SL. NO.	Section / Part / Subsection	Page No.	Clause No.	Bid Specification	Bidder's Query	Purchaser's Reply Dtd: 02.02.2021
1	P&ID	--	Annexure-1	Inlet & Outlet Line Size Shown across Scrubber is 3"	Please confirm that bidder has to follow line size shown in P&ID only.	Inlet and Outlet line size is 8"
2	P&ID	--	Annexure-1	Outlet Line Size Shown after Filter is 8"	Please confirm velocity limitation considered for line sizing.	Line velocity shall be limited to 20 m/s(Max.)
3	P&ID	--	Annexure-1	P&ID Note 1.8: Downstream of filter separator skid is of stainless steel	As per P&ID we understand that bidder has to provide Carbon Steel MOC after filter separator skid, please confirm our understanding is correct.	Bidder's understanding is correct.
4	P&ID	--	Annexure-1	P&ID Drain: 	As per P&ID we understand that bidder has to provide 2 Nos of Gate Valve kindly confirm our understanding is correct.	Bidder's understanding is correct.
5	P&ID	--	Annexure-1	PG Root Isolation Valve	As per P&ID size of root isolation valve not shown in P&ID, please confirm bidder has to provide Ball Valve root isolation as per PG connection size i.e 1/2"X800# SW type.	Hook-up for instrumentation shall be as per Annexure-7(Instrument Datasheet, Hook-Up, Control Valve and ON/OFF Valve Inputs)
6	P&ID	--	Annexure-1	DPG & DPT	As per P&ID we understand that bidder has to provide DPT & DPG as per P&ID ONLY & No DPT & DPG required fro Filter #2, confirm our understanding is correct.	Bidder's understanding is correct.
7	P&ID	--	Annexure-20	Annexure 20: Technical Details of Scrubber cum Filter Separator (Ramgarh Project) -1 No. of Scrubber(1X100%) cum filter separator(2X100%) skid is issued to successful bidder.	Please remove existing skid scope from this tender as it is very difficult to re use existing skid components/equipment's. Kindly issue revised SOR & Scope.	Bidder to follow tender specification requirement.
8	P&ID	--	Annexure-1	LT Process Connection : 3"X600#	Based on Pressure Class shown in P&ID we understand that bidder has to considered 3"X300# rating process connection for LT	Bidder's understanding is correct.
9	P&ID	--	Annexure-1	LG Process Connection : 2"X600#	Based on Pressure Class shown in P&ID we understand that bidder has to considered 2"X300# rating process connection for LG	Process connect shall be 1", 300#.
10	P&ID	--	Annexure-1	Outlet Line of PSV	For Outlet line of PSV we understand that bidder has to follow 150# . Please confirm applicable PMS i.e A1A (Carbon Steel150#)	PMS shall be 150#, carbon steel. The applicable PMS shall be 11A. The same is enclosed with these clarifications. This PMS(Annexure-3A) shall be considered instead of PMS(Annexure-3) issued earlier with Enquiry.
11	P&ID	--	Annexure-1	Air line & N2 Line	Please confirm PMS for Air & N2 line shown in P&ID.	Following PMS to be followed: 1) Instrument Air - Stainless Steel(SS304) 2) N2 - 11D (Refer PMS enclosed with these clarifications)
12	Technical Specification	--	Annexure-1	Natural Gas B/L Condition: Pressure, kg/cm2g:- Min – 40.0, Normal- 45.0	Please confirm that bidder has to follow process parameter given in P&ID only & may ignore B/L pressure condition.	Inlet parameters shall be as per Annexure-1(P&ID for Natural Gas Conditioning Skid). Inlet parameters are indicated at the inlet of scrubber cum filter separator skid.
13	Datasheet LT & DPT	--	Annexure-7	FRP canopy: Not Applicable	Please confirm that FRP Canopy not required for LT & DPT.	FRP to be provided as per Cl. NO. 3.2.17 of PY 51702.
14	Datasheet	--	Annexure-3	Ball Valve	Kindly confirm ball valve 2” & below shall be Floating type irrespective of rating (i.e. 150#,300#,800#)	Noted and confirm.
15	Datasheet	--	Annexure-3	Ball Valve	Kindly confirm 8”x300# ball valve shall be Lever or gear operated	Valve size ≥ 6" shall be gear operated. For other detail of ball valves, refer 6-71-0014(Standard Specification for Pipeline Ball Valves) enclosed with these clarifications.
16	Datasheet	--	Annexure-7	Pressure Gauge - Diaphragm Seal (PGD)	Please confirm Diaphragm Seal PG is not applicable for this tender.	Bidder to follow Annexure-7(Instrument Datasheet, Hook-Up, Control Valve and ON/OFF Valve Inputs). Pressure Gauge Diaphragm Seal is applicable for PGs mounted on vessels
17	P&ID	--	Annexure-1	Note 2.2 LT Shall be Contact Radar Type	As per Datasheet we understand that bidder has to provide Guided Wave Radar Type LT. Please confirm our understanding is correct.	Bidder's understanding is correct.

