









INVENTORY NO.	SIGN. & DATE	REF. DRG. NO.	COMPUTER NO.	THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED																						
							CHECKED			CHECKED			CHECKED																						
							APPROVED			APPROVED			APPROVED																						
PROJECT: NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2 OF MRPL CPP-3 UNIT																																			
OWNER:  MANGALORE REFINERY & PETROCHEMICALS LTD																																			
PMC:  L&T - SARGENT & LUNDY LIMITED.																																			
<table><tr><td rowspan="3"></td><td rowspan="3">BHARAT HEAVY ELECTRICALS LTD. HYDERABAD</td><td></td><td>NAME</td><td>SIGN.</td><td>DATE</td><td rowspan="3">NO.OF VAR.</td></tr><tr><td>DRN.</td><td>ANUPAM</td><td><i>Aghastha</i></td><td>07.07.20</td></tr><tr><td>CHD.</td><td>K.N.B.R.</td><td><i>Barkhan</i></td><td>07.07.20</td></tr><tr><td></td><td></td><td>APPD.</td><td>M.S.S.N</td><td><i>M</i></td><td>07.07.20</td><td>-N.A.-</td></tr></table>															BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN.	DATE	NO.OF VAR.	DRN.	ANUPAM	<i>Aghastha</i>	07.07.20	CHD.	K.N.B.R.	<i>Barkhan</i>	07.07.20			APPD.	M.S.S.N	<i>M</i>	07.07.20	-N.A.-
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<table><tr><td colspan="4" rowspan="3">TITLE PIPING MATERIAL SPECIFICATION</td><td rowspan="3">CARD CODE N.A.</td><td colspan="2">BHEL DRG NO. PY-AS-4-M161-1000-01</td><td rowspan="3">REV. 00</td></tr><tr><td colspan="2">CUST DRG NO. 100001-380-05-6411</td></tr><tr><td>SHT. No</td><td>1</td><td>NO. OF SHT.</td><td>67</td></tr></table>														TITLE PIPING MATERIAL SPECIFICATION				CARD CODE N.A.	BHEL DRG NO. PY-AS-4-M161-1000-01		REV. 00	CUST DRG NO. 100001-380-05-6411		SHT. No	1	NO. OF SHT.	67								
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					SHT. No	1		NO. OF SHT.	67																										

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A11A Sheet 1 of 5

**PIPECLASS : A11A**  
**RATING : 150**  
**BASEMATERIAL : CARBON STEEL**  
**CORROSION ALLOWANCE:3 MM**  
**SPECIAL REQUIREMENT :**

## TEMPERATURE (Deg. C) AND PRESSURE ( Kg/Sq. cm g ) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

## SERVICE

MILD SOUR FLARE (NON NACE) - REFER NOTE 34.

## NOTES

- 5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER STD; AND FOR TEMPORARY STRAINERS,REFER STD ; FOR SPACER AND BLIND REFER STD.
- 7 FOR RESTRICTION ON USE OF BALL,PLUG& BUTTERFLY VALVES,REFER GENERAL NOTES.
- 32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCH. REFER GENERAL NOTES TO PMS.
- 34 MAXIMUM HARDNESS IN WELD JOINTS SHALL BE LIMITED TO 200 BHN.
- 73 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH BS-1414 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.
- 121 ASBESTOS FREE GASKETS AND STEM PACKING SHALL BE USED FOR ALL VALVES
- 143 NDT REQUIREMENT AS PER STANDARD B038-6-44-0016

## SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER STD.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER STD.	
VENTS	ON LINES <= 1.5"	REFER STD.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER STD	
TEMP.CONN	1.5"	FLANGED. REFER STD	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER STD	

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A11A Sheet 1 of 5

**PIPECLASS : A11A**  
**RATING : 150**  
**BASEMATERIAL : CARBON STEEL**  
**CORROSION ALLOWANCE:3 MM**  
**SPECIAL REQUIREMENT :**

## TEMPERATURE (Deg. C) AND PRESSURE ( Kg/Sq. cm g ) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

## SERVICE

MILD SOUR FLARE (NON NACE) - REFER NOTE 34.

## NOTES

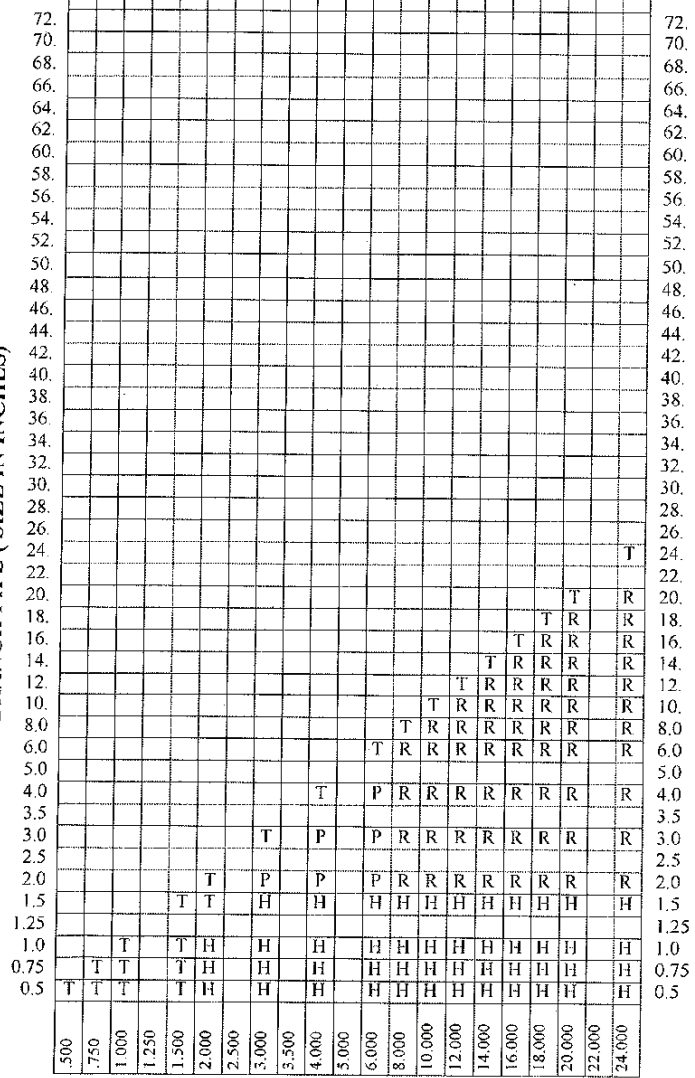
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## SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER STD.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER STD.	
VENTS	ON LINES <= 1.5"	REFER STD.	
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TEMP.CONN	1.5"	FLANGED. REFER STD	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER STD	

**380-GTG-NG-003**

<b>Client :</b> MRPL	<b>Dept./Secn.:</b> 10/43
<b>Project`` :</b> NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
<b>Location :</b> MANGALORE	<b>Pipe Class :</b> A11A      Sheet 2 of 5



<b><u>CODE</u></b>	<b><u>DESCRIPTION</u></b>
<b>F</b>	SADDLE FUSED JT
<b>T</b>	TEES
<b>J</b>	THREADOLET
<b>H</b>	H. COUPLING
<b>W</b>	WELDOLETS
<b>P</b>	PIPE TO PIPE
<b>I</b>	INSTRUMENT TEE
<b>R</b>	REINFORCED
<b>X</b>	Refer Notes
<b>S</b>	SOCKOLETS
<b>L</b>	SWEEPOLET

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A11A Sheet 3 of 5

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description	Note No
<b>Pipe Group</b>								
PIP	PIPE	0.50	1.50	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	
PIP	PIPE	2.00	2.00	XS	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	
PIP	PIPE	3.00	6.00	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	
PIP	PIPE	8.00	12.00	S20	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	
PIP	PIPE	14.00	14.00	S10	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	
PIP	PIPE	16.00	22.00	8.0	B-36.10	A672GR.B60 CL.22 (200 BHN MAX)	BE, E.F.S.W	
PIP	PIPE	24.00	24.00	8.0	B-36.10	A672GR.B60 CL.22 (200 BHN MAX)	BE, E.F.S.W	32
PIP	PIPE	26.00	36.00	CALC	B-36.10	A672GR.B60 CL.22 (200 BHN MAX)	BE, E.F.S.W	
NIP	NIPPLE	0.50	1.50	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	
<b>Flange Group</b>								
FLG	FLNG.WN	0.50	24.00	M	B-16.5	ASTM A 105	150, RF/125AARH	
FLG	FLNG.WN	26.00	36.00	M	B-16.47-B	ASTM A 105	150, RF/125AARH	
FLG/300	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RF/125AARH	
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 105	150, RF/125AARH	
FLB	FLNG.BLIND	26.00	36.00		B-16.47-B	ASTM A 105	150, RF/125AARH	
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	
FEF	SPCR&BLND	26.00	36.00		STD	ASTM A 516 GR.70	150, FF/125AARH	
<b>Fitting Group</b>								
ELB90	ELBOW.90	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
ELB90	ELBOW.90	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	
ELB90	ELBOW.90	16.00	36.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	
ELB45	ELBOW.45	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
ELB45	ELBOW.45	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A11A Sheet 4 of 5

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dim. STD	Material	Description		Note No
<b>Fitting Group</b>									
ELB45	ELBOW.45	16.00	36.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D		
TEQ	T.EQUAL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
TEQ	T.EQUAL	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW		
TEQ	T.EQUAL	16.00	36.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW		
TRED	T.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
TRED	T.RED	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
TRED	T.RED	16.00	36.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
REDC	REDUC.CONC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
REDC	REDUC.CONC	16.00	36.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
REDE	REDUC.ECC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
REDE	REDUC.ECC	16.00	36.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
SWGC	SWAGE.CONC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE		
SWGE	SWAGE.ECC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE		
CAP	CAP	2.00	36.00	M	B-16.9	ASTM A 234 GR.WPB	BW		
CPLF	CPLNG.FULL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
CPLH	CPLNG.HALF	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
CPLL	CPLNG.LH	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
CPLR	CPLNG.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
<b>Valves Group</b>									
GAV	VLV.GATE	0.25	1.50		API-602	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR.STEEL	SW, 800, 3000, B-16.11, SHT NO.- 51001		
GAV	VLV.GATE	2.00	42.00		API-600	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301		73
GLV	VLV.GLOBE	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED,STEM-	SW, 800, 3000, B-16.11, SHT NO.- 52001		

