who intends bidding for fittings must possess the records of a successful proof test in accordance with the provisions of relevant MSS-SP-75 and/or ANSI B16.9/ANSI B16.11 as applicable. These records shall be submitted at the time of bidding.



TECHNICAL SPECIFICATION
FOR SEAMLESS FITTINGS

Document No.

11-0290-02-08-02-019

SHEET 3 of 6

Rev

0

4.0 MATERIAL

- 4.1 The basic material for fittings shall be as indicated in the Purchase Requisition. Additionally, the material shall also meet the requirements specified hereinafter.
- 4.2 Steel used shall be fully killed.
- 4.3 Each heat of steel used for the manufacture of fittings shall have carbon equivalent (CE) not greater than 0.45 calculated from check analysis in accordance with the following formula:

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

Carbon contents on check analysis shall not exceed 0.22%.

- 4.4 Unless specified otherwise, Charpy V-notch test shall be conducted for each heat of steel, in accordance with the impact test provisions of ASTM A370 at temperature of 0°C. The average absorbed impact energy values of three full-sized specimens shall be 35 joules.

The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 80% of the above mentioned average value.
- 4.5 Hardness testing shall be carried out by Manufacturer in accordance with applicable ASTM code.

5.0 DESIGN AND MANUFACTURE

- 5.1 Fittings such as tees, elbows and reducers shall be seamless type and shall conform to ASME B16.9 for sizes 50mm (2") NB and above ASME B16.11 for sizes below 50mm (2") NB.
- 5.2 Fittings such as weldolets, sockolets, etc. shall be manufactured in accordance with MSS-SP-75.
- 5.3 Stub-in or pipe-to-pipe connection shall not be used in the manufacture of tees. Tees shall be manufactured by forging or extrusion methods. The longitudinal weld seam shall be kept at 90° from the extrusion. Fittings shall not have any circumferential joints.
- 5.4 All butt weld ends shall be bevelled as per ASME B16.25.
- 5.5 Repair by welding on parent metal of the fittings is not allowed.

6.0 INSPECTION AND TESTS

- 6.1 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:

J.P. KENNY		Document No.	
	TECHNICAL SPECIFICATION FOR SEAMLESS FITTINGS		Rev
		11-0290-02-08-02-019	0
		SHEET 4 of 6	

- 6.1.1 Visual inspection.
- 6.1.2 Dimensional checks as per MSS-SP-75 for fittings/applicable standards.
- 6.1.3 Chemical composition, mechanical properties and hardness examination.
- 6.1.4 All finished wrought weld ends shall be 100% ultrasonically tested for lamination type defects. Any lamination larger than 6.35 mm shall not be acceptable.
- 6.1.5 All other tests not specifically listed but are required as per applicable standard/specification.
- 6.2 Purchaser's Inspector may also perform stage wise inspection and witness tests as indicated in Para 6.1 at manufacturer's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charges reasonable access and facilities required for inspection to the Purchaser's Inspector

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

7.0 TEST CERTIFICATES

Manufacturer shall produce the certificates (in original) for all, including, but not limited, the following tests:

- a) Certificates of chemical analysis and mechanical properties of the material used for construction as per this specification and relevant standards.
- b) Certificates of required non-destructive tests inspections.
- c) Certificates of all other tests as required in this specification.
- d) In case any of the said certificates is not available during the final test, the supply shall be considered incomplete.