SL. NO.	Section / Part / Subsection	Page No.	Clause No.	Bid Specification	Bidder's Query	Purchaser's Reply Dtd: 02.02.2021
18	HOOK UP DWG	--	Annexure-7	PG	As per hook up drawing we understand that bidder has to provide valve 2 way manifold which is not shown in P&ID.	Bidder to follow Annexure-7(Instrument Datasheet, Hook-Up, Control Valve and ON/OFF Valve Inputs) for hook-up details.
19	HOOK UP DWG	--	Annexure-7	DPG & DPT	As per hook up drawing we understand that bidder has to provide valve 5 way manifold which is not shown in P&ID.	Bidder to follow Annexure-7(Instrument Datasheet, Hook-Up, Control Valve and ON/OFF Valve Inputs) for hook-up details.
20	SSC			CONTRACT PERFORMANCE BANK GUARANTEE: Ten percept (10%) of Supply order value and CPBG validity shall be till completion of the supply.	As per current Government Norm CPBG critera revised to 3% of supply order value, please confirm.	BHEL is issuing Skid to L1 Bidder as per the bid specification and hence CPBG of 15% is applicable for this project.
21	SSC			PERFORMANCE BANK GUARANTEE: Five percept (5%) of Supply order value		PBG of 5% is the requirement specific to this project.
22	Bid Due Date			Last Submission Date: 01/02/2021	We required some time to prepare bid as per your query reply thus requesting you extend bid due date by 2 week after receipt of pre-bid query reply.	Bid due date extended up to 08th Feb'2021. There will be no further extension.
23	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Month and year shipped from manufacturing :	Skid was stored and preserved as per the OEM recommended procedures. The skid was received by BHEL in Dec'2020.
24	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Was it shipped with Nitrogen charged ?.	Skid is properly packed and shipped from vendor works to BHEL Factory.
25	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Does it currently remain charged with Nitrogen ?	Skid was purged with nitrogen after hydrotest, properly preserved and the same is shipped from vendor works to BHEL factory.
26	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Is it stored in Original Packing ?	Yes, the skid is stored with packing. However, bidder shall visit to BHEL factory, Ramachandrapuram, Hyderabad to ascertain the condition of skid in all aspects.
27	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Is it stored under the shade ?	Yes, the skid is stored under the shade. However, bidder shall visit to BHEL factory, Ramachandrapuram, Hyderabad to ascertain the condition of skid in all aspects.
28	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	What was the specified shelf life by the OEM ?	Operational life of skid is 25 years. However, bidder shall visit to BHEL factory, Ramachandrapuram, Hyderabad to ascertain the condition of skid in all aspects.
29	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Does previous supplier (OEM) warranty remain valid for entire skid ?	Skid is not under warranty.
30	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	Please provide dimension L x W x H with Weight and current colour photograph from at least 2 directions.	Refer Annexure-20 for details of dimensions of skid and weight. Bidder shall visit to BHEL factory, Ramachandrapuram, Hyderabad to ascertain the condition of skid in all aspects.
31	SCOPE OF SUPPLY	Pg 07 of 50	3.1	–	BOQ Sheet (Ms-Excel) file for scrubber-cum filter separators not found. Please provide the same.	Refer Annexure-20 for BoQ of skid. BoQ of skid is indicated in table of the GA drawings.
Additional Clarifications						
1	Sub-Vendor List	--	Annexure-16	--	--	Sub-Vendor List(Annexure-16A) is enclosed. This list is in additional to Annexure-16 enclosed with tender specification.

A. Notes: During Preparation of Pre-Bid Queries, Complete Tender Specification Doc. No. PY-51702 (along with all Annexures) shall also be referred.

B. Enclosures:

1 Annexure-3A : Piping Material Specification
2 Annexure B: Standard Specification for Pipeline Ball Valves, Doc. No. 6-71-0014.
3 Annexure-16A : Sub-Vendor list

C. Abbreviations: Purchaser- BHEL; Bidder – Skid Supplier

Annexure-3A : Piping Material Specification

PIPING MATERIAL SPECIFICATION

Project :	**IOCL PARADIP FUEL CONVERSION PROJECT FOR 3XFr.9E GTGs**
Customer :	**M/s. INDIAN OIL CORPORATION LIMITED (IOCL)**

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PIPING MATERIAL SPECIFICATION INDEX

Sl. No.	Piping class	Design pressure Kg/Cm2 (g)	Design Temperature Deg C	Rating	Basic Material	Service
1.	11A	12.5	114	150	Carbon steel	Steam heater drain line Fuel line drain & vent
2.	11C	7	240	150	Carbon steel	LP steam from battery limit
3.	11D	10.5	65	150	Carbon Steel	Nitrogen distribution line
4.	11E	10.5	65	150	Carbon Steel (Galvanized)	Instrument air distribution lines
5.	21A	35.1	80	300	Carbon Steel	Fuel gas line
6.	22A	35.1	80	300	Stainless Steel	Fuel gas line
7.	31A	50	240	600	Carbon steel	Fuel gas line

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11A

Customer:	IOCL Paradip Fuel Conversion
ANSI CLASS:	150 #
MATERIAL:	CS (A106 Gr. B)
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	100	114											
PRESS.	12.5	12.5	12.5	12.5											

SERVICE

HEATER DRAIN CONDENSATE LINES, FUEL GAS DRAIN & VENT LINES

(DO NOT USE THIS PMS BEYOND 12.5 KG/CM^{2}G AND 114° C.)

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1½" AND BELOW	SW COUPLING (REF NOTE-5)
	2" AND ABOVE	BUTT WELDED
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

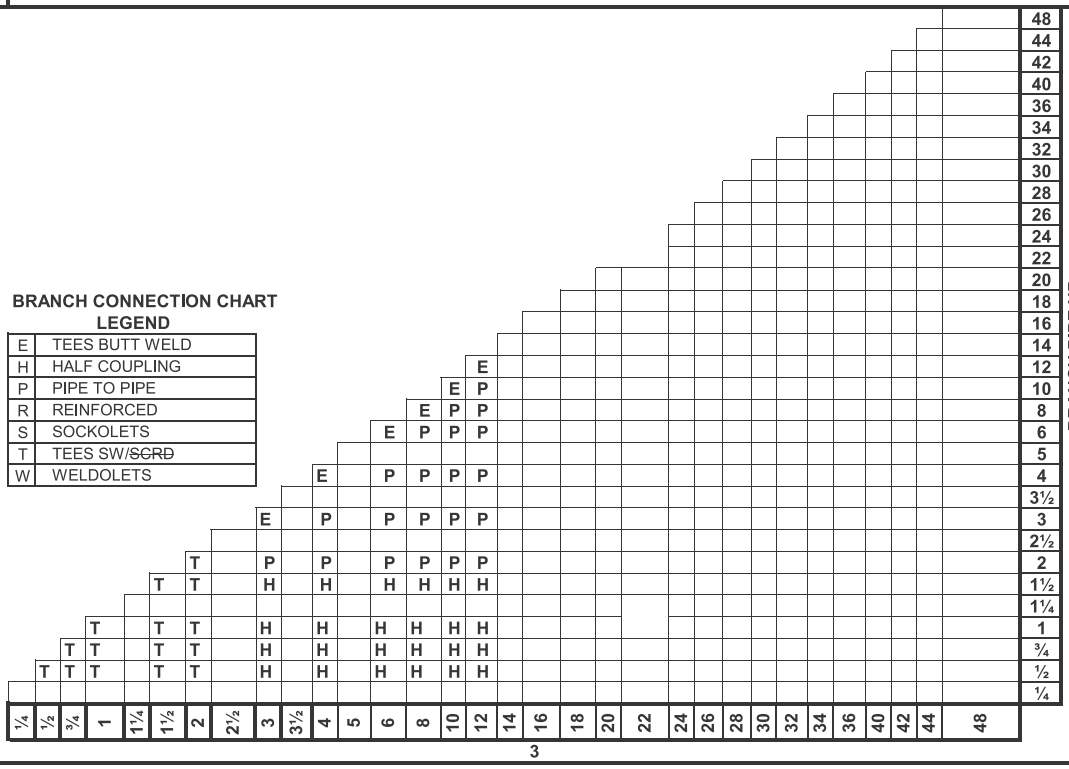
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. BLANK.
3. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. NPT CONNECTIONS ARE PERMITTED IN THERMAL RELIEF VALVES ONLY.
6. WELDED PIPE SHALL HAVE ONLY LONGITUDINAL WELD MADE BY EMPLOYING AUTOMATIC WELDING.
7. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
8. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11A