TENDER NO. 3200000352

PAGE

697

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A11A Sheet 5 of 5

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description		Note No
<b>Valves Group</b>									
						13%CR STEEL			
GLV	VLV.GLOBE	2.00	16.00		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301		
CHV	VLV.CHECK	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001		
CHV	VLV.CHECK	2.00	24.00		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301		
BLV	VLV.BALL	0.50	16.00		BS-5351	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301		
PLV	VLV.PLUG	0.50	24.00		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55301		
<b>Bolt Group</b>									
BOS	BOLT.STUD	0.50	36.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H			
<b>Gasket Group</b>									
GAS	GASKET	0.50	24.00		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 150		
GAS	GASKET	26.00	36.00		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+1 RING	SPIRAL, 150		
GAS/300	GASKET	2.00	24.00		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 300		
<b>Trap/Strainer Group</b>									
TSR	STRNR.TEMP	1.50	24.00		STD	B:A516GR.70,INT:SS304	CONETYPE, 150,FF/125AARH		
PSR	STRNR.PERM	0.50	1.50		MNF STD	B:A105,INT:SS304	SW, Y-TYPE, 800		
PSR	STRNR.PERM	2.00	14.00	M	STD	B:A234GR.WPB,INT:SS304	BW, T-TYPE		
PSR	STRNR.PERM	16.00	24.00	M	STD	B:A234GR.WPBW,INT:SS304	BW, T-TYPE		

TENDER No. 3200000352

PAGE

698

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class A1A Sheet 1 of 6

**PIPECLASS : A1A**  
**RATING : 150**  
**BASEMATERIAL : CARBON STEEL**  
**CORROSION ALLOWANCE : 1.5 MM**  
**SPECIAL REQIREMENT:**

## TEMPERATFRE (Deg. C) AND PRESSFRE ( Kg/Sq. cm g ) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371
PRESS	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

## SERVICE

NON CORROSIVE/ FLAMMABLE / NON FLAMMABLE/ NON LETHAL -PROCESS & HYDROCARBONS; LUBE OIL BEFORE FILTER; AMMONIA,BFW, STEAM & CONDENSATE (NON IBR); UTILITIES- PLANT AIR, NITROGEN-BEYOND A3A; COOLING WATER - BEYOND A3A; CBD (A/G AND U/G), SERVICE WATER,OWS(A/G).

## NOTES

- 3 USE PIPE OF CLASS 22 INSTEAD OF CLASS 12 IF PIPE THICKNESS EXCEEDS 19.05MM.
- 5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER'STD ; AND FOR TEMPORARY STRAINERS,REFER STD; FOR SPACER AND BLIND REFER STD .
- 7 FOR RESTRICTION ON USE OF BALL,PLUG& BUTTERFLY VALVES,REFER GENERAL NOTES.
- 73 GATE VALVES OF SIZE 26" AND ABOVE SHALL BE IN ACCORDANCE WITH BS-1414 AND FLANGE ENDS SHALL BE IN ACCORDANCE WITH ASME B16.47 SERIES B.
- 121 ASBESTOS FREE GASKETS AND STEM PACKING SHALL BE USED FOR ALL VALVES
- 127 ALL UNDERGROUND PIPING SHALL BE PROVIDED WITH CORROSION RESISTANCE PROTECTION AS PER APPLICABLE SPECIFICATION.
- 143 NDT REQUIREMENT AS PER JOB AS PER STANDARD B038-6-44-0016
- 181 GASKET & BOLT DIMENSION TO SUIT CORRESPONDING FLANGE SIZE & RATING.
- 197 LOW DELTA P CHECK VALVE

## SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER STD	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER STD.	
VENTS	ON LINES <= 1.5"	REFER STD.	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER STD	
TEMP.CONN	1.5"	FLANGED. REFER STD	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER STD	

TENDER NO. 3200000352

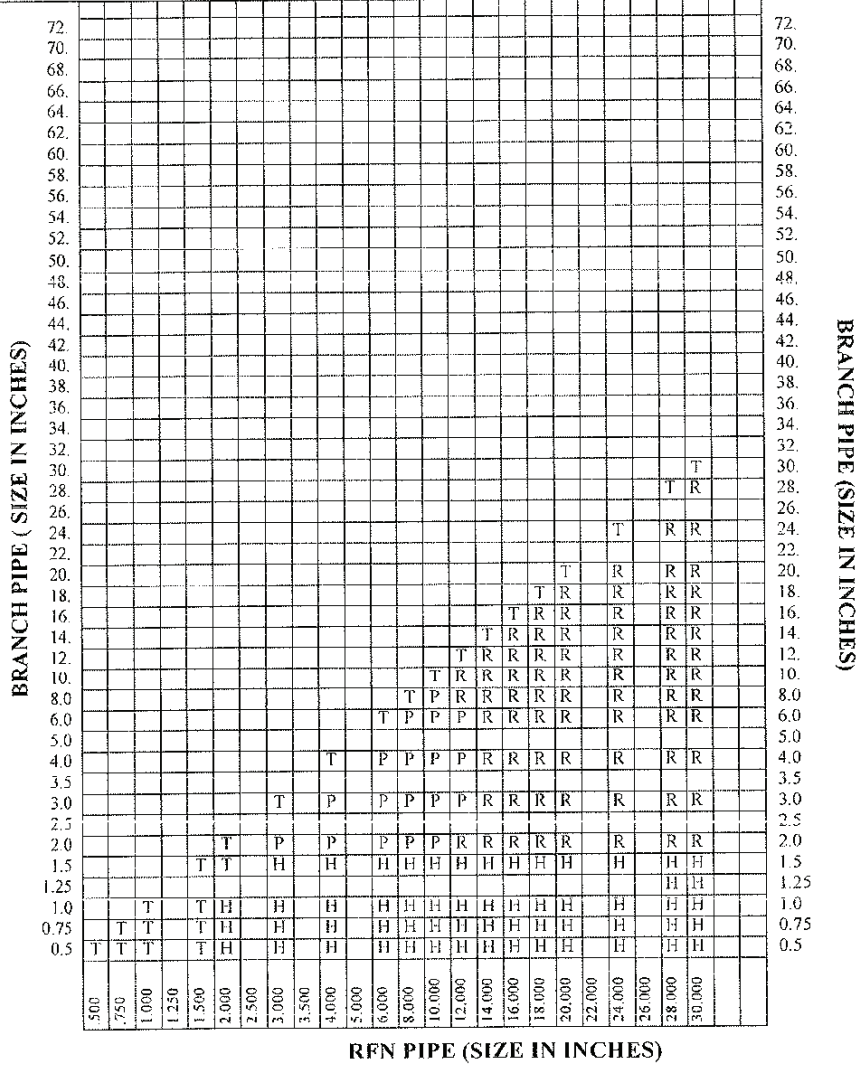
PAGE 699

380-GTG-NG-003

Dept./Sect.:

16/43

<b>Client :</b> MRPL	
<b>Project :</b> NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
<b>Location :</b> MANGALORE	<b>Pipe Class :</b> A1A                      Sheet 2 of 6



<u>CODE</u>	<u>DESCRIPTION</u>				
F	SADDLE FUSED JT	T	TEES	J	THREAOLET
H	H. COUPLING	W	WELDOLETS		
P	PIPE TO PIPE	I	INSTRUMENT TEE		
R	REINFORCED	X	Refer Notes		
S	SOCKOLETS	L	SWEEPOLET		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A1A Sheet 3 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description		Note No
<b>Pipe Group</b>									
PIP	PIPE	0.50	1.50	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS		
PIP	PIPE	2.00	6.00	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS		
PIP	PIPE	8.00	12.00	S20	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS		
PIP	PIPE	14.00	14.00	S10	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS		
PIP	PIPE	16.00	20.00	6.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W		
PIP	PIPE	22.00	30.00	8.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W		
NIP	NIPPLE	0.50	0.75	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS		
NIP	NIPPLE	1.00	1.50	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS		
<b>Flange Group</b>									
FLG/300	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	300, RF/125AARH		
FLG/600	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	600, RF/125AARH		
FLG	FLNG.WN	0.50	24.00	M	B-16.5	ASTM A 105	150, RF/125AARH		
FLG	FLNG.WN	26.00	30.00	M	B-16.47-B	ASTM A 105	150, RF/125AARH		
FLG/600	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	600, RF/125AARH		
FLG/300	FLNG.WN	26.00	30.00	M	B-16.47-B	ASTM A 105	300, RF/125AARH		
FLG/300	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RF/125AARH		
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 105	150, RF/125AARH		
FLB	FLNG.BLIND	26.00	30.00		B-16.47-B	ASTM A 105	150, RF/125AARH		
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	150, FF/125AARH		
FEF/300	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	300, FF/125AARH		
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 105	150, FF/125AARH		
FEF	SPCR&BLND	26.00	30.00		STD	ASTM A 105	150, FF/125AARH		
<b>Fitting Group</b>									
ELB90	ELBOW.90	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		

TENDER NO. 3200000352 PAGE 701

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A1A Sheet 4 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description		Note No
<b>Fitting Group</b>									
ELB90	ELBOW.90	2.00	14.00	M	B-16.9	ASTM A 234 GR WPB	BW, 1.5D		
ELB90	ELBOW.90	16.00	30.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D		
ELB45	ELBOW.45	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
ELB45	ELBOW.45	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D		
ELB45	ELBOW.45	16.00	30.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D		
ELB45	ELBOW.45	26.00	28.00	M	B-16.9	ASTM A 234 GR WPB	BW, 1.5D		
TEQ	T.EQUAL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
TEQ	T.EQUAL	2.00	14.00	M	B-16.9	ASTM A 234 GR WPB	BW		
TEQ	T.EQUAL	16.00	30.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW		
TRED	T.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
TRED	T.RED	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
TRED	T.RED	16.00	30.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
REDC	REDUC.CONC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
REDC	REDUC.CONC	16.00	30.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
REDE	REDUC.ECC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW		
REDE	REDUC.ECC	16.00	30.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW		
SWGC	SWAGE.CONC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE		
SWGE	SWAGE.ECC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE		
CAP	CAP	0.50	0.75		B-16.11	ASTM A 105	SCRF, 6000		
CAP	CAP	1.00	1.50		B-16.11	ASTM A 105	SCRF, 3000		
CAP	CAP	2.00	30.00	M	B-16.9	ASTM A 234 GR.WPB	BW		
CPLF	CPLNG.FULL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		
CPLH	CPLNG.HALF	0.50	1.50		B-16.11	ASTM A 105	SW, 3000		