8.0 PAINTING, MARKING AND SHIPMENT

- 8.1 All fittings shall be marked as per MSS-SP-25.
- 8.2 All loose material and foreign material i.e. rust, grease, etc. shall be removed from the inside and outside of the fittings.
- 8.2 Ends of all fittings shall be suitably protected to avoid any damage during transit. Metallic bevel protectors shall be used for fittings of size 18" and larger each item shall be marked with indelible paint with the following data:
 - a) Manufacturer marking
 - b) Material Specification
 - c) Size & Sch.
 - d) Heat No.
- 8.4 Package shall be marked legibly with suitable marking ink to indicate the following:
 - a) Order Number
 - b) Package Number
 - c) Manufacturer's Name

J.P.KENNY		Document No.	
	TECHNICAL SPECIFICATION FOR SEAMLESS FITTINGS		Rev
		11-0290-02-08-02-019	0
		SHEET 5 of 6	

- d) Type of Fitting
- e) Size (inches) and Wall Thickness (mm)

9.0 WARRANTY

Manufacturer will reimburse purchaser for any fitting furnished on this order that fails under field hydrostatic test if such failure is caused by a defect in the fitting, which is outside the acceptance limits of this specification. The reimbursement cost shall include fitting, labour and equipment rental for finding, excavation, cutting out and installation of replaced fitting in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 100% of specified minimum yield strength for the pipe with which the fitting is to be attached without impairing its serviceability.

10.0 DOCUMENTATION

10.1 All documents shall be in English Language.

10.2 At the time of bidding bidder shall submit the following documents:

- a) Reference list of previous supplies of similar fittings of similar specification.
- b) Clause wise list of deviation from this specification, if any.
- c) Brief description of the manufacturing and quality control facilities of the Manufacturer's work.
- d) Manufacturer's qualification requirement as per section 3.0 of this specification.
- e) Quality Assurance Plan (QAP).

10.3 Within two weeks of placement of order, the manufacturer shall submit four copies of method of manufacture and quality control procedure for raw material and finished product.

Once the approval has been given by Purchaser, any change in material, method of manufacture and quality control procedure shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the fittings are manufactured.

10.4 Within four weeks from the approval date, Manufacturer shall submit six copies of the approved documents as stated in Para 10.3 of this specification.

10.5 Prior to shipment, Manufacturer shall submit six copies of test certificates as listed in Para 7.0 of this specification.

J.P.KENNY		Document No.	
	TECHNICAL SPECIFICATION FOR SEAMLESS FITTINGS		Rev
		11-0290-02-08-02-019	0
		SHEET 6 of 6	



**GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT**



DATA SHEET FOR FITTINGS

CLIENT JOB NO.

TOTAL SHEETS

2

DOCUMENT NO

11

0290

02

08


03

019

--	--	--	--	--	--

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	09/11/09	ISSUED FOR TENDER	GV	RM	PKS
B	25/09/09	ISSUER FOR CLIENT'S REVIEW	GV	RM	PKS
A	24/09/09	ISSUED FOR IDC	GV	RM	PKS

CLIENT	GGL	TAG NO.	
QUANTITY	Refer MR	SIZE	Refer MR
APPLICABLE TO: <input checked="" type="checkbox"/> PROPOSAL <input type="checkbox"/> PURCHASE <input type="checkbox"/> AS BUILT			
DESIGN DATA			
DESIGN CLASS :		300#	
DESIGN CODE :		ASME B 16.9 & MSS SP 75	
FLUID :		NATURAL GAS / R-LNG	
<input checked="" type="checkbox"/> SWEET SERVICE <input type="checkbox"/> SOUR <input type="checkbox"/> LETHAL			
DESIGN PRESSURE AND TEMPERATURE:			
INTERNAL : 49 BAR g @ 0 to 60 °C			
EXTERNAL : ATM @ 45 °C			
HYDRO TEST PRESSURE		73.5 BARg @ AMBIENT temp	
MATERIAL OF CONSTRUCTION :		A 234 Gr.WPB for Tees ,Reducers ,Elbows and Bends A 105 for Weldolets and Scokolets	
<input checked="" type="checkbox"/> PWHT <input checked="" type="checkbox"/> CHARPY IMPACT TEST			
PWHT REQUIRED FOR <input type="checkbox"/> CLIENT <input type="checkbox"/> PROCESS			
<input checked="" type="checkbox"/> CODE			
RADIOGRAPHY AS PER CODE			
ULTRASONIC TESTING As Per CODE			
HYDROTEST As Per CODE			
End Connection THK. (mm) :		Refer MR	
Body Construction :		Seamless	