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	150 #
MATERIAL:	CS (A106 Gr. B)
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	S 80		B 36.10	A106 GRB			
	SEAMLESS	BE	3	8	S 40		B 36.10	A106 GRB			
	SEAMLESS	BE	10	12	S 30		B 36.10	A106 GRB			
FLANGES	SOCKET WELDED	RF	½	1½	150	125AARH	B 16.5	ASTM A 105			
	WELD NECK	RF	2	12	150	125AARH	B 16.5	ASTM A 105			
	BLIND	RF	½	12	150	125AARH	B 16.5	ASTM A 105			
	FIGURE 8 BLANK	RF	½	8	150	125AARH	B 16.5	ASTM A 105			
	SPACER & BLIND	RF	10	12	150	125 AARH	B 16.5	ASTM A 105			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 90 DEG	BW	2	12	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		7	
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 45 DEG	BW	2	12	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		7	
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 105			
	EQ. TEE	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 105			
	CON. RDCR	BW	2	12	M,M		B 16.9	ASTM A 234 GR WPB		7	
	CAP	SW	½	1½	3000		B 16.11	ASTM A 105			
	CAP	BW	2	12	M		B 16.9	ASTM A 234 GR WPB		7	
	HALF CPLG	SW	½	¾	3000		B 16.11	ASTM A 105			
	HALF CPLG	SW	1	1½	3000		B 16.11	ASTM A 105			
	FULL CPLG	SW	½	¾	3000		B 16.11	ASTM A 105			
	FULL CPLG	SW	1	1½	3000		B 16.11	ASTM A 105			
	REDUCED CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	NIPPLE	SW /NPT	½	¾	S 80		B 16.11	A106 GRB		5	
	NIPPLE	SW /NPT	1	1½	S 80		B 16.11	A106 GRB		5	
	NIPPLE	NPT/NPT	½	¾	S 80		B 16.11	A106 GRB		5	
	NIPPLE	NPT/NPT	1	1½	S 80		B 16.11	A106 GRB		5	
VALVES	GATE	SW	½	2	800		API 602	B:A 105; T:13% Cr;St			
	GATE	BW	3	12	150		API 600	B:A 216 GR. WCB; T:13% Cr			
	GLOBE	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	GLOBE	BW	3	12	150		BS 1873	B:A 216 GR. WCB; T:13% Cr			
	Reg GLOBE VLV	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	Reg GLOBE VLV	BW	3	12	150		BS 1873	B:A 216 GR. WCB; T:13% Cr			
	CHECK (PISTON LIFT)	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	CHECK	BW	3	12	150		BS 1868	B:A 216 GR. WCB; T:13% Cr			
	B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED										
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	GASKET		½	3	150		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
	GASKET		4	12	150		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
MISC	STEAM TRAP	SW	½	2	800	THERMODYNAMIC	MFG. STANDARD	B:A 105; INT: SS 304			
	BALL FLOAT ST. TRAP	BW	2	2	150	BALL FLOAT	MFG. STANDARD	B: A 216 WCB; INT: SS 304			
	Y-TYPE STRAINER	SW	½	2	800		MFG. STANDARD	B: A 105; INT: SS 304			
	T-TYPE STRAINER	BW	2	2	150		MFG. STANDARD	B: A 216 WCB; INT: SS 304			
	Y-TYPE STRAINER	FL	3	12	150		MFG. STANDARD	B: A 216 WCB; INT: SS 304			

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11C

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	# 150 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	100	150	200	240									
PRESS.	7.00	7.00	7.00	7.00	7.00	7.00									

SERVICE

LP STEAM SUPPLY FROM BATTERY LIMIT TO STEAM HEATERS **(DO NOT USE THIS PMS BEYOND 7 KG/CM2G AND 240˚ C.)**

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1 1/2" AND BELOW	SW COUPLING (REF NOTE-2)
	2" & ABOVE	BUTT WELDED AS PER ANSI B16.25
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

NOTES

1. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
2. NPT CONNECTIONS ARE PERMITTED IN THERMAL RELIEF VALVES ONLY.
3. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.
4. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
5. NDT REQUIREMENTS AS PER BHEL STD. DOC. NO. GT 57124
6. ALL PIPES, FITTINGS, VALVES, FLANGES STRAINERS,ETC SHALL BE TESTED & TEST CERTIFICATES IN FORM IIIA FOR PIPES & FORM IIIC FOR OTHERS SHALL BE REQUIRED DULY COUNTER SIGNED BY IBR AUTHORITY OR THEIR APPROVED REPRESENTATIVE.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS

BRANCH PIPE NB	¼	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	22	24	26	30	32	34	36	40	42	44	48
48																														
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2							E		R		R		R																	
1½						T	H		H		H		H																	
1¼																														
1				T		T	H		H		H		H																	
¾			T	T		T	H		H		H		H																	
½		T	T	T		T	H		H		H		H																	
¼																														