TENDER NO. 3200000352 PAGE 702

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A1A Sheet 5 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description	Note No
<b>Fitting Group</b>								
CPLL	CPLNG.LH	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	
CPLR	CPLNG.RED	1.00	1.50		B-16.11	ASTM A 105	SW, 3000	
<b>Valves Group</b>								
GAV	VLV.GATE	0.25	1.50		API-602	BODY-ASTM A 105,TRIM- STELLITED,STEM- 13%CR STEEL	SW, 800, 3000, B- 16.11, SHT NO.- 51001	
GAV	VLV.GATE	2.00	42.00		API-600	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301	73
GLV	VLV.GLOBE	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM- STELLITED,STEM- 13%CR STEEL	SW, 800, 3000, B- 16.11, SHT NO.- 52001	
GLV	VLV.GLOBE	2.00	16.00		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301	
CHV	VLV.CHECK	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM- STELLITED	SW, 800, 3000, B- 16.11, SHT NO.- 53001	
CHV	VLV.CHECK	2.00	24.00		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301	
CHV/I	VLV.CHECK	2.00	6.00		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM- 13% CR STEEL	WAFI, 150, B-16.5, WAF/125AARH, SHT NO.- 53391	197
BLV	VLV.BALL	0.50	16.00		BS-5351	BODY-ASTM A 105 / A 216GR.WCB,TRIM- BODY SEAT- RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301	
PLV	VLV.PLUG	0.50	24.00		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM- PLUG-HARDENED	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55301	
BFV	VLV.BTRFLY	3.00	24.00		API-609/BS- 5155	BODY-ASTM A 105 / A 216GR.WCB,TRIM- 13% CR STEEL	WAFI, 150, B-16.5, WAF/125AARH, SHT NO.- 56301	
BFV	VLV.BTRFLY	26.00	48.00		BS EN 593	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR STEEL	FLGD, 150, B-16.47 B, RF/125AARH, SHT NO.- 56315	
<b>Bolt Group</b>								
BOS	BOLT.STUD	0.50	24.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		181

TENDER NO-3200000352 PAGE

703

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A1A Sheet 6 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dim. STD	Material	Description		Note No
<b>Bolt Group</b>									
BOS	BOLT.STUD	26.00	30.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H			
<b>Gasket Group</b>									
GAS	GASKET	0.50	24.00		B-16.20- ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 150		
GAS	GASKET	26.00	30.00		B-16.20- ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 150		
GAS/600	GASKET	0.50	24.00		B-16.20- ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 600		
GAS/300	GASKET	26.00	30.00		B-16.20- ANSI B16.47B	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300		
GAS/300	GASKET	0.50	24.00		B-16.20- ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 300		
<b>Trap/Strainer Group</b>									
TRP	TRAP.STEAM	0.50	1.50		MNF STD	B:A105,T:13%CR,S: SS304	FLGD, THRM DNMC, 150,RF/125AARH		
TSR	STRNR.TEMP	1.50	24.00		STD	B:A516GR.70;INT:S S304	CONETYPE, 150,FF/125AARH		
PSR	STRNR.PERM	0.50	1.50		MNF STD	B:A105;INT:SS304	SW, Y-TYPE, 800		
PSR	STRNR.PERM	2.00	14.00	M	STD	B:A234GR.WPB;JN T:SS304	BW, T-TYPE		
PSR	STRNR.PERM	16.00	24.00	M	STD	B:A234GR.WPBW;J NT:SS304	BW, T-TYPE		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class A3A Sheet 1 of 7

**PIPECLASS :** A3A  
**RATING :** 150  
**BASEMATERIAL :** CARBON STEEL  
**CORROSION ALLOWANCE :** 1.5 MM  
**SPECIAL REQIREMENT:**

## TEMPERATFRE (Deg. C) AND PRESSFRE ( Kg/Sq. cm g ) RATINGS

TEMP	0	38	50	65	100	150	186
PRESS	10.55	10.55	10.55	10.55	10.55	10.55	10.55

## SERVICE

NON CORROSIVE UTILITIES (ABOVE GROUND) CATEGORY "D" FLUID -COOLING WATER,BEARING COOLING WATER,PLANTAIR,INERTGAS,CARBONDIOXIDE(DRY),NITROGEN,CONDENSATE&BOILERFEEDSUCTION(NONIBR). THIS CLASS DOES NOT COVER UNDERGROUND PIPING AND THE FIRE WATERSERVICE.

## NOTES

- 6 FOR FABRICATED REDUCERS,REFER STD . FOR MITRES, REFER STD.
- 10 USE4-PIECE90DEG.MITREFOR8"&10",5-PIECE90DEG.MITREFORSIZESFROM12"TO54"AND6-PIECE90DEG. MITRE FOR SIZES 56" TO 80" (45 DEG. MITRE SHALL REQUIRE ONE PIECELESS )
- 31 USEBUTTERFLYVALVESINSTEADOFGATEVALVESFROM10"ONWARDSINWATERSERVICEANDUPTO70DEGC. DESIGN PRESSURE FOR BUTTERFLY VALVES IS LIMITED UPTO 10BAR.
- 65 FORGINGS ARE ACCEPTABLE IN LIEU OF PLATE MATERIAL FOR BLIND FLANGES AND SPACER & BLINDS.
- 73 GATEVALVESOF26"ANDABOVESHALLBEINACCORDANCEWITHBS-1414ANDFLANGEENDSSHALLBEIN ACCORDANCE WITH ASME B16.47 SERIESB.
- 76 FOR PERMANENT BW STRAINERS,REFER STD ; AND FOR TEMPORARY STRAINERS,REFER STD .
- 77 FORSIZES>24",SPACER&BLINDSHALLBEDESIGNEDBYTHEMANUFACTURERASPERASMEB31.3.
- 86 BUTTERFLYVALVESFORTHESECAREPN10RATEDWITHAMAXIMUMPRESSUREOF10.2KG/CM2G.
- 121 ASBESTOS FREE GASKETS AND STEM PACKING SHALL BE USED FOR ALLVALVES
- 128 ALLWELDEDPIPESSHALLBELONGITUDINALLYWELDEDTYPE.SPIRALLYWELDEDPIPESARENOTACCEPTABLE. NDT
- 143 REQUIREMENT AS PER STANDARDB038-6-44-0016
- 194 FOR CLASS RATING BEYOND 150# IN THIS CLASS, B1A(300#) PIPING CLASS SHALL BE APPLICABLE.

TENDER NO. 3200000352

PAGE 716

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

<b>Client :</b> MRPL	<b>Dept./Sect.:</b> 16/43
<b>Project :</b> NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
<b>Location :</b> MANGALORE	<b>Pipe Class :</b> A3A <span style="float: right;">Sheet 2 of 7</span>

## SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING 3000 LBS.	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER STD	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER STD.	
VENTS	ON LINES <= 1.5"	REFER STD.	
	ON LINES >= 2.0"	0.75" OR AS PER P&ID. REFER STD	
TEMP.CONN	1.5"	FLANGED REFER STD	
PRESS.CONN	0.75"	SW, SH HVY NIPPLE WITH GATE VALVE TO SPEC AS PER STD	

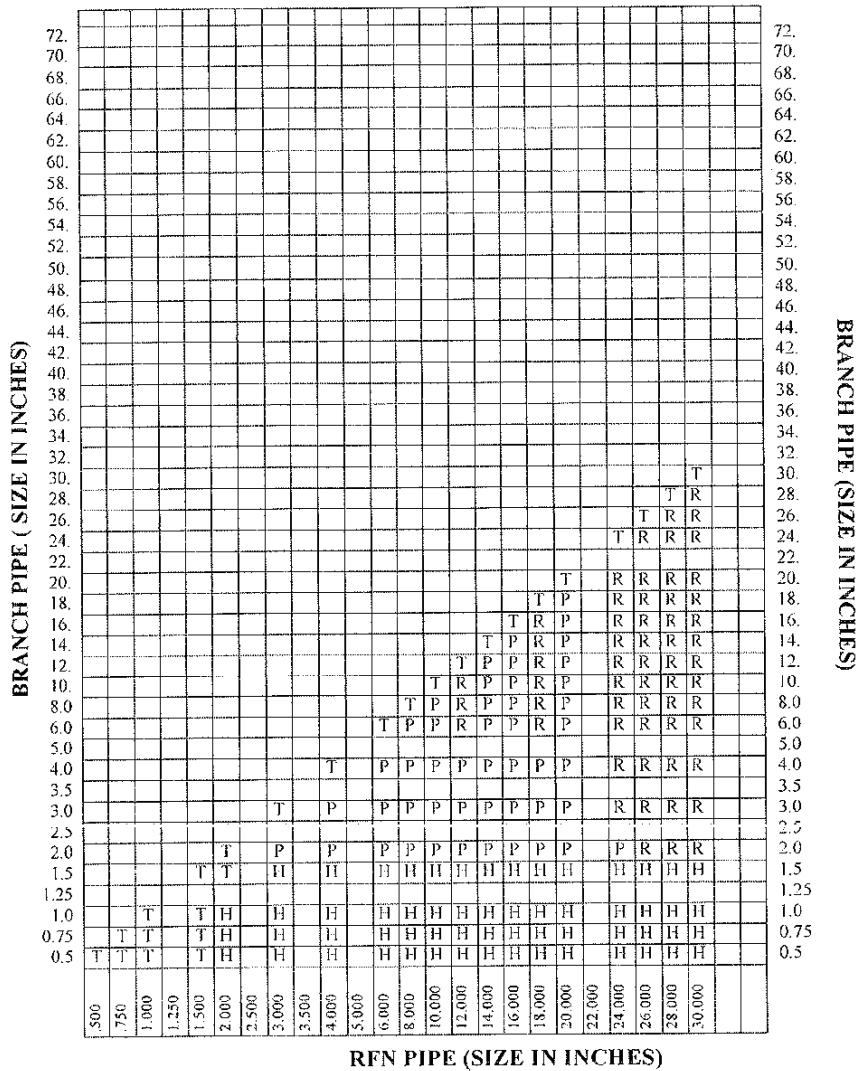
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TENDER NO. 3200000352 PAGE

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A3A Sheet 3 of 7



CODE	DESCRIPTION				
F	SADDLE FUSED JT	T	TEES	J	THREADOLET
H	H COUPLING	W	WELDOLETS		
P	PIPE TO PIPE	I	INSTRUMENT TEE		
R	REINFORCED	X	Refer Notes		
S	SOCKOLETS	L	SWEEPOLET		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

<b>Client :</b> MRPL	<b>Dept./Sect.:</b> 16/43
<b>Project :</b> NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
<b>Location :</b> MANGALORE	<b>Pipe Class</b> A3A Sheet 4 of 7