		PROJECT: CITY GAS DISTRIBUTION PROJECT CLIENT: GAIL GAS LIMITED CONSULTANT: WGI VENDOR			QAP NO: 11-0290-02-08-10-019 ITEM DESCRIPTION/ QUANTITY: FITTINGS PAGE NO: 1 of 1			
	OPERATION	CHARACTERISTICS	REF. DOC. & ACCEPTANCE NORMS	FORMAT OF RECORD	TYPE OF CHECK	INSPECTION		
						Subvendor	TPI	WGI
RAW MATERIAL INSPECTION								
Pipes/ Plates	Chemical	Correlation with Mill Test Certificate & Check Test Cert. as per TS	Applicable Codes	Mill T.C. or Check T.C.	Verification of marking with MTC & Check test if any	P	R	R
Electrodes		Batch Test Certificate	ASME Sec II Part C	Test Cert.		P	R	R
IN PROCESS								
1	HEAT TREATMENT	Quenching, Normalising and Tempering	ASTM A 234 Gr.WPB	HT Records	Visual & Review of T.C.	P	R	R
DESTRUCTIVE TESTING - PRODUCT								
2	MECHANICAL TEST	Testing - per heat	ASTM A 234 Gr.WPB	LR	Witness/ Scrutiny of the Report	P	W	R
3	HARDNESS TEST	Testing - per heat	350 HV 10	LR	Witness/ Scrutiny of the Report	P	R	R
4	Impact Test at 0 deg C (Base Material, Weld, & Haz)	Testing - one set per heat	AVG - 35 J IND - 28J (for one specimen)	LR	Witness/ Scrutiny of the Report	P	W	R
5	NDT (Whichever applicable)	U.T.	ASME Sev V	LR	Witness/ Scrutiny of the Report	P	R	R
		M.P.I at Bevel Ends THK>= 6MM, D.P> at Bevel if t<= 6 MM, 100%	ASME Sec V	LR	Witness/ Scrutiny of the Report	P	R	R
FINAL								
6	Overall Dimension	100%	As per Code	IIR		P	R	R
7	Visual Check	FFD - 100%						
8	MARKING	Logo, Matl. Specn., Size, Sch/ Rating, Lot No.	P.O. Spec.	SPECIFIED IN T.C	Visual	P	R	R
9	Review of Manufacturer's	Correlation of TC			LR	P	R	R
10	Preparation of documentation and issue of Release Note			Standard	LR	P	R	R
CTC/ MTC : CHECK/ MILL TEST CERT., P: PERFORM, IIR: INTERNAL INSPECTION REPORT, W: WITNESS, FFD: FREE FROM DEFECTS, TPI: THIRD PARTY INSPECTION AGENCY, H: HOLD, LR: LAB REPORTS NOTE 1 : ALL FITTINGS 18" & ABOVE SHALL BE IN WELDED CONSTRUCTION - EXISTING WPS, PQR SHALL BE REVIEWED BY TPI NOTE 2 : TPI TO ISSUE CERTIFICATE AS PER EN 10204 3.2 FORMAT								



**GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT**



TECHNICAL SPECIFICATION FOR FLANGES

CLIENT JOB NO.

TOTAL SHEETS

6

DOCUMENT NO

11

0290

02

08

02

018



REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	09/11/09	ISSUED FOR TENDER	GV	RM	DDS
B	26/08/09	ISSUED FOR CLIENT'S COMMENTS	GV	RM	DDS
A	25/08/09	ISSUED FOR IDC	GV	RM	DDS

TABLE OF CONTENT

1.0	SCOPE.....	3
2.0	REFERENCE DOCUMENTS.....	3
3.0	MANUFACTURER'S QUALIFICATION.....	3
4.0	MATERIALS.....	4
5.0	DESIGN AND MANUFACTURE.....	4
6.0	INSPECTION AND TESTS.....	5
7.0	TEST CERTIFICATES.....	5
8.0	MARKING.....	5
10.0	PACKING, SHIPPING & HANDLING.....	5

J P KENNY



TECHNICAL SPECIFICATION FOR
FLANGES

Document No.