RUN PIPE NB

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11C

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	# 150 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BASIC MATERIAL CARBON STEEL BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	S 80		B 36.10	A106 GRB			
	SEAMLESS	BE	3	6	S 40		B 36.10	A106 GRB			
FLANGES	SOCKET WELDED	RF	½	1½	150	125AARH	B 16.5	ASTM A 105			
	WELD NECK	RF	2	6	150	125AARH	B 16.5	ASTM A 105			
	BLIND	RF	½	6	150	125AARH	B 16.5	ASTM A 105			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 90 DEG	BW	2	6	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		1	
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 45 DEG	BW	2	6	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		1	
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 105			
	EQ. TEE	BW	2	6	M		B 16.9	ASTM A 234 GR WPB		1	
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 105			
	CON. RDCR	BW	2	6	M,M		B 16.9	ASTM A 234 GR WPB		1	
	CAP	SW	½	1½	3000		B 16.11	ASTM A 105			
	CAP	BW	2	6	M		B 16.9	ASTM A 234 GR WPB		1	
	HALF CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	REDUCED CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	NIPPLE	SW /NPT	½	1½	S 80		B 16.11	A106 GRB		2	
	NIPPLE	NPT/NPT	½	1½	S 80		B 16.11	A106 GRB		2	
VALVES	GATE	SW	½	2	800		API 602	B: A 105;			
	GATE	BW	3	6	150		API 600	B: A 216 GR. WCB;			
	GLOBE	SW	½	2	800		BS 5352	B: A 105;			
	GLOBE	BW	3	6	150		BS 1873	B: A 216 GR. WCB;			
	Reg GLOBE VLV	SW	½	2	800		BS 5352	B: A 105;			
	Reg GLOBE VLV	BW	3	6	150		BS 1873	B: A 216 GR. WCB;			
	CHECK (PISTON LIFT)	SW	½	1½	800		BS 5352	B: A 105;			
	CHECK (PISTON LIFT)	BW	2	2	150		BS 1868	B: A 216 GR. WCB;			
	CHECK	BW	3	6	150		BS 1868	B: A 216 GR. WCB;			
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/18.2.2	A 193 GR B7/ A194 2H			
	STUD + 2NUTS		M30	M70			B 18.2.1/18.2.2	A 193 GR B7/ A194 2H			
	GASKET		½	3	150		B 16.20	MSW (SS316)+ GRAPHITE FILLER		3	
	GASKET		4	6	150		B 16.20	MSW (SS316)+ GRAPHITE FILLER		3	
MISC	STEAM TRAP	SW	½	1½	800	THERMODYNAMIC	MFG. STD.	A 105;			
	Y-TYPE STRAINER	SW	½	1½	800		MFG. STD.	B: A 105;			
	Y-TYPE STRAINER	FL	2	6	150		MFG.STD	B: A 216 WCB;			

B: BODY; INT: INTERNALS; T:TRIM; St:STELLITED

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11D

Customer:	IOCL Paradip Fuel Conversion
ANSI CLASS:	150 #
MATERIAL:	CS (IS:1239)
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	65												
PRESS.	10.5	10.5	10.5												

SERVICE

NITROGEN DISTRIBUTION LINE

(DO NOT USE THIS PMS BEYOND 10.5 KG/CM^{2}G AND 65° C.)

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1½" AND BELOW	SW COUPLING
	2" AND ABOVE	BUTT WELDED
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

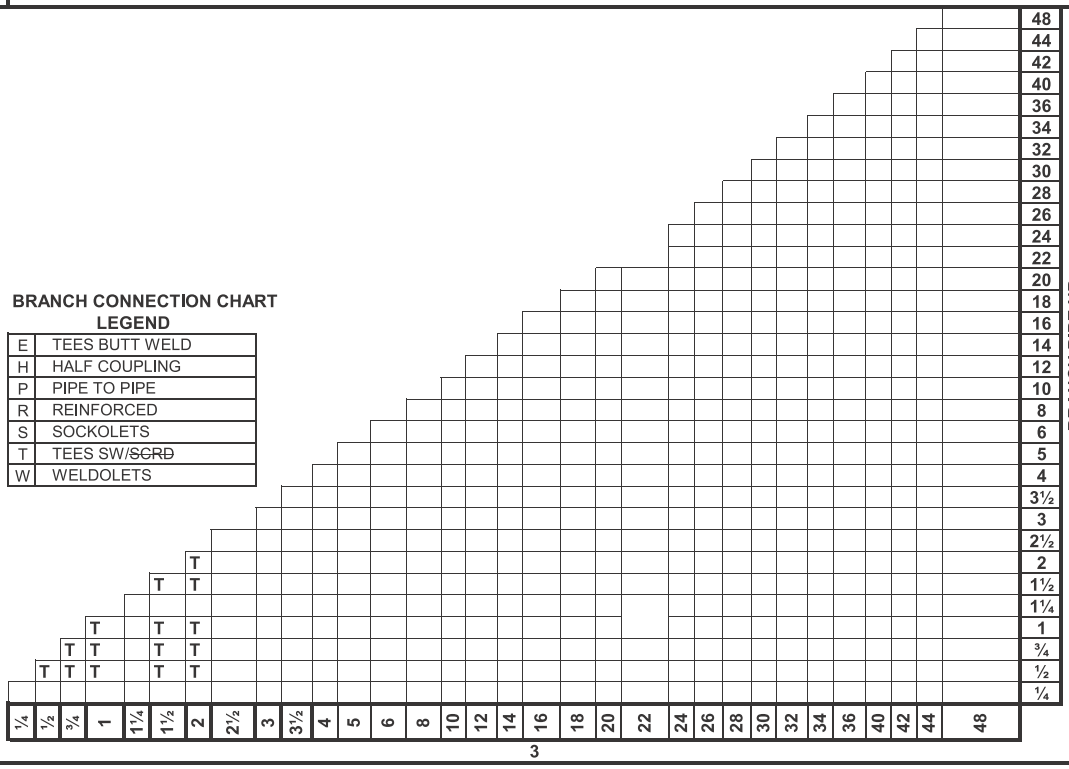
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. BLANK.
3. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
6. WELDED PIPE SHALL HAVE ONLY LONGITUDINAL WELD MADE BY EMPLOYING AUTOMATIC WELDING.
7. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11D

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	150 #
MATERIAL:	CS (IS:1239)
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BASIC MATERIAL CARBON STEEL BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	HVY		B 36.10	IS 1239 PART 1			
FLANGES	SOCKET WELDED	SORF	½	1½	150	125AARH	B 16.5	ASTM A 105			
	WELD NECK	SORF	2	12	150	125AARH	B 16.5	ASTM A 105			
	BLIND	RF	½	12	150	125AARH	B 16.5	ASTM A 105			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 90 DEG	BW	2	2	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		7	
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 45 DEG	BW	2	2	M	R=1.5D	B 16.9	ASTM A 234 GR WPB		7	
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 105			
	EQ. TEE	BW	2	2	M		B 16.9	ASTM A 234 GR WPB			
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 105			
	CON. RDCR	BW	2	2	M,M		B 16.9	ASTM A 234 GR WPB		7	
	CAP	SW	½	1½	3000		B 16.11	ASTM A 105			
	CAP	BW	2	2	M		B 16.9	ASTM A 234 GR WPB		7	
	HALF CPLG	SW	½	¾	3000		B 16.11	ASTM A 105			
	HALF CPLG	SW	1	1½	3000		B 16.11	ASTM A 105			
	FULL CPLG	SW	½	¾	3000		B 16.11	ASTM A 105			
	FULL CPLG	SW	1	1½	3000		B 16.11	ASTM A 105			
VALVES	GATE	SW	½	2	800		API 602	B:A 105; T:13% Cr;St			
	GLOBE	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	Reg GLOBE VLV	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	CHECK (PISTON LIFT)	SW	½	2	800		BS 5352	B:A 105; T:13% Cr;St			
	B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED										
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	GASKET		½	2	150		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
MISC	Y-TYPE STRAINER	SW	½	2	800		MFG. STANDARD	B: A 105; INT: SS 304			

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11E

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	150 #
MATERIAL:	CS (IS:1239 GALVANIZED)
CORR.ALL.	0.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	65												
PRESS.	10.5	10.5	10.5												

SERVICE

INSTRUMENT AIR DISTRIBUTION LINE

(DO NOT USE THIS PMS BEYOND 10.5 KG/CM^{2}G AND 65° C.)