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description	Note No
<b>Pipe Group</b>								
PIP	PIPE	0.50	1.50	HVY	IS-1239-I	IS-1239 (BLACK)	PE, C.WELDED	
PIP	PIPE	2.00	6.00	HVY	IS-1239-I	IS-1239 (BLACK)	BE, C.WELDED	
PIP	PIPE	8.00	12.00	6.0	IS-3589	IS-3589 GR.330	BE, WELDED	
PIP	PIPE	14.00	18.00	8.0	IS-3589	IS-3589 GR.330	BE, WELDED	
PIP	PIPE	20.00	24.00	10.0	IS-3589	IS-3589 GR.330	BE, WELDED	
PIP	PIPE	26.00	30.00	12.0	IS-3589	IS-3589 GR.330	BE, WELDED	
NIP	NIPPLE	0.50	1.50	HVY	IS-1239-I	IS-1239 (BLACK)	PBE, C.WELDED	
<b>Flange Group</b>								
FLG	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	150, RF/125AARH	
FLG/300	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	300, RF/125AARH	
FLG/300	FLNG.WN	26.00	30.00	M	B-16.47-B	ASTM A 105	300, RF/125AARH	
FLG/300	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RF/125AARH	
FLG	FLNG.SO	2.00	24.00		B-16.5	ASTM A 105	150, RF/125AARH	
FLG	FLNG.SO	26.00	30.00		AWWA-C207 CL.D	ASTM A 105	150, FF/125AARH	
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 105	150, RF/125AARH	
FLB	FLNG.BLIND	26.00	30.00		AWWA-C207 CL.D	ASTM A 285 GR.C	150, FF/125AARH	
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 105	150, FF/125AARH	
FEF	SPCR&BLND	26.00	30.00		MNFSTD	ASTM A 285 GR.C	150, FF/125AARH	
<b>Fitting Group</b>								
ELB90	ELBOW.90	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
ELB90	ELBOW.90	2.00	6.00	STD	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	
ELB45	ELBOW.45	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
ELB45	ELBOW.45	2.00	6.00	STD	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	

TENDER NO. 3200000352

PAGE 4

719

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class A3A Sheet 5 of 7

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description	Note No
<b>Fitting Group</b>								
MIT90	MITRE.90	8.00	30.00	M	STD	IS-3589 GR.330	BW, 1.5D	
MIT45	MITRE.45	8.00	30.00	M	STD	IS-3589 GR.330	BW, 1.5D	
TEQ	T.EQUAL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
TEQ	T.EQUAL	2.00	6.00	STD	B-16.9	ASTM A 234 GR.WPB	BW	
TEQ	T.EQUAL	8.00	30.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW	
TRED	T.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
TRED	T.RED	2.00	6.00	STD, STD	B-16.9	ASTM A 234 GR.WPB	BW	
TRED	T.RED	8.00	30.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	
REDC	REDUC.CONC	2.00	6.00	STD, STD	B-16.9	ASTM A 234 GR.WPB	BW	
REDC	REDUC.CONC	8.00	30.00	M, M	STD	IS-3589 GR.330	BW	
REDE	REDUC.ECC	2.00	6.00	STD, STD	B-16.9	ASTM A 234 GR.WPB	BW	
REDE	REDUC.ECC	8.00	30.00	M, M	STD	IS-3589 GR.330	BW	
SWGC	SWAGE.CONC	0.50	3.00	STD, STD	BS-3799	ASTM A 105	PBE	
SWGE	SWAGE.ECC	0.50	3.00	STD, STD	BS-3799	ASTM A 105	PBE	
CAP	CAP	0.50	1.50		B-16.11	ASTM A 105	SCRF, 3000	
CAP	CAP	2.00	6.00	STD	B-16.9	ASTM A 234 GR.WPB	BW	
CAP	CAP	8.00	30.00	M	B-16.9	ASTM A 234 GR.WPB	BW	
CPLF	CPLNG.FULL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
CPLH	CPLNG.HALF	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
CPLL	CPLNG.LH	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
CPLR	CPLNG.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	
UNN	UNION	0.50	1.50		BS-3799	ASTM A 105	SW, 3000	
<b>Valves Group</b>								
GAV	VLV.GATE	0.25	1.50		API-602	BODY-ASTM A 105, TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 51001	

TENDER NO. 3800000352 PAGE 720

### PIPING MATERIAL SPECIFICATION

<b>Client :</b>		<b>Dept./Sect.:</b>	16/43
<b>Project :</b>	NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2		
<b>Location :</b>	MANGALORE	<b>Pipe Class</b>	A3A
			Sheet 6 of 7

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dimn. STD	Material	Description		Note No
<b>Valves Group</b>									
						STELLITED,STEM-13%CR.STEEL			
GAV	VLV.GATE	2.00	42.00		API-600	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 51301		73
GLV	VLV.GLOBE	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001		
GLV	VLV.GLOBE	2.00	16.00		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 52301		
CHV	VLV.CHECK	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001		
CHV	VLV.CHECK	2.00	24.00		BS 1868	BODY-ASTM A 216 GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 53301		
CHV	VLV.CHECK	26.00	48.00		API-594	BODY-ASTM A 105 / A 216GR.WCB,TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 53316		
BLV	VLV.BALL	0.50	16.00		BS-5351	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 54301		
PLV	VLV.PLUG	0.50	1.50		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-HARDENED PLUG	FLGD, 150, B-16.5, RF/125AARH, SHT NO.- 55923		
BFV	VLV.BTRFLY	3.00	24.00		BS EN 593	BODY-ASTM A 216 GR WCB,TRIM-13% CR.STEEL	WAF, 150, B-16.5, WAF/125AARH, SHT NO.- 56392		
BFV	VLV.BTRFLY	26.00	48.00		BS EN 593	BODY-ASTM A 216 GR WCB,TRIM-13% CR.STEEL	FLGD, 150, AWWAC207, FF/125AARH, SHT NO.- 56396		
<b>Bolt Group</b>									
BOS	BOLT.STUD	0.50	30.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H			
<b>Gasket Group</b>									
GAS	GASKET	0.50	24.00		B-16.21-ANSI B16.5	NONASBESTOS BS7531 GR X	RING, 150, 2 MM		
GAS	GASKET	26.00	30.00		AWWA-C207 CL.D	NONASBESTOS BS7531 GR X	FULLFACE, 150, 2 MM		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

GAS/300	GASKET	26.00	30.00		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+1 RING	SPIRAL, 300		
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Client : MRPL	Dept./Sect.: 16/43
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : A3A Sheet 7 of 7

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description		Note No
<b>Gasket Group</b>									
GAS/300	GASKET	0.50	24.00		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 300		
<b>Trap/Strainer Group</b>									
TRP	TRAP.STEAM	0.50	1.50		MNF STD	B:A105;T:13%CR;S:SS304	FLGD, THRM DNMC, 150, RF/125AARH		
TSR	STRNR.TEMP	1.50	24.00		STD	B:A285GR.C;INT:S S304	CONETYPE, 150, RF/125AARH		
PSR	STRNR.PERM	0.50	1.50		MNF STD	B:A105;INT:SS304	SW, Y-TYPE, 800		
PSR	STRNR.PERM	2.00	6.00	M	STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE		
PSR	STRNR.PERM	8.00	24.00	M	STD	B:A234GR.WPB;INT:SS304	BW, T-TYPE		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : B1A Sheet 1 of 6

PIPE CLASS : **B1A**  
RATING :  
BASE MATERIAL : CARBON STEEL  
CORROSION ALLOWANCE : 1.5 MM  
SPECIAL REQUIREMENT :

## TEMPERATURE (Deg. C) AND PRESSURE ( Kg/Sq. cm g ) RATINGS

TEMP	-29	38	93	149	204	260	316	343	371	399	427
PRESS	52.02	52.02	47.45	46.05	44.64	42.18	38.66	37.61	37.61	35.5	28.82

## SERVICE

NON CORROSIVE PROCESS - FLAMMABLE / NON FLAMMABLE, NON LETHAL - HYDROCARBONS, AROMATICS, AMMONIA, SWEET GAS, FLUSHING OIL AND OTHER UTILITIES -MP CONDENSATE, INSTRUMENT AIR, PLANT AIR, NITROGEN, AMMONIA GAS ETC. ABOVE CLASS 'A1A'.