11-0290-02-08-02-018

Rev

0

SHEET 2 of 6

1.0 SCOPE

This specification covers the minimum requirements for the design, manufacture and supply of following carbon steel flanges of size to be installed in pipeline systems handling hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG):

- Flanges such as weld neck flanges, blind flanges, spectacle blinds, spacers and blinds, etc.

This specification does not cover the above-mentioned items, which are to be installed in pipeline system handling sour hydrocarbons (liquid / gas) service as defined in NACE standard MR-01-75-98.

2.0 REFERENCE DOCUMENTS

Reference has been made in this specification to the latest edition of the following codes, standards and specifications:



CODES AND STANDARDS:

- ASME B3 1.3 - Process Piping
- ASME B3 1.4 - Pipeline Transportation System for Liquid Hydrocarbons and Other Liquids
- ASME B3 1.8 - Gas Transmission and Distribution Piping Systems
- ASME B 16.5 - Pipe Flanges and Flanged Fittings
- ASME B 16.9 - Factory Made Wrought Steel Butt Welding Fittings (1/2" to 24")
- ASME B 16.25 - Butt-welding Ends
- ASME B16.47 - Large Diameter Steel Flanges (26" to 60")
- ASME B 16.48 - Steel Line Blanks
- ASME Sec VIII/IX - Boiler and Pressure Vessel Code
- ASTM A 370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
- MSS-SP-25 - Standard Marking System for Valves, Fittings, Flanges and Unions
- MSS-SP-75 - Specification for High Test Wrought Welded Fittings.
- MSS-SP-97 - Forged Carbon Steel Branch Outlet Fittings- Socket Welding, Threaded and Butt Welding Ends.

In case of conflict between various requirements of this specification and reference standard mentioned above, the more stringent requirement shall apply.

3.0 MANUFACTURER'S QUALIFICATION

Manufacturer, who intends bid for flanges, must possess the records of a successful proof test, in accordance with the provisions of ASME B 16.9/ MSSSP- 75, as applicable. These records shall be submitted at the time of bidding.

 	TECHNICAL SPECIFICATION FOR FLANGES	Document No.	Rev
		11-0290-02-08-02-018	0
		SHEET 3 of 6	

4.0 MATERIALS

4.1 The basic material for flanges shall be as indicated in the Material Requisition Additionally; the material shall also meet the requirements specified hereinafter.

4.2 The Carbon steel used for the manufacture of Flanges shall be fully killed.

4.3 Each heat of steel used for the manufacture of flanges shall have carbon equivalent (CE) not greater than 0.45 %calculated from check analysis in accordance with following formula:

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

Carbon contents on check analysis shall not exceed 0.22%.

4.4 Unless specified otherwise, Charpy V-notch test shall be conducted for each heat of steel, in accordance with the impact test provision of ASTM A370 at 0°C temperature. The average absorbed impact energy values of three full- sized specimens shall be 35 joules.

The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 80% of the above- mentioned average value.

For flanges specified to be used for other hydrocarbon service, the Charpy V-notch test requirements as 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 Purchase Requisition for flanges, the Charpy V-notch test requirements of applicable material standard shall be complied with.

4.5 For flanges specified to be used for Gas service or High Vapour Pressure (HVP) liquid service, hardness test shall be carried out in accordance with ASTM A 370. Hardness testing shall cover at least 10% per item, per size, per heat, per manufacturing method. A full thickness cross section shall be taken for this purpose and the maximum hardness shall not exceed 248 HV10.

For welded portion maximum difference in hardness of base material, weld material and heat affected zone shall be less than 80 points in Vickers HV10.