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	ALL	SCREWED COUPLING (REF NOTE-5)
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

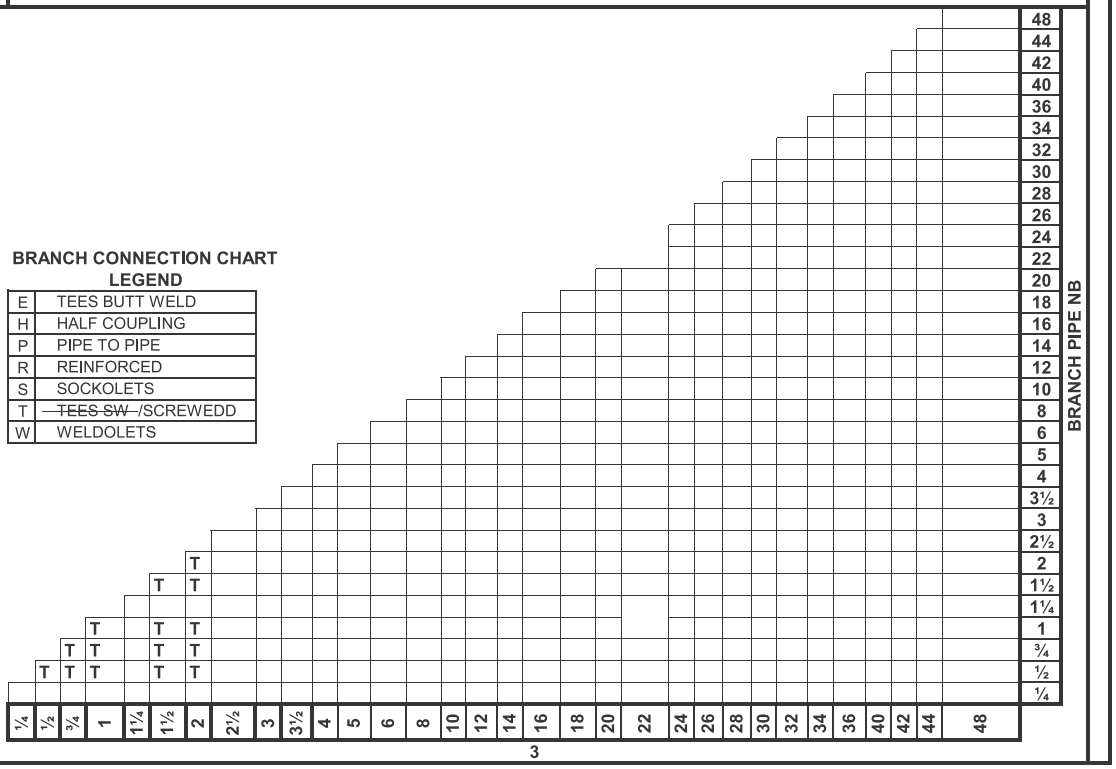
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. THREADED JOINTS SHALL BE MADE WITH 1" WIDE PTFE TAPE.
3. SURFACE, WHERE GALVANIZED COATING HAS BEEN BURNT OFF, SHALL BE WIRE BRUSHED AND COLD GALVANIZED WITH ZINC COATING COMPOUND.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. NO FIELD TEST REQUIRED FOR INSTRUMENT AIR SERVICE.
6. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
7. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	~~TEES SW~~/SCREWEDD
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

11E

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	150 #
MATERIAL:	CS (IS:1239 GALVANIZED)
CORR.ALL.	0.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	HVY		B 36.10	IS 1239 PART 1 (GALV)			
FLANGES	SCREWED	RF	½	2	150	125AARH	B 16.5	ASTM A 105 (GALV.)			
	BLIND	RF	½	2	150	125AARH	B 16.5	ASTM A 105 (GALV.)			
FITTINGS	ELBOWS 90 DEG	NPT-F	½	2	3000		B 16.11	ASTM A 105 (GALV.)			
	ELBOWS 45 DEG	NPT-F	½	2	3000		B 16.11	ASTM A 105 (GALV.)			
	EQ. TEE	NPT-F	½	2	3000		B 16.11	ASTM A 105 (GALV.)			
	CON. RDCR	NPT-F	½	2	3000		B 16.11	ASTM A 105 (GALV.)			
	CAP	NPT-F	½	2	3000		B 16.11	ASTM A 105 (GALV.)			
	HALF CPLG	SW	½	¾	3000		B 16.11	ASTM A 105 (GALV.)			
	HALF CPLG	SW	1	1½	3000		B 16.11	ASTM A 105 (GALV.)			
	FULL CPLG	SW	½	¾	3000		B 16.11	ASTM A 105 (GALV.)			
	FULL CPLG	SW	1	1½	3000		B 16.11	ASTM A 105 (GALV.)			
	REDUCED CPLG	NPT-M	½	1½	3000		B 16.11	ASTM A 105 (GALV.)			
	NIPPLE	NPT-M	½	¾	HVY		B 16.11	A106 GRB (GALV.)		5	
	NIPPLE	NPT-M	1	1½	HVY		B 16.11	A106 GRB (GALV.)		5	
	HEX HEAD PLUG	NPT-M	½	2	3000		B 16.11	ASTM A 105 (GALV.)		5	
VALVES	GATE	NPT-F	½	2	800		API 602	B:A 105 (GALV); T:13% Cr;St			
	GLOBE	NPT-F	½	2	800		BS 5352	B:A 105 (GALV); T:13% Cr;St			
	B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED										
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H (GALV.)			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H (GALV.)			
	GASKET		½	2	150		B 16.20	NAB MSW (SS304)+ GRAPHITE		7	
MISC	Y-TYPE STRAINER	SW	½	2	800		MFG. STANDARD	B: A 105 (GALV); INT: SS 304			