## NOTES

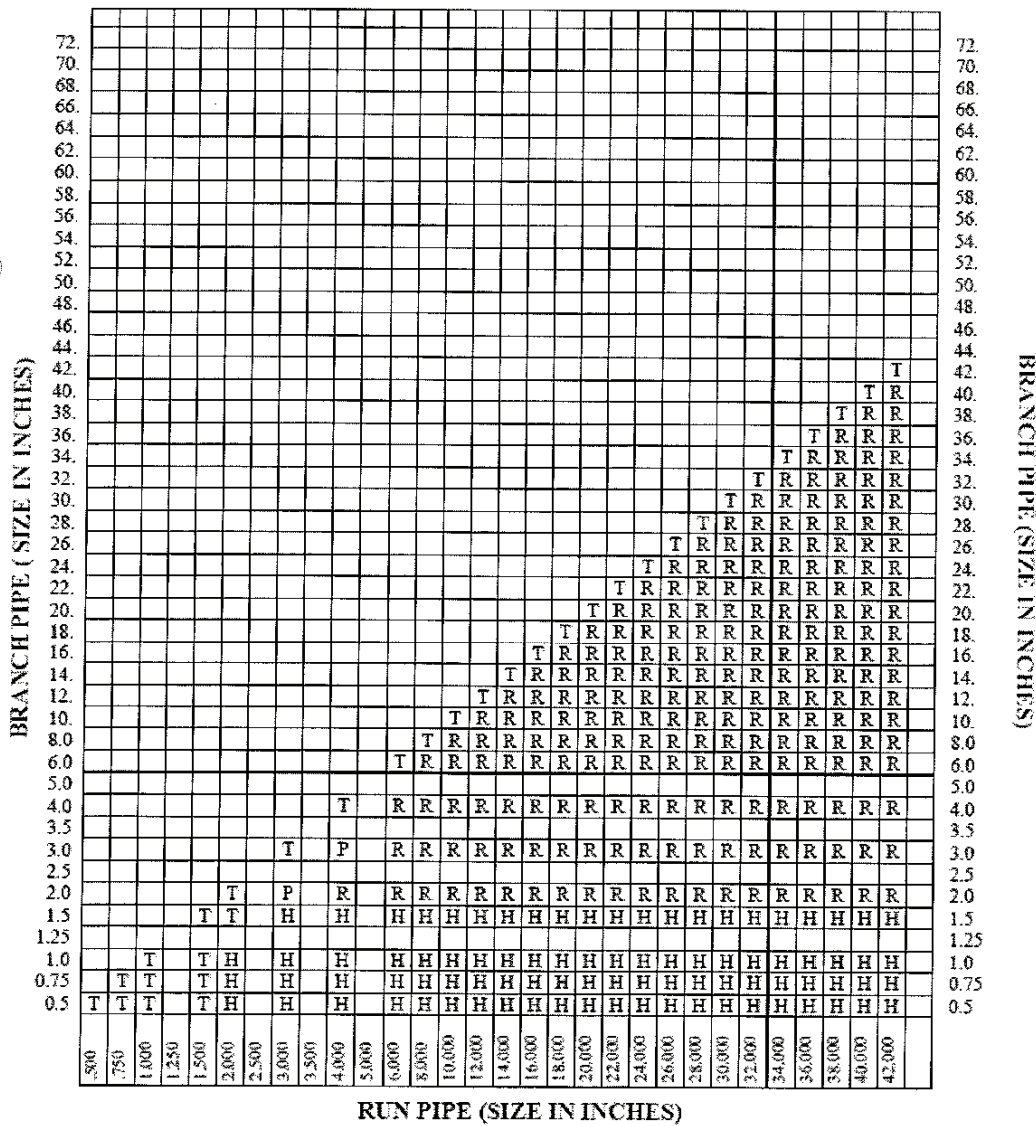
- 1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.
- 5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 -44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.
- 7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.
- 32 CORROSION ALLOWANCE HAS BEEN ADJUSTED TO SELECT OPTIMUM SCHEDULE. REFER GENERAL NOTES TO PMS.
- 116 NONDESTRUCTIVE EXAMINATION REQUIREMENT FOR CARBON STEEL PIPING CLASSES SHALL BE STRINGENT OF EIL'S NDT STD. 6-44-0016 & UOP STD. SPECIFICATION 8-11 FOR UOP LICENSED UNIT.
- 121 ASBESTOS FREE GASKETS AND STEM PACKING SHALL BE USED FOR ALL VALVES
- 134 RTJ FLANGE WITH OCTAGONAL RING GASKET SHALL BE USED FOR ROV IN MOUNDED BULLET AREA AS PER P&ID REQUIREMENT.
- 170 THICKNESS CALCULATED AT ACTUAL LINE CONDITION OF 125 DEGREE C & 21.8 Kg/cm<sup>2</sup>g.
- 171 THICKNESS CALCULATED AT ACTUAL LINE CONDITION OF 110 DEGREE C & 25.3 Kg/cm<sup>2</sup>g.
- 173 THICKNESS CALCULATED BASED ON 80% OF CLASS CONDITION.
- 174 THICKNESS CALCULATED AT ACTUAL LINE CONDITIONS OF 110 DEG.C & 26.70 Kg/cm<sup>2</sup>g,210 DEG.C & 14.5 Kg/cm<sup>2</sup>g,125 DEG.C & 21.8 Kg/cm<sup>2</sup>g.
- 182 THICKNESS CALCULATION IS DONE AT CLASS CONDITIONS FOR 16" TO 20".

## SPECIAL NOTES

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EIL STD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-0350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

**380-GTG-NG-003**

<b>Client :</b> MRPL	
<b>Project :</b> NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
<b>Location :</b> MANGALORE	<b>Pipe Class :</b> B1A                      Sheet 2 of 6



<u>CODE</u>	<u>DESCRIPTION</u>				
F	SADDLE FUSED JT	T	TEES	J	THREDOLET
H	H. COUPLING	W	WELDOLETS		
P	PIPE TO PIPE	I	INSTRUMENT TEE		
R	REINFORCED	X	Refer Notes		
S	SOCKOLETS	L	SWEEPOLET		

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class B1A Sheet 3 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Pipe Group</b>									
PIP	PIPE	0.50	1.50	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS	PI21977Z0	
PIP	PIPE	2.00	6.00	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	8.00	10.00	S30	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	12.00	14.00	STD	B-36.10	ASTM A 106 GR.B	BE, SEAMLESS	PI21917Z0	
PIP	PIPE	16.00	18.00	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	182
PIP	PIPE	20.00	20.00	XS	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	182
PIP	PIPE	22.00	24.00	14.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	173
PIP	PIPE	30.00	30.00	12.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	174
PIP	PIPE	36.00	36.00	12.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	171
PIP	PIPE	42.00	42.00	12.0	B-36.10	ASTM A 672 GR.B60 CL.12	BE, E.F.S.W	PI2A813Z0	170
NIP	NIPPLE	0.50	1.50	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS	PN21967Z0	
<b>Flange Group</b>									
FLG	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 105	300, RF/125AARH	FSC0147Z0	
FLG	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RF/125AARH	FWC0147Z0	
FLG	FLNG.WN	26.00	42.00	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG	FLNG.WN	26.00	42.00	M	B-16.47-B	ASTM A 105	300, RF/125AARH	FWB0147Z0	
FLG/300	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 105	300, RTJ/63AARH	FWC0149Z0	134
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 105	300, RF/125AARH	FBC0147Z0	
FLB	FLNG.BLIND	26.00	42.00		B-16.47-B	ASTM A 105	300, FF/125AARH	FBB0141Z0	
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 105	300, FF/125AARH	FGK0141Z0	
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 105	300, FF/125AARH	FCK0141Z0	
FEF	SPCR&BLND	26.00	42.00		EIL/STD	ASTM A 105	300, FF/125AARH	FCE0141Z0	
<b>Fitting Group</b>									
ELB90	ELBOW.90	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WA602D2Z0	

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : B1A Sheet 4 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Fitting Group</b>									
ELB90	ELBOW.90	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WAG684Z10	
ELB90	ELBOW.90	16.00	42.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WAG754Z10	
ELB45	ELBOW.45	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WB602D2Z0	
ELB45	ELBOW.45	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW, 1.5D	WBG684Z10	
ELB45	ELBOW.45	16.00	42.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW, 1.5D	WBG754Z10	
TEQ	T.EQUAL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WE602D2Z0	
TEQ	T.EQUAL	2.00	14.00	M	B-16.9	ASTM A 234 GR.WPB	BW	WEG684ZZ0	
TEQ	T.EQUAL	16.00	42.00	M	B-16.9	ASTM A 234 GR.WPB-W	BW	WEG754ZZ0	
TRED	T.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WR602D2Z0	
TRED	T.RED	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WRG684ZZ0	
TRED	T.RED	16.00	42.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WRG754ZZ0	
REDC	REDUC.CONC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WUG684ZZ0	
REDC	REDUC.CONC	16.00	42.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WUG754ZZ0	
REDE	REDUC.ECC	2.00	14.00	M, M	B-16.9	ASTM A 234 GR.WPB	BW	WVG684ZZ0	
REDE	REDUC.ECC	16.00	42.00	M, M	B-16.9	ASTM A 234 GR.WPB-W	BW	WVG754ZZ0	
SWGC	SWAGE.CONC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE	WNH026ZZ0	
SWGE	SWAGE.ECC	0.50	3.00	M, M	BS-3799	ASTM A 105	PBE	WPH026ZZ0	
CAP	CAP	2.00	42.00	M	B-16.9	ASTM A 234 GR.WPB	BW	WFG684ZZ0	
CPLF	CPLNG.FULL	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WJ602D2Z0	
CPLH	CPLNG.HALF	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WK602D2Z0	
CPLL	CPLNG.LH	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WL602D2Z0	
CPLR	CPLNG.RED	0.50	1.50		B-16.11	ASTM A 105	SW, 3000	WM602D2Z0	
<b>Valves Group</b>									
GAV	VLV.GATE	0.25	1.50		API-602	BODY-ASTM A 105,TRIM-	SW, 800, 3000, B-16.11, SHT NO.- 51001	51001ZZZ0	

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class : B1A Sheet 5 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Valves Group</b>									
						STELLITED,STEM-13%CR STEEL			
GAV	VLV.GATE	2.00	24.00		API-600	BODY-ASTM A 216 GR.WCB,TRIM-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51401	51401ZZZ0	
GLV	VLV.GLOBE	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11, SHT NO.- 52001	52001ZZZ0	
GLV	VLV.GLOBE	2.00	12.00		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52401	52401ZZZ0	
CHV	VLV.CHECK	0.25	1.50		BS-5352	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53001	53001ZZZ0	
CHV	VLV.CHECK	0.50	4.00		MNFSTD	BODY-ASTM A 105 / A 216GR.WCB,SEAT-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53495	53495ZZZ0	
CHV	VLV.CHECK	2.00	24.00		BS-1868	BODY-ASTM A 216 GR.WCB,TRIM-13% CR STEEL	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53401	53401ZZZ0	
BLV	VLV.BALL	0.50	16.00		BS-5351	BODY-ASTM A 105 / A 216GR.WCB,TRIM-BODY SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54401	54401ZZZ0	
BLV	VLV.BALL	0.50	1.00		BS-5351	BODY-ASTM A 105 / A 216GR.WCB,TRIM-SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54491	54491ZZZ0	
PLV	VLV.PLUG	0.50	24.00		BS-5353	BODY-ASTM A 105 / A 216GR.WCB,TRIM-PLUG-HARDENED	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 55401	55401ZZZ0	
<b>Bolt Group</b>									
BOS	BOLT STUD	0.50	42.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	
<b>Gasket Group</b>									
GAS	GASKET	0.50	24.00		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL	SPIRAL, 300	GK65074Z0	
GAS	GASKET	26.00	42.00		B-16.20-ANSI B16.47B	SP.WND SS316+GRAFIL+1 RING	SPIRAL, 300	GK56274Z0	
GAS/300	GASKET	2.00	24.00		B-16.20-ANSI B16.5	SOFT IRON	OCT-RING, 300	GK67234Z0	134

# PIPING MATERIAL SPECIFICATION

380-GTG-NG-003

Client : MRPL	
Project : NATURAL GAS FIRING PROVISION IN GTG 1 & GTG 2	
Location : MANGALORE	Pipe Class B1A : Sheet 6 of 6

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dimn. STD	Material	Description	Commodity Code	Note No
<b>Trap/Strainer Group</b>									
TRP	TRAP.STEAM	0.50	1.50		MNF'STD	B:A105;T:13%CR;S:SS304	FLGD, THRMDC, 300,RF/125AARH	TR30655B0	
TSR	STRNR.TEMP	1.50	24.00		EIL'STD	B:A516GR.70;INT:S304	CONETYPE, 300,FF/125AARH	ST16839Z0	
PSR	STRNR.PERM	0.50	1.50		MNF'STD	B:A105;INT:SS304	SW, Y-TYPE, 800	SP303D510	
PSR	STRNR.PERM	2.00	14.00	M	EIL'STD	B:A234GR.WPB;IN T:SS304	BW, T-TYPE	SP13344Z0	
PSR	STRNR.PERM	16.00	24.00	M	EIL'STD	B:A234GR.WPBW;I NT:SS304	BW, T-TYPE	SP13644Z0	

Client : OPAL	Dept./Sect. : 16/43
Project : DAHEJ PETRO. COMPLEX	
Location : DAHEJ , GUJRAT	Pipe Class : B1K Sheet 1 of 5

PIPE CLASS : **B1K**  
 RATING : 300  
 BASE MATERIAL : SS 304  
 CORROSION ALLOWANCE : 0 MM  
 SPECIAL REQUIREMENT :

**TEMPERATURE (Deg. C) AND PRESSURE ( Kg/Sq. cm g ) RATINGS**

TEMP	-29	38	93	149	204	260	316	343	371	399	427	454
PRESS	50.5	50.5	42.18	37.96	34.8	32.69	30.58	30.23	29.88	29.17	28.47	27.77

**SERVICE**

PURE PROCESS LIQUID, VAPOUR AND GAS OR MILD CORROSIVE HYDROCARBON - FLAMMABLE/ NON FLAMMABLE & NON LETHAL HYDROCARBONS, CHEMICAL ETC.