4.6 In case of RTJ flanges, the groove hardness shall be minimum 140 BHN

5.0 DESIGN AND MANUFACTURE


5.1 Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B16.5 upto sizes DN 600 mm (24”) excluding DN 550 mm (22”), and for sizes DN 550 mm (22”), DN 650mm (26”) and above ASME B 16.47 (Series B) shall be used.

5.2 Type, face and face finish of flanges shall be as specified in Purchase Requisition.

5.3 Flanges manufactured from bar stock is not acceptable.

5.4 All welds shall be made by welders and welding procedures qualified in accordance with provisions of ASME Sec. IX. The procedure qualification shall include Charpy V-notch test for weld/heat affected zone and hardness test in accordance with clause 4.4 and 4.5 of this specification.

5.5 Repair by welding on flanges and parent metal of fittings is not permitted. Repair of weld seam by welding shall be carried out by welders and welding procedures duly qualified as per ASME Section IX and records for each repair shall be maintained. Repair welding procedure qualification shall include all tests, which are applicable for regular production welding procedure qualification.

	TECHNICAL SPECIFICATION FOR FLANGES	Document No.	Rev
		11-0290-02-08-02-018	0
		SHEET 4 of 6	

6.0 INSPECTION AND TESTS

6.1 The Manufacturer shall perform all inspection and tests as per the requirement 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:

6.1.1 All flanges shall be visually inspected. The internal and external surfaces of the fittings shall be free from any earth strikes, gauges and other detrimental defects.

6.1.2 Dimensional checks shall be carried out on finished products as per ASME B16.5/MSS-SP-44/ASME B16.47 as applicable for flanges, ASME B 16.48 for spacers and blinds and ASME B16.9/MSS-SP-75/MSS-SP-97 as applicable for fittings and as per this specification.

6.1.3 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

6.2 Purchaser’s Inspector reserves the right to perform stage wise inspection and witness tests, as - indicated in clause 6.1 of this specification at Manufacturer’s Works prior to shipment.

Manufacturer shall give reasonable notice of time and shall provide, without charge, reasonable access and facilities required for inspection, to the Purchaser’s Inspector.

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

7.0 TEST CERTIFICATES

Manufacturer shall submit following certificates to Purchaser’s Inspector:

- a) Test certificates relevant to the chemical analysis and mechanical properties of the materials used for construction as per this specification and relevant standards
- b) Test Reports on radiography, ultrasonic inspection and magnetic particle examination.
- c) Test reports of heat treatment carried out as per the specification.
- d) Welding procedures and welders qualification reports.
- e) EN 10204 3.2 Certificate stating the quality of relevant Flanges.

8.0 MARKING

8.1 All Flanges shall be marked with:

- PO Number
- Item Code

9.0 DOCUMENTATION

9.1 Prior to shipment, the Manufacturer shall submit six copies of the test certificates as listed in clause 7.0 of this specification.

9.2 All documents shall be in English Language only.

10.0 PACKING, SHIPPING & HANDLING

10.1 After all inspection and tests required have been carried out; all external surfaces shall be thoroughly cleaned to remove grease, dust and rust and shall be applied with standard mill



Document No.	Rev
11-0290-02-08-02-018	0
SHEET 5 of 6	

coating for protection against corrosion during transit and storage. The coating shall be easily removable in the field.

10.2

Ends of all weld neck flanges shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for fittings and flange. Flange face shall be suitably protected to avoid any damage during transit.

J P KENNY



**TECHNICAL SPECIFICATION FOR
FLANGES**

Document No.

11-0290-02-08-02-018

Rev

0

SHEET 6 of 6



GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT



DATA SHEET FOR FLANGES (300#)

CLIENT JOB NO.