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

21A

Customer:	IOCL Paradip Fuel Conversion
ANSI CLASS:	# 300 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	60	80												
PRESS.	50.0	50.0	50.0	35.1												

SERVICE

NATURAL GAS SERVICE **(DO NOT USE THIS PMS BEYOND 50 KG/CM^{2}G & 60° C. OR 35.1 KG/CM2G & 80° C)**

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1½" AND BELOW	SW COUPLING (REF NOTE-5)
	2" AND ABOVE	BUTT WELDED
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

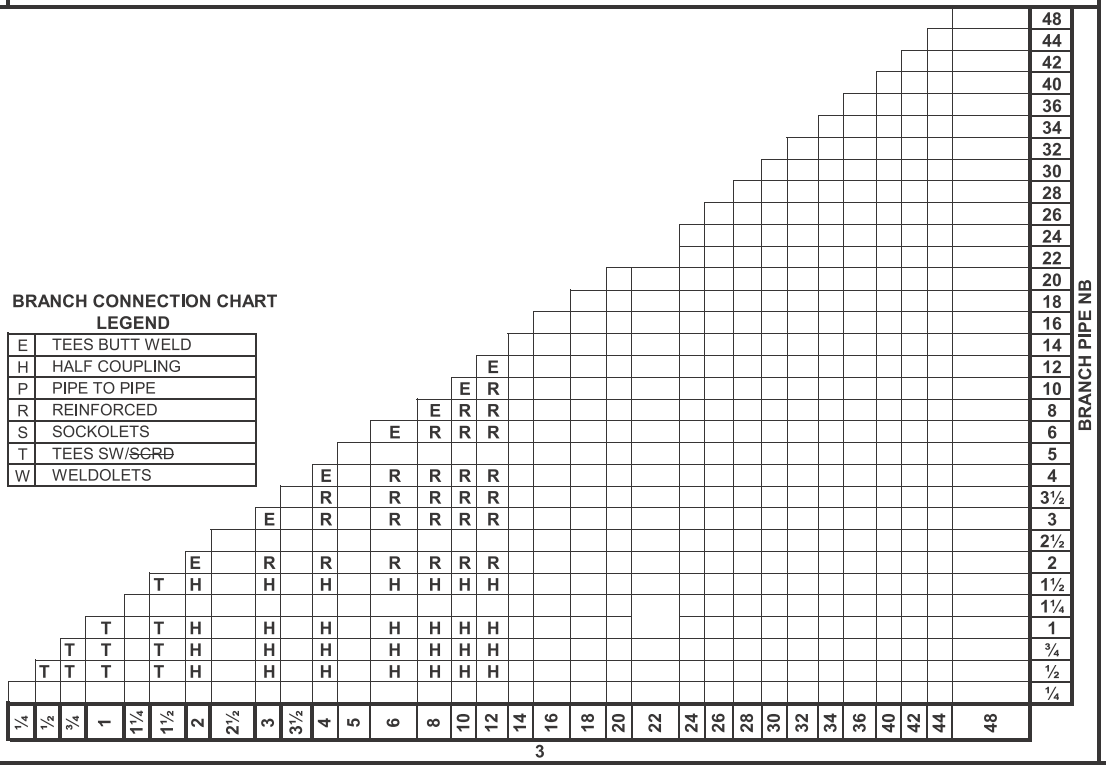
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. BLANK.
3. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. NPT CONNECTIONS ARE PERMITTED IN THERMAL RELIEF VALVES ONLY.
6. WELDED PIPE SHALL HAVE ONLY LONGITUDINAL WELD MADE BY EMPLOYING AUTOMATIC WELDING.
7. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
8. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

21A

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	# 300 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BASIC MATERIAL CARBON STEEL BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	S 80		B 36.10	A106 GRB			
	SEAMLESS	BE	3	8	S 40		B 36.10	A106 GRB			
	SEAMLESS	BE	10	10	S 30		B 36.10	A106 GRB			
	SEAMLESS	BE	12	12	S STD		B 36.10	A106 GRB			
FLANGES	SOCKET WELDED	RF	½	1½	300	125AARH	B 16.5	ASTM A 105			
	WELD NECK	RF	2	12	300	125AARH	B 16.5	ASTM A 105			
	BLIND	RF	½	12	300	125AARH	B 16.5	ASTM A 105			
	FIGURE 8 BLANK	RF	½	8	300	125AARH	B 16.5	ASTM A 105			
	SPACER & BLIND	RF	10	12	300	125AARH	B 16.5	ASTM A 105			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 90 DEG	BW	2	12	M	R= 1.5D	B 16.9	ASTM A 234 GR WPB			
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 45 DEG	BW	2	12	M	R= 1.5D	B 16.9	ASTM A 234 GR WPB			
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 105			
	EQ. TEE	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 105			
	CON. RDCR	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	CAP	SW	½	1½	3000		B 16.11	ASTM A 105			
	CAP	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	HALF CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	REDUCED CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	NIPPLE	SW /NPT	½	1½	S 80		B 16.11	A106 GRB		5	
	NIPPLE	NPT/NPT	½	1½	S 80		B 16.11	A106 GRB		5	
VALVES	GATE	SW	½	1½	800		API 602	B:A 105; T:13% Cr;St			
	GATE	FL	2	12	300		API 600	B:A216 Gr WCB; T:13% Cr;St			
	GLOBE	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	GLOBE	FL	2	12	300		BS 1873	B:A216 Gr WCB; T:13% Cr;St			
	Reg GLOBE VLV	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	Reg GLOBE VLV	FL	2	12	300		BS 1873	B:A216 Gr WCB; T:13% Cr;St			
	CHECK (PISTON LIFT)	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	CHECK	FL	2	12	300		BS 1868	B:A216 Gr WCB; T:13% Cr;St			
	B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED										
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	GASKET		½	2	300		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
	GASKET		3	12	300		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
MISC	STEAM TRAP	RF	½	1½	300	THERMO DYNAMIC	MNF. STD.	A 105			
	Y-TYPE STRAINER	SW	½	1½	800		B 16.11	B: A 105; INT: SS 304			
	Y-TYPE STRAINER	FL	2	12	300		B 16.9	B 216 GR WCB			

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

22A

Customer:	IOCL Paradip Fuel Conversion
ANSI CLASS:	# 300 (De-rated)
MATERIAL:	STAINLESS STEEL
CORR.ALL.	0.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	80												
PRESS.	35.1	35.1	35.1												