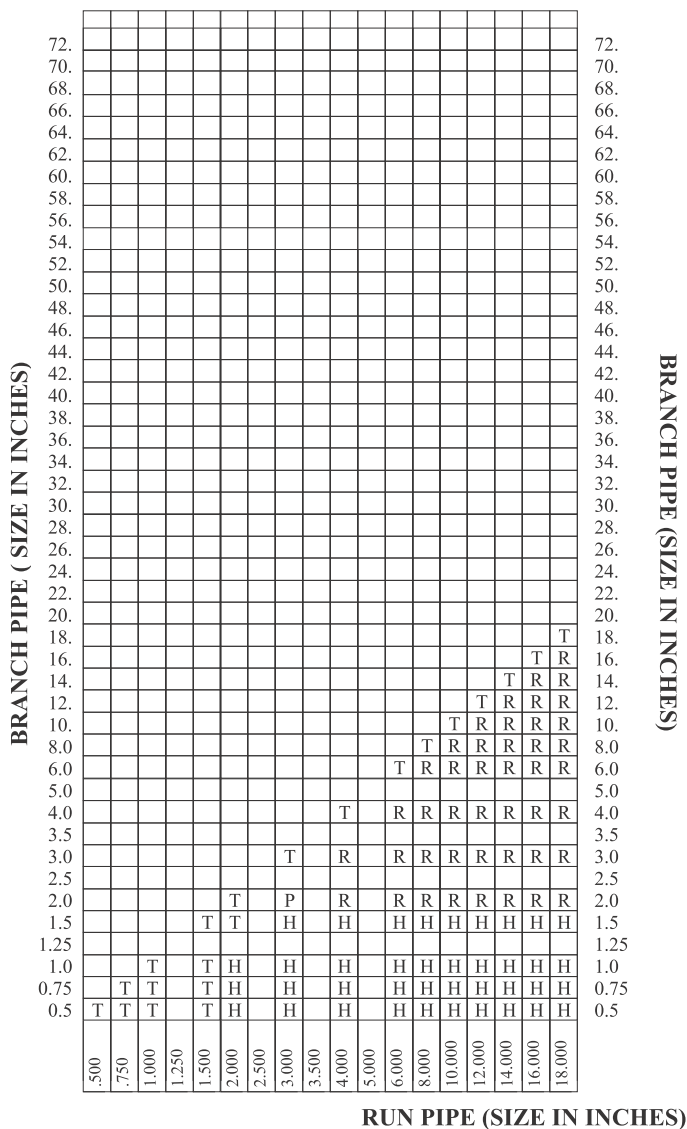
**NOTES**

- 1 NDT REQUIREMENTS AS PER EIL STANDARD 6-44-0016.
- 5 FOR PERMANENT 'T' TYPE BW STRAINERS,REFER EIL'STD 7-44-0303 -44-0304; AND FOR TEMPORARY STRAINERS,REFER EIL'STD 7-44-0300; FOR SPACER AND BLIND REFER EIL'STD 7-44-0162.
- 7 FOR RESTRICTION ON USE OF BALL,PLUG & BUTTERFLY VALVES,REFER GENERAL NOTES.
- 48 FOR INSULATED FLANGED JOINTS BEYOND 427 DEG.C. IN THIS CLASS, USE A453 GR.660 CL.A
- 51 DESIGN PRESSURE AT -29 DEG.C. AND 38 DEG.C. FOR THIS PRESSURE HAS BEEN REDUCED FROM 50.62 KG/CM2G TO 50.50 KG/CM2G TO OPTIMISE THE THICKNESS FOR 6" SIZE.
- 74 STRESS RUPTURE TEST AS DETAILED IN ASTM A453 SHALL BE CARRIED OUT FOR ALL ASTM A453 GR.660A BOLTING MATERIALS.
- 121 ASBESTOS FREE GASKETS AND STEM PACKING SHALL BE USED FOR ALL VALVES

**SPECIAL NOTES**

ITEM	SIZE	DESCRIPTION	A.CODE
MAINTAINENCE JOINTS	ALL	FLANGED, TO BE KEPT MINIMUM	
PIPE JOINTS	1.5" & BELOW	SW COUPLING	
	2.0" & ABOVE	BUTTWELDED	
DRAINS	ON LINES <= 1.5"	REFER EILSTD 7-44-0350, DF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD. 7-44-0351, D4	
VENTS	ON LINES <= 1.5"	REFER EIL STD. 7-44-350, VF3	
	ON LINES >= 2.0"	AS PER P&ID OR 0.75". REFER EIL STD 7-44-0351, V4	
TEMP.CONN	1.5"	FLANGED. REFER EIL STD 7-44-0353	
PRESS.CONN	0.75"	SW NIPPLE WITH VALVE TO SPEC AS PER EIL STD 7-44-0354	

<b>Client :</b>	OPAL	<b>Dept./Sect. :</b>	16/43
<b>Project :</b>	DAHEJ PETRO. COMPLEX		
<b>Location :</b>	DAHEJ , GUJRAT	<b>Pipe Class :</b>	<b>B1K</b> Sheet 2 of 5



<u>CODE</u>	<u>DESCRIPTION</u>				
<b>F</b>	SADDLE FUSED JT	<b>T</b>	TEES	<b>J</b>	THREADOLET
<b>H</b>	H. COUPLING	<b>W</b>	WELDOLETS		
<b>P</b>	PIPE TO PIPE	<b>I</b>	INSTRUMENT TEE		
<b>R</b>	REINFORCED	<b>X</b>	Refer Notes		
<b>S</b>	SOCKOLETS	<b>L</b>	SWEEPOLET		

<b>Client :</b> OPAL	<b>Dept./Sect. :</b> 16/43
<b>Project :</b> DAHEJ PETRO. COMPLEX	
<b>Location :</b> DAHEJ , GUJRAT	<b>Pipe Class : B1K</b> <span style="float: right;">Sheet 3 of 5</span>

**Note : (The shaded portion of PMS body shows Field Fabricated Items)**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Pipe Group</b>									
PIP	PIPE	0.50	0.75	80S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	1.00	1.50	40S	B-36.19	ASTM A 312 TP304	PE, SEAMLESS	PI33577Z0	
PIP	PIPE	2.00	2.00	40S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	3.00	4.00	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	6.00	6.00	10S	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	51
PIP	PIPE	8.00	8.00	6.35	B-36.19	ASTM A 312 TP304	BE, SEAMLESS	PI33517Z0	
PIP	PIPE	10.00	10.00	6.35	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	12.00	12.00	8.38	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	14.00	14.00	7.92	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	16.00	18.00	9.53	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
PIP	PIPE	20.00	24.00	CALC	B-36.19	ASTM A 358 TP304 CL.1	BE, E.FS.W	PI35513Z0	
NIP	NIPPLE	0.50	0.75	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
NIP	NIPPLE	1.00	1.50	M	B-36.19	ASTM A 312 TP304	PBE, SEAMLESS	PN33567Z0	
<b>Flange Group</b>									
FLG	FLNG.SW	0.50	1.50	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FSC4147Z0	
FLG	FLNG.WN	2.00	24.00	M	B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FWC4147Z0	
FLB	FLNG.BLIND	0.50	24.00		B-16.5	ASTM A 182 GR.F304	300, RF/125AARH	FBC4147Z0	
FEF	FLNG.FIG.8	0.50	8.00		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FGK4141Z0	
FEF	SPCR&BLND	10.00	24.00		ASME-B16.48	ASTM A 182 GR.F304	300, FF/125AARH	FCK4141Z0	
<b>Fitting Group</b>									
ELB90	ELBOW.90	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WA642D2Z0	
ELB90	ELBOW.90	2.00	8.00	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WAG874Z10	
ELB90	ELBOW.90	10.00	24.00	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WAG894Z10	
ELB45	ELBOW.45	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WB642D2Z0	

**Package :** IPMCS

**Report No. :** 50

**B1K**

Client : OPAL	Dept./Sect. : 16/43
Project : DAHEJ PETRO. COMPLEX	
Location : DAHEJ , GUJRAT	Pipe Class : B1K Sheet 4 of 5

Note : (The shaded portion of PMS body shows Field Fabricated Items)

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Fitting Group</b>									
ELB45	ELBOW.45	2.00	8.00	M	B-16.9	ASTM A 403 GR.WP304-S	BW, 1.5D	WBG874Z10	
ELB45	ELBOW.45	10.00	24.00	M	B-16.9	ASTM A 403 GR.WP304-WX	BW, 1.5D	WBG894Z10	
TEQ	T.EQUAL	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WE642D2Z0	
TEQ	T.EQUAL	2.00	8.00	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WEG874ZZ0	
TEQ	T.EQUAL	10.00	24.00	M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WEG894ZZ0	
TRED	T.RED	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WR642D2Z0	
TRED	T.RED	2.00	8.00	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WRG874ZZ0	
TRED	T.RED	10.00	24.00	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WRG894ZZ0	
REDC	REDUC.CONC	2.00	8.00	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WUG874ZZ0	
REDC	REDUC.CONC	10.00	24.00	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WUG894ZZ0	
REDE	REDUC.ECC	2.00	8.00	M, M	B-16.9	ASTM A 403 GR.WP304-S	BW	WVG874ZZ0	
REDE	REDUC.ECC	10.00	24.00	M, M	B-16.9	ASTM A 403 GR.WP304-WX	BW	WVG894ZZ0	
SWGC	SWAGE.CONC	0.50	3.00	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WNH426ZZ0	
SWGE	SWAGE.ECC	0.50	3.00	M, M	BS-3799	ASTM A 182 GR.F304	PBE	WPH426ZZ0	
CAP	CAP	2.00	24.00	M	B-16.9	ASTM A 403 GR.WP304-S	BW	WFG874ZZ0	
CPLF	CPLNG.FULL	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WJ642D2Z0	
CPLH	CPLNG.HALF	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WK642D2Z0	
CPLL	CPLNG.LH	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WL642D2Z0	
CPLR	CPLNG.RED	0.50	1.50		B-16.11	ASTM A 182 GR.F304	SW, 3000	WM642D2Z0	
<b>Valves Group</b>									
GAV	VLV.GATE	0.50	1.50		API-602	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS 304	SW, 800, 3000, B-16.11, SHT NO.- 51045	51045ZZZ0	
GAV	VLV.GATE	2.00	24.00		API-600	BODY-ASTM A 351 GR.CF8,TRIM-SS 304	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 51445	51445ZZZ0	