TOTAL SHEETS

2

DOCUMENT NO

11

0290

02

08


03

018

--	--	--	--	--	--

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	09/11/09	ISSUED FOR TENDER	GV	RM	DDS
B	25/09/09	ISSUER FOR CLIENT'S REVIEW	GV	RM	DDS
A	24/09/09	ISSUED FOR IDC	GV	RM	DDS

CLIENT	GGL	TAG NO.	
QUANTITY	As per MR	SIZE	As per M R
APPLICABLE TO: <input checked="" type="checkbox"/> PROPOSAL <input type="checkbox"/> PURCHASE <input type="checkbox"/> AS BUILT			
DESIGN DATA		FLANGE & SPACR BLIND	
DESIGN CLASS :		300#	
DESIGN CODE :		B -16.5	
FLUID :		NATURAL GAS / R-LNG	
<input checked="" type="checkbox"/> SWEET SERVICE <input type="checkbox"/> SOUR <input type="checkbox"/> LETHAL			
DESIGN PRESSURE AND TEMPERATURE:			
INTERNAL : 49BAR g @ 0 to 60 °C			
EXTERNAL : ATM @ 45 °C			
MATERIAL OF CONSTRUCTION :		ASTM A 105	
FLANGE TYPE:		WELD NECK FLANGE	
FLANGE FACING		RAISED FACE 125 AARH	
<input checked="" type="checkbox"/> PWHT <input checked="" type="checkbox"/> CHARPY IMPACT TEST			
PWHT REQUIRED FOR <input type="checkbox"/> CLIENT <input type="checkbox"/> PROCESS <input checked="" type="checkbox"/> CODE			
End Connection THK. (mm) :		Refer MR	
TOTAL MIN. THK :		N.A.	
RADIOGRAPHY AS PER CODE			
ULTRASONIC TESTING As Per CODE			

	DATA SHEET FOR FLANGES (300#)	DOCUMENT NO.	REV
		11-0290-02-08-03-018	0
		SHEET 2 OF 2	



GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT



DATA SHEET FOR FLANGES (150#)

CLIENT JOB NO.

TOTAL SHEETS

2

DOCUMENT NO

11

0290

02

08


03


020

--	--	--	--	--	--

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	09/11/09	ISSUED FOR TENDER	GV	RM	DDS
B	25/09/09	ISSUER FOR CLIENT'S REVIEW	GV	RM	DDS
A	24/09/09	ISSUED FOR IDC	GV	RM	DDS

CLIENT	GGL	TAG NO.	
QUANTITY	As per MR	SIZE	As per M R
APPLICABLE TO: <input checked="" type="checkbox"/> PROPOSAL <input type="checkbox"/> PURCHASE <input type="checkbox"/> AS BUILT			
DESIGN DATA		FLANGE & SPACR BLIND	
DESIGN CLASS :		150#	
DESIGN CODE :		B -16.5	
FLUID :		NATURAL GAS / R-LNG	
<input checked="" type="checkbox"/> SWEET SERVICE <input type="checkbox"/> SOUR <input type="checkbox"/> LETHAL			
DESIGN PRESSURE AND TEMPERATURE:			
INTERNAL : 19BAR g @ 0 to 60 °C			
EXTERNAL : ATM @ 45 °C			
MATERIAL OF CONSTRUCTION :		ASTM A 105	
FLANGE TYPE:		WELD NECK FLANGE	
FLANGE FACING		RAISED FACE 125 AARH	
<input checked="" type="checkbox"/> PWHT <input checked="" type="checkbox"/> CHARPY IMPACT TEST			
PWHT REQUIRED FOR <input type="checkbox"/> CLIENT <input type="checkbox"/> PROCESS <input checked="" type="checkbox"/> CODE			
End Connection THK. (mm) :		Refer MR	
TOTAL MIN. THK :		N.A.	
RADIOGRAPHY AS PER CODE			
ULTRASONIC TESTING As Per CODE			