SERVICE

NATURAL GAS SERVICE **(DO NOT USE THIS PMS BEYOND 35.1 KG/CM^{2}G & 80° C)**

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1½" AND BELOW	SW COUPLING (REF NOTE-5)
	2" AND ABOVE	BUTT WELDED
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

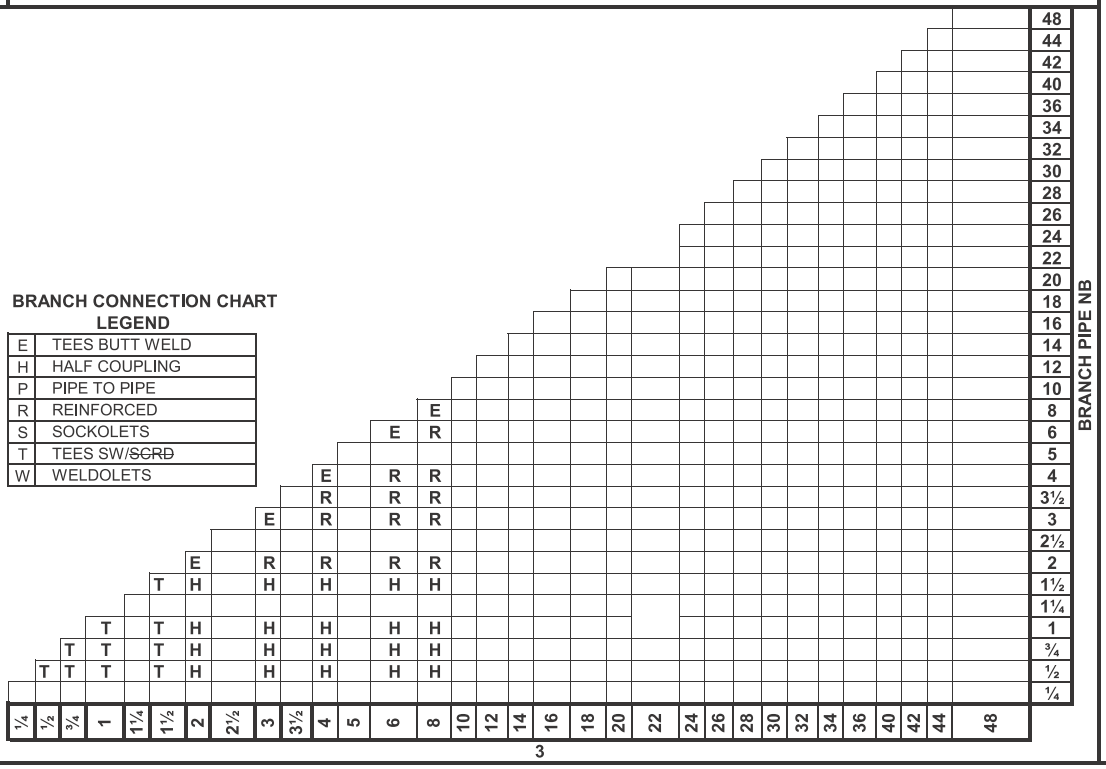
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. BLANK.
3. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. NPT CONNECTIONS ARE PERMITTED IN THERMAL RELIEF VALVES ONLY.
6. WELDED PIPE SHALL HAVE ONLY LONGITUDINAL WELD MADE BY EMPLOYING AUTOMATIC WELDING.
7. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
8. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

22A

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	# 300 (De-rated)
MATERIAL:	STAINLESS STEEL
CORR.ALL.	0.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BASIC MATERIAL CARBON STEEL BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	S 40S		B 36.19	ASTM A312 TP 304			
	SEAMLESS	BE	3	8	S 10S		B 36.19	ASTM A312 TP 304			
FLANGES	SOCKET WELDED	RF	½	1½	300	125AARH	B 16.5	ASTM A 182 Gr F304			
	WELD NECK	RF	2	8	300	125AARH	B 16.5	ASTM A 182 Gr F304			
	BLIND	RF	½	8	300	125AARH	B 16.5	ASTM A 182 Gr F304			
	FIGURE 8 BLANK	RF	½	8	300	125AARH	B 16.5	ASTM A 182 Gr F304			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	ELBOWS 90 DEG	BW	2	8	M	R= 1.5D	B 16.9	ASTM A 403 WP 304-S			
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	ELBOWS 45 DEG	BW	2	8	M	R= 1.5D	B 16.9	ASTM A 403 WP 304-S			
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	EQ. TEE	BW	2	8	M		B 16.9	ASTM A 403 WP 304-S			
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	CON. RDCR	BW	2	8	M		B 16.9	ASTM A 403 WP 304-S			
	CAP	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	CAP	BW	2	8	M		B 16.9	ASTM A 403 WP 304-S			
	HALF CPLG	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	REDUCED CPLG	SW	½	1½	3000		B 16.11	ASTM A 182 Gr F304			
	NIPPLE	SW /NPT	½	1½	S 80		B 16.11	ASTM A312 TP 304		5	
	NIPPLE	NPT/NPT	½	1½	S 80		B 16.11	ASTM A312 TP 304		5	
VALVES	GATE	SW	½	1½	800		API 602	B:A 182 Gr 304; T:13% Cr;St			
	GATE	FL	2	8	300		API 600	B:A351 Gr CF8; T:13% Cr;St			
	GLOBE	SW	½	1½	800		BS 5352	B:A 182 Gr 304; T:13% Cr;St			
	GLOBE	FL	2	8	300		BS 1873	B:A351 Gr CF8; T:13% Cr;St			
	Reg GLOBE VLV	SW	½	1½	800		BS 5352	B:A 182 Gr 304; T:13% Cr;St			
	Reg GLOBE VLV	FL	2	8	300		BS 1873	B:A351 Gr CF8; T:13% Cr;St			
	CHECK (PISTON LIFT)	SW	½	1½	800		BS 5352	B:A 182 Gr 304; T:13% Cr;St			
	CHECK	FL	2	8	300		BS 1868	B:A351 Gr CF8; T:13% Cr;St			
	B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED										
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H (GALV)			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H (GALV)			
	GASKET		½	2	300		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
	GASKET		3	8	300		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
MISC	STEAM TRAP	RF	½	1½	300	THERMO DYNAMIC	MNF. STD.	B:A 182 Gr 304			
	Y-TYPE STRAINER	SW	½	1½	800		B 16.11	B:A 182 Gr 304; INT: SS 304			
	Y-TYPE STRAINER	FL	2	8	300		B 16.9	B:A351 Gr CF8			

PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

31A

Customer:	IOCL Paradip Fuel Conversion
ANSI CLASS:	# 600 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