Package : IPMCS

Report No. : 50

**B1K**

<b>Client :</b> OPAL	<b>Dept./Sect. :</b> 16/43
<b>Project :</b> DAHEJ PETRO. COMPLEX	
<b>Location :</b> DAHEJ , GUJRAT	<b>Pipe Class :</b> B1K Sheet 5 of 5

**Note : (The shaded portion of PMS body shows Field Fabricated Items)**

Input Id.	Item Type	Lower Size (Inch)	Upper Size (Inch)	Sch/ Thk	Dmn. STD	Material	Description	Commodity Code	Note No
<b>Valves Group</b>									
GLV	VLV.GLOBE	0.50	1.50		BS-5352	BODY-ASTM A 182 GR.F304,TRIM-STELLITED,STEM-SS304	SW, 800, 3000, B-16.11, SHT NO.- 52045	52045ZZZ0	
GLV	VLV.GLOBE	2.00	12.00		BS-1873	BODY-ASTM A 351 GR.CF8,TRIM-SS 304	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 52445	52445ZZZ0	
CHV	VLV.CHECK	0.50	1.50		BS-5352	BODY-ASTM A 182 GR.F304,TRIM-STELLITED	SW, 800, 3000, B-16.11, SHT NO.- 53045	53045ZZZ0	
CHV	VLV.CHECK	2.00	24.00		BS-1868	BODY-ASTM A 351 GR.CF8,TRIM-SS 304	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 53445	53445ZZZ0	
BLV	VLV.BALL	0.50	16.00		BS-5351	BODY-ASTM A 351 GR.CF8 / ASTM A 182 GR.F304,TRIM-SEAT-RPTFE	FLGD, 300, B-16.5, RF/125AARH, SHT NO.- 54445	54445ZZZ0	
<b>Bolt Group</b>									
BOS	BOLT.STUD	0.50	24.00		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H		BS40404Z0	48
<b>Gasket Group</b>									
GAS	GASKET	0.50	24.00		B-16.20-ANSI B16.5	SP.WND SS316+GRAFIL+ I RING	SPIRAL, 300	GK66274Z0	
<b>Trap/Strainer Group</b>									
TSR	STRNR.TEMP	1.50	24.00		EIL'STD	B:A240TP304;INT:S S304	CONETYPE, 300,FF/125AARH	ST14139Z0	
PSR	STRNR.PERM	0.50	1.50		MNF'STD	B:A182GR.F304;IN T:SS304	SW, Y-TYPE, 800	SP307D510	
PSR	STRNR.PERM	2.00	8.00	M	EIL'STD	B:A403GR.WP304-S;INT:SS304	BW, T-TYPE	SP15344Z0	
PSR	STRNR.PERM	10.00	24.00	M	EIL'STD	B:A403GR.WP304-WX;INT:SS304	BW, T-TYPE	SP15444Z0	

ANNEXURE – I (TO PMS)

PIPING MATERIAL SPECIFICATION  
GENERAL NOTES

PROJECT : MRPL BS VIPROJECT

CLIENT : MRPL

LOCATION : MANGALORE

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JOBNO. : B038

Abbreviations:

PMS : Piping Material Specification

CONTENTS

Sl. No.	Description	Page No.
1.0	SCOPE	4
2.0	REFERRED CODES & STANDARDS	4
3.0	MATERIAL SPECIFICATIONS	4
4.0	CLASS DESIGNATION CODE	4
5.0	PIPES	5
6.0	FLANGES	5
7.0	FITTINGS	6
8.0	BENDS, MITRES & REDUCERS FABRICATED FROM PIPE	6
9.0	GASKETS	6
10.0	BOLTING	6
11.0	THREADS	7
12.0	VALVES	7
13.0	NDT SPECIFICATIONS	8
14.0	WELDING SPECIFICATIONS	8
	TABLE FOR MIDDLE NUMBER	9
	TABLE FOR PRESSURE-TEMPERATURE RATING FOR BALL, PLUG AND BUTTERFLY VALVES	12
	INSTRUCTIONS TO PROCESS USER	13
	INSTRUCTION TO PIPING ENGINEERS FOR PREPARATION OF JOB SPECIFICATIONS	15

## SCOPE

This specification (PMS) covers the various piping classes for Process and utility Piping.

Deviations from this specification may be necessary to conform to specific job requirements.

## REFERRED CODES & STANDARDS

All Piping shall be designed in accordance with the Process Piping Code, ASME B31.3. A particular edition (indicated in Design Basis), once selected shall be followed throughout the job.

Editions and addenda (if any) of referred Codes and Standards shall be as per the Job Engineering Design Basis (Piping).

For the sake of brevity, the initials of the society to which the codes are referred to may be omitted in the specification. For example; B16.5 is a code referring to ASME; A106 is a standard referring to ASTM.

For Standard PMS, Rev. 5 'ASME B31.3-2008' & 'ASME B16.5-2003' have been followed.

## MATERIAL SPECIFICATIONS

Individual piping Class has been generally designed to cover a set of services operating within pressure-temperature combination as per ASME B16.5 / B16.34 or part of it.

The PMS shall be strictly adhered to in the design, requisitioning, purchasing, fabrication and testing of the piping system. However, deviations of material may occur due to design conditions and/or availability. All substitutions must be duly approved.

Unless mentioned otherwise, pipe thicknesses in the specs are for above ground piping.

## CLASS DESIGNATION CODE

The class designation shall consist of not more than three components made up of a letter, number & letter; e.g.B1A.

The first letter indicates pressure rating.

A	150 Class	D	600 Class	G	2500 Class
B	300 Class	E	900 Class	J	125/150 Class
C	400 Class	F	1500 Class	K	UNCLASSIFIED

The middle number indicates difference in the specifications within the same rating and material as enlisted in the Table attached.

The third letter indicates type of material.

A	Carbon
B	Carbon Moly.
C	1.0 % Cr., 0.5 %
D	1.25 % Cr., 0.5 % Moly.
E	2.25 % Cr., 1.0 % Moly.
F	5.0 % Cr., 0.5 %Moly.
G	9.0 % Cr., 1.0 %Moly.
H	3.5 % Ni.
I	

J	Nickel /Titanium
K	Stainless steel type 304, 304H, 304L.
L	Aluminium
M	Stabilised stainless steel type 316, 316H, 321, 347.
N	316L
P	Monel / Alloy20
Q	Hastalloy / Inconel / Incoloy
R	Lead
S	PVC & FRP, PP / FRP, PVDF /FRP
T	Cast Iron / Silicon Iron
U	
V	Duplex StainlessSteel
W	Cupro-Nickel
Y	Lined steel (Rubber Lined, Teflon Lined, Cement lined etc).
Z	HDPE / PDVF / Teflon /PVC

## PIPES

Pipe dimension shall be in accordance with ASME B36.10, IS:1239& IS:3589 for wrought steel and wrought iron pipe; to B36.10 / B36.19 for stainless steel pipe and respective ASTM Standard for non-ferrous and non- metallic pipes.

Pipe made by acid-bessemer process shall not be acceptable, steel pipe shall be made by open hearth, electric furnace or basic Oxygen process.

All pipe threads shall conform to ASME B1.20.1 except where otherwise noted.

Pipe thicknesses not covered in different classes of this specification shall be calculated to meet specific job requirement based on actual max. design condition to economise on thickness. However, in such cases the thickness shall be calculated at not less than 80% of class rating unless defined otherwise in the Job Engineering Design Basis(Piping).

Maximum of 10% of Corrosion Allowance may be adjusted to optimize on pipe schedule. However, if CA is suffixed by 'minimum', this downward adjustment shall not be used.

Non-standard pipe sizes 1¼", 2½", 3½", 5" and 22" shall not be treated as a part of this specification unless these sizes are separately called out.

## FLANGES

Flanges shall be in accordance with the following codes, except where otherwise noted:

Upto 24"(150# -1500#)	ASME B16.5
Upto 12",2500#	ASME B16.5
Above24"	ASME B16.47 SERIES 'B' / AWWA /STD.

Flanges to ASME B16.47 SERIES 'A' or any other standard (e.g. DIN, GOST, JIS etc.) may be specified to mate with equipment or valve flanges with the corresponding bolting.

Finish of steel flange faces shall be as follows:

Stock Finish	:	1000 µin AARH max.
Serrated Finish / 125AARH/	:	Serrations with 125-250µin AARH
Smooth finish	:	
63AARH	:	32 TO 63 µin AARH

Brinell hardness for RTJ groove shall be atleast 20 BHN more than that of corresponding gasket as specified.

Fig.8 Fl and SPCR & BLN shall be as per B16.48 upto 24" (150-1500#) & upto 12" for 2500#. For other sizes, refer Std.

#### FITTINGS

Forged steel SW and threaded fittings shall be in accordance with ASME B16.11, unless otherwise specified. For items not covered under B16.11, reference may be made to BS 3799 or appropriate MSS-SP-Std.

BW Fittings shall be in accordance with ASME B16.9, unless otherwise specified.

Dimensions of steel BW fittings for sizes not covered in ASME B16.9 shall conform to MSS-SP-48.

Usage of unions shall be restricted to utilities only.

H. Couplings & L.H. Couplings are not to be used instead Socklets & Elbowlets to be used respectively.

#### BENDS, MITRES AND REDUCERS FABRICATED FROM PIPE

Mitres and Reducers fabricated from Pipe may be used if specified in particular Piping Class. Mitres require higher thickness than corresponding Pipe / Elbow to hold the same pressure (Refer ASME B31.3).