	DATA SHEET FOR FLANGES (150#)	DOCUMENT NO.	REV
		11-0290-02-08-03-020	0
		SHEET 2 OF 2	

		PROJECT: CITY GAS DISTRIBUTION PROJECT CLIENT: GAIL GAS LIMITED CONSULTANT: WGI VENDOR				QAP NO: 11-0290-02-08-10-018 ITEM DESCRIPTION: FLANGES (WNRF & SPACER BLIND) PAGE NO: 1 of 1			
OPERATION	CHARACTERISTIC	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION		
							Subvendor	TPI	WGI
Review of PO/ TDC/ DRG	Review of PO/ DOC./ DRG & TD	Scrutiny/ Varification	Each doc of	Appl. Spec./ Std			P	R	R
RAW MATERIAL	Manufacturing Process of Steel	Verification with M.T.C.	Each Heat	ASTM A 105	Material Spec/ Std/ Customer Spec	Material Test Cert. / RMI Register	P	R	R
	Chemical Composition	Spectro Analysis	Each Heat						
FORGINGS	Reductino Ratio	Measurements	Minimum 1 per size	CHW Standard Manufacturing Procedure FFD	Std. Procedure	Forging Process Record/ Internal Register	P	W	R
	Temperature during Forging	Optical Pyrometer							
	Forging Dimensions	Measurements	100%		Forging Drwg ANSI B16.5				
Heat Treatment (Quenching and Tempering)	Heat Treatment Cycle	Verification of Heat Treatment Cycle	HT one Lot	ASTM A 105	ASTM A 105	T.P.M Sheet, Heat Treatment Graph	P	R	R
MECHANICAL TESTING	Tensile Test (TS,YS,EL%)	Tensile Testing	One Lot	ASTM A 105	YS-485 MPA min TS-565 MPA min %EL - 18 Grain Size ASTM 5 to 8	Mechanical Test Report & T.C.	P	W	R
	Hardness *								
	Micro Test								
	Impact Test			28 J min (one specimen) 35 J avg					

* Hardness - 248 HV10
RMI - Raw Material Indent

NOTE:TPI TO ISSUE 3.2 CERTIFICATE AS PER EN10204.



**GAIL GAS LIMITED
CITY GAS DISTRIBUTION PROJECT**



PIPING MATERIAL SPECIFICATION

CLIENT JOB NO.

-

TOTAL SHEETS

14

DOCUMENT NO

11

0290

02

08

02

001

--	--	--	--	--	--

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	09/11/09	ISSUED FOR APPROVAL	GV	DDS	PKS
B	10/08/09	ISSUED FOR APPROVAL	GV	DDS	PKS
A	07/08/09	ISSUED FOR IDC	GV	DDS	PKS

TABLE OF CONTENT

CONTENT	PAGE No.
GENERAL NOTES	3
DEFINITIONS	3
CODES AND STANDARDS	3
ABBREVIATIONS	4
PIPING CLASS DESCRIPTION	6
PIPING CLASS 1A1	7
PIPING CLASS 3A1	11

JP KENNY



PIPING MATERIAL SPECIFICATION

Document No.

11-0290-02-08-02-001

Rev

0

SHEET 2 of 14

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" thru 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
API 6D	Pipeline Valves
API 590	Steel Line Blank



PIPING MATERIAL SPECIFICATION

Document No.

11-0290-02-08-02-001

Rev

0

SHEET 3 of 14

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



PIPING MATERIAL SPECIFICATION

Document No.

11-0290-02-08-02-001

Rev

0

SHEET 4 of 14

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



PIPING MATERIAL SPECIFICATION

Document No.

11-0290-02-08-02-001

Rev

0

SHEET 5 of 14

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


Document No.