TEMPERATURE (Deg.C) & PRESSURE (kg/cm2 g) RATINGS

TEMP	38	50	100	150	200	240										
PRESS.	50.0	50.0	50.0	50.0	50.0	50.0										

SERVICE

NATURAL GAS SERVICE **(DO NOT USE THIS PMS BEYOND 50 KG/CM^{2}G & 240° C.)**

ITEM	SIZE	DESCRIPTION
MAINT. JOINTS	ALL	FLANGED (TO BE KEPT MINIMUM)
PIPE JOINTS	1½" AND BELOW	SW COUPLING (REF NOTE-5)
	2" AND ABOVE	BUTT WELDED
DRAINS	ALL	1" & AS PER PROJECT REQUIREMENT
VENTS	ALL	1" & AS PER PROJECT REQUIREMENT
TEMP. CONN.	1.5" FLANGED	
PRESS. CONN.	3/4" SW	

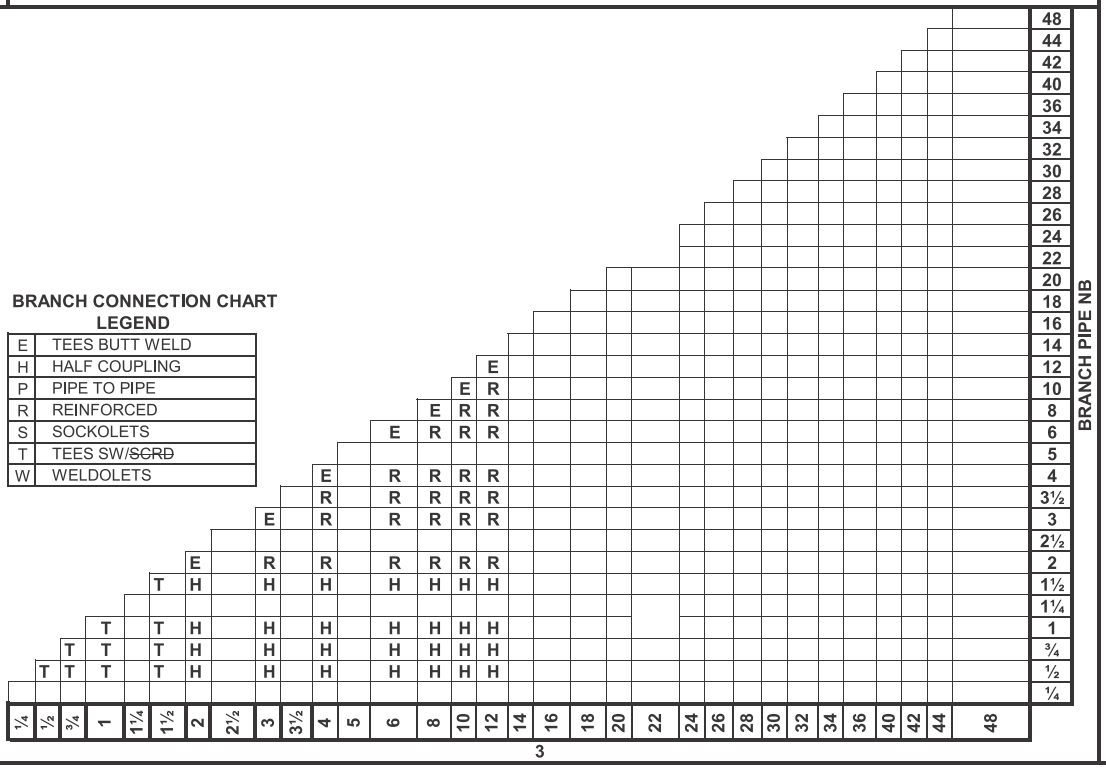
NOTES

1. NDT REQUIREMENTS AS PER BHEL STD DOC NO GT 57124
2. BLANK.
3. VENT & DRAIN ISOLATION VALVES SHALL BE GATE VALVES.
4. FOR GENERAL NOTES ON PMS,PIPING & VALVES REFER STD. NO GT 69959.
5. NPT CONNECTIONS ARE PERMITTED IN THERMAL RELIEF VALVES ONLY.
6. WELDED PIPE SHALL HAVE ONLY LONGITUDINAL WELD MADE BY EMPLOYING AUTOMATIC WELDING.
7. MINIMUM THICKNESS OF FITTING SHALL BE IN LINE WITH THE PIPE SCHEDULE/THICKNESS.
8. MSW GASKET SHALL BE SELF ALIGNING TYPE WITH INNER RING OF SPIRAL STRIP MATERIAL.

BRANCH CONNECTION CHART

LEGEND

E	TEES BUTT WELD
H	HALF COUPLING
P	PIPE TO PIPE
R	REINFORCED
S	SOCKOLETS
T	TEES SW/~~SCRD~~
W	WELDOLETS



PE&SD-Mech.

PIPING MATERIAL SPECIFICATION

31A

Customer:	**IOCL Paradip Fuel Conversion**
ANSI CLASS:	# 600 (De-rated)
MATERIAL:	CARBON STEEL
CORR.ALL.	1.0 mm
Special requirement	Non-IBR

Rev.00
13.01.21

ITEMS	TYPE	ENDS	DIA. RANGE (INCH) LOW	DIA. RANGE (INCH) HIGH	SCH/ THK/ RATING	FACE FINISH / RADIUS	DIM / DESG. STD.	BASIC MATERIAL CARBON STEEL DESCRIPTION	BASIC MATERIAL CARBON STEEL BHEL SPEC	NOTE	Revision
PIPES	SEAMLESS	BE	½	2	S 80		B 36.10	A106 GRB			
	SEAMLESS	BE	3	8	S 40		B 36.10	A106 GRB			
	SEAMLESS	BE	10	10	S 30		B 36.10	A106 GRB			
	SEAMLESS	BE	12	12	S STD		B 36.10	A106 GRB			
FLANGES	SOCKET WELDED	RF	½	1½	600	125AARH	B 16.5	ASTM A 105			
	WELD NECK	RF	2	12	600	125AARH	B 16.5	ASTM A 105			
	BLIND	RF	½	12	600	125AARH	B 16.5	ASTM A 105			
	FIGURE 8 BLANK	RF	½	8	600	125AARH	B 16.5	ASTM A 105			
	SPACER & BLIND	RF	10	12	600	125AARH	B 16.5	ASTM A 105			
FITTINGS	ELBOWS 90 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 90 DEG	BW	2	12	M	R= 1.5D	B 16.9	ASTM A 234 GR WPB			
	ELBOWS