#### GASKETS

Non-metallic gaskets shall conform to B16.21 (corresponding to B16.5) upto 24", and B16.21 (corresponding to B16.47B) beyond 24", unless otherwise specified.

Spiral wound gaskets (SP.WND or SPWD) and Ring Joint gaskets shall conform to B16.20.

#### BOLTING

All bolts shall conform to B18.2.1, nuts to be B18.2.2. Reference shall also be made to B16.5 for studs.

Threads shall be to coarse Thread Series, B1.1, having Class 2A allowances for bolts and studs, and Class 2B tolerance for nuts.

Nuts for Bolts and Studs shall be the American Standard Hexagon Heavy Series.

#### THREADS

Threads for threaded Pipes, Fittings, Flanges and Valves shall be in accordance with B1.20.1 taper threads, unless otherwise specified.

Upto 204 deg.C, threaded joints shall be made with 1" width PTFE joining tape.

Above 204 deg. C, threaded joints shall be seal welded with a full strength fillet weld.

All threaded joints irrespective of pressure and temperature on lines carrying toxic fluid shall be seal welded with a full strength fillet weld.

VALVES

Face to Face / End to End dimension of valves shall conform to B16.10 to the extent covered. For valves not covered in B16.10, reference shall be made to BS EN 558-1 for PN Designated Flanged valves, BS EN 558-2 for Class designated Flanged valves and BS EN 12627 for Butt Welding end valves and / or the manufacturer's drawings.

Flange / weld ends of the valve shall be as per the corresponding Flange / Fitting ends of the piping class, unless otherwise specified.

Pressure-temperature rating for flanged and butt welding end valves shall be as per ASME B16.34 except for ball, plug & butterfly valves. For these valves refer TABLE FOR PRESSURE-TEMP RATING FOR BALL, PLUG AND BUTTERFLY VALVES. Wall thickness of valve body at different locations should not be less than as calculated as per B16.34.

Unless called-out specifically, valves shall be as per the following Standards:

Valve	Size	Rating	Des. Std.	Testing Std.
Gate	1/2"- 1-1/2"	800 / 1500	API 602/ ISO 15761	API-598
Globe / Check	-do-	800 / 1500	BS EN ISO 15761	BS EN 12266-1
Gate	2"-24"	150 / 300 / 600	API 600/ ISO 10434	API-598
Gate	26"-42"	150 / 300	B-16.34	API 598/ BS EN 12266-1
Globe	2"-16"	150	BS-1873	BS 6755 Pt-I/ BS EN 12266-1
Globe	2"-12"	300/600	BS-1873	-do-
Check	2"-24"	-do-	BS-1868	-do-
Gate/ Globe/Check	2"-8"	900 / 1500 / 2500	B-16.34 (Refer 12.6 also)	API 598 / BS EN 12266-1
Ball	1/2"-16"	150 / 300 / 600	BS EN ISO 17292 / API 6D	BS EN 12266-1 / API-598
Ball	1/2"-8"	900/ 1500	API 6D	API-598
Plug	1/2"-12"	All	API-599 /BS 5353	API-598 / (BS 6755 Pt.I/ BS EN 12266-1)
Btrfly	3" & above	All	API-609 / BS EN 593 / AWWA C504	API-598 / BS EN 12266-1/ AWWA
Diaphragm	ALL	-	BS-5156	BS-6755 Pt-I/ BS EN 12266-1
Bronze			RELEVANT IS STD.	RELEVANT IS STD.
Cast Iron			RELEVANT IS STD.	RELEVANT IS STD.

If not covered in 12.3, the valve shall be as per B16.34 / relevant MSS-SP Standard.

- 12.7 Unless otherwise specifically called for, upto 600# rating, 2" and larger size steel Gate, Globe & Check valves in Hydrocarbon and utility service shall have bolted bonnets. Pressure-seal bonnets or covers shall be used for Classes 900# and above to minimize bonnet leakage. However, valves with Pr-seal Bonnet shall have wall thickness & stem diameter as per API-600, (if required). Welded bonnets or screwed & seal welded bonnets are acceptable for sizes lower than 2" for Classes 900# & above.
- 13.0 For Non-Destructive Testing (NDT) specification, refer std.B038-6-44-0016.

TABLE FOR MIDDLE NUMBER

Middle Number	Carbon Steel A	Alloy Steel B, C, D, E, F, G, H	SS304 / SS304H / SS304L K	SS 316 / 316H / 321 / 321H / 347 M
1	CA=1.5	CA=1.5	CA=NIL (SS304)	CA=NIL (SS316)
2	CA=1.5 (IBR)	CA=1.5 (IBR)	CA=NIL (SS304-CRYO)	CA=NIL (SS321-CRYO)
3	CA=1.5 (CAT'D)	CA=6.0	CA=NIL (CAT'D SS304)	CA=1.5 (SS321)
4	CA=1.5 (LTCS)	CA=3.0	CA=1.5 (SS304H)	CA=NIL (SS321)
5	CA=1.5 (Hydrogen)	CA=1.5 (Hydrogen)>230°C	CA=3.0 (SS304H)	CA=NIL (SS316H) – H <sub>2</sub>
6	CA=4.5	CA=4.5	CA=1.5 (SS304L)	CA=NIL (SS316H)
7	CA=1.5 (Vacuum)		CA=NIL (SS304L-Vacuum)	CA=NIL (SS347)
8	CA=1.5 (Conc. Sulphuric Acid)		CA=1.5 (SS304L-CRYO)	CA=1.5 (SS347)
9	CA=3.0		CA=1.5 (SS304)	CA=1.5 (SS316)
10	CA=1.5 (Offsites)			
11	CA=3.0 (Hardness controlled)		CA=NIL (SS304L)	
12			CA=NIL (SS304-IBR)	
13	CA=6.0			
14				
15	CA=3.0 (Liquid Sulphur)		CA=1.5 (SS304 H <sub>2</sub> & CO <sub>2</sub> )	CA=1.5 (SS321H - H <sub>2</sub> )
16	CA=4.5 (NACE)	CA=4.5 (NACE)	CA=1.5 (SS304L - NACE)	CA=1.5 (SS321 - NACE)
17	CA=3.0 (dry Chlorine)			
18	CA=1.5 (Oxygen)		CA=NIL (SS304L-Oxygen)	
19	CA=3.0 (Caustic / Amine, Stress relieved)			
20	CA=1.5 (Jacket for A15A)			
21	CA=1.5 (Sea Water,CS)			
32	CA=1.5 (Tracing)		CA=NIL (Tracing)	
33	CA=1.5 (Fire Water)			

NOTE: USE MIDDLE NUMBERS 21 TO 30 & 91 TO 99 FOR PROJECT DEPENDENT CLASSES.

Middle Number	SS316L N	NICKEL /TITANUM J	ALLUMINIUM L	MONEL / ALLOY 20 P
1	CA=NIL	CA=NIL (NICKEL)		CA=NIL (MONEL)
2	CA=1.5 (CRYO)	CA=1.5 (NICKEL)		CA=1.5 (MONEL)
3		CA=NIL (TITANUM)		CA=NIL(ALLOY 20)
4		CA=1.5 (TITANUM)		CA=1.5 (ALLOY 20)
5	CA=1.5 H <sub>2</sub>			
6	CA=NIL (Vacuum)			
7				
8				
9				
10				
11			CA=NIL	
12				
13				
14				
15				
16	CA=1.5(NACE)			
17				
18				CA=NIL (MONEL) OXYGEN
19				
20				
32				
33				

NOTE: USE MIDDLE NUMBERS 21 TO 30 & 91 TO 99 FOR PROJECT DEPENDENT CLASSES.

TABLE FOR MIDDLE NUMBER

Middle Number	Hastelloy / Inconel / Incoloy Q	PVC / FRP S	LINED STEEL Y	HDPE / PVDF / TEFLON Z
1	CA=NIL (INCONEL 600)	CA=NIL (PVC)	CA = NIL (TEF LINED)	CA=NIL (HDPE) H <sub>2</sub> SO <sub>4</sub>
2		CA=1.5 (PVC / FRP)		
3	CA = NIL (INCOLOY 800)	CA=NIL (FRP)	CA = NIL (RUBBER LINED - SOFT)	
4	CA = 1.5 (INCOLOY 800)		CA = NIL (RUBBER LINED - SEMI HARD) 30% HCL	CA = NIL (HDPE) 30% HCL
5			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) CAT 'D' SEA WATER	CA = NIL (HDPE) 50% HF
6	CA = 1.5 (INCOLOY 800H)			
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
32				
33			CA = 3.0 (<= 2") & NIL (>= 3") (CEMENT LINED) FIRE WATER (SEA)	

NOTE: USE MIDDLE NUMBERS 21 TO 30 & 91 TO 99 FOR PROJECT DEPENDENT CLASSES.

TABLE FOR PRESSURE TEMPERATURE RATING FOR BALL, PLUG & BUTTERFLY VALVES

ITEM	PRESSURE RATING (PIPING CLASS)	SIZE RANGE (NB INCHES)	PRESSURE IN kg / cm <sup>2</sup>									
			TEMPERATURE IN °C									
			-29 TO 38	50	65	100	120	150	175	200	>200	
BALL (Soft Seated)	150# (AS PER PMS)	Upto 16"	19.99	19.58	19.2	17.93	17.2	16.12	15.22	7.03	DO NOT USE	
	300# (AS PER PMS)		52.00	51.02	49.8	41.85	37.3	27.4	19.15	7.03		
	600# (AS PER PMS)		104.1	98.46	91.4	64.61	49.3	38.6	29.68	17.6		
PLUG (Soft Seated)	150# (AS PER PMS)	Upto 8"	19.33	19.3	18.63	17.6	16.89	15.82	14.93	14.06		
	300# (AS PER PMS)		52.02	50.35	48.26	43.4	40.0	37.4	35.23	28.1		
PLUG (Lubricated)	150# (AS PER PMS)	Upto 12"	19.99	19.58	19.12	18.05	17.28	16.12	15.15	14.28		
	300# (AS PER PMS)		52.0	51.1	49.96	47.3	46.82	46.1	45.5	44.6		
	600# (AS PER PMS)		104.1	102.2	99.95	94.7	93.74	92.3	91.1	89.4		
Butterfly (Soft Seat)	150# (A3A, A5Y)	Upto 48"	10.55	10.55	10.55	DON'T USE						
	150# (A33A, A33Y)		16	16	16							
	150#		19.99	19.58	19.2	17.93	17.20	16.12	15.22	7.03		

NOTE: IF THE CLASS PRESSURE / TEMPERATURE IS LOWER THAN THIS TABLE, CLASS PRESSURE / TEMPERATURE TO BE FOLLOWED.

[illegible]