11-0290-02-08-02-001


Rev

0

SHEET 6 of 14

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" - 10"	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" - 10"	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" - 10"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 90°	LR B	4-10"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 45°	LR B 45	4-10"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
REDUCERS CONCENTRIC	RC	2" - 10"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
REDUCERS ECCENTRIC	RE	2" - 10"	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" - 10"	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" - 10"	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" - 10"	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" - 10"	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				
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS										
		PIPING MATERIAL SPECIFICATION				Document No.		Rev		
						11-0290-02-08-02-001		0		
						Sheet 7 of 14				

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 ALLOWANCE 0.5 mm	
ITEM	SHORT CODE	SIZE FROM-THRU	DESCRIPTION	RATING AND/OR SCHED.	DIMENSION STANDARD	MATERIAL	REMARKS	
WN FLANGES	FW	0.50"-10"	RF,125 AARH	150#	ASME B16-5	ASTM A105		
BLIND FLANGE	FB	0.50"-10"	RF,125 AARH	150#	ASMEB16-5	ASTM A105		
FLANGES FIG 8	FF	0.5" - 8"	RF,125 AARH	150#	ASME B16-48	ASTM A105		
SPCR & BLND	FSB	10"	RF,125 AARH	150#	ASME B16-48	ASTM A105		
STUD BOLTS	B	0.5" - 10"			ASME B18-2	Bolt: A193 B7 Nut: A194 Gr.2H		
GASKETS SPIRAL WOUND	G	0.5" - 10"		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"-10"	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"-10"	FLG/BW,API6D	150#	ASME B16.10	ASTM A 216 Gr WCB		
NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS								
		PIPING MATERIAL SPECIFICATION				Document No.		Rev.
						11-0290-02-08-02-001		0
						Sheet 8 of 14		

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"-10"	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" - 10"	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"-10"	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										
		PIPING MATERIAL SPECIFICATION				Document No.		Rev.		
						11-0290-02-08-02-001		0		
						Sheet 9 of 14				


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 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"									
H E A D E R S I Z E	1/2"	T																		
	3/4"	T	T																	
	1"	T	T	T																
	1.1/2"	T	T	T	T															
	2"	S	S	S	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									


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


	PIPING MATERIAL SPECIFICATION	Document No.	Rev.
		11-0290-02-08-02-001	0
		Sheet 10 of 14	

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" - 10"	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" - 10"	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" - 10"	BW, 1.5D, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 90°	LR B	4-10"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
LR Bends 45°	LR B 45	4-10"	BW, 3D	M	ASME B16.9	ASTM A 234 Gr WPB				
REDUCERS CONCENTRIC	RC	2" - 10"	BW - ASME B16-25	M X M	ASME B16-9	ASTM A 234 Gr WPB				
REDUCERS ECCENTRIC	RE	2" - 10"	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" - 10"	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" - 10"	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" - 10"	BW - ASME B16-25	M X M	MSS-SP 75	ASTM A105				
CAPS	C	2" - 10"	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										
		PIPING MATERIAL SPECIFICATION				Document No.		Rev.		
						11-0290-02-08-02-001		0		
						Sheet 11 of 14				

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"-10"	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"-10"	RF, 125 AARH	300#	ASME B16-5	ASTM A105		
FLANGES FIG 8	FF	0.5" - 8"	FF, 125 AARH	300#	ASME B16-48	ASTM A105		
SPCR & BLND	FSB	10"	FF, 125 AARH	300#	ASME B16-48	ASTM A105		
STUD BOLTS	B	0.50" - 10"			ASME B18-2	Bolt: A193 B7 Nut: A194 Gr.2H		
GASKETS SPIRAL WOUND	G	0.5" - 10"		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" - 10"	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" - 10"	FLG/ BW, API 6D	300#	ASME B16-10	ASTM A 216 Gr WCB		

NOTE: M=THICKNESS TO MATCH PIPE WALL THICKNESS

	PIPING MATERIAL SPECIFICATION	Document No.	Rev.
		11-0290-02-08-02-001	0
		Sheet 12 of 14	

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		
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"-10"	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" - 10"	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"-10"	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									
		PIPING MATERIAL SPECIFICATION				Document No.	Rev.		
						11-0290-02-08-02-001	0		
						Sheet 13 of 14			


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 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"										
H E A D E R S I Z E	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									

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

	PIPING MATERIAL SPECIFICATION	Document No.	Rev.
		1-0290-02-08-02-00	0
		Sheet 14 of 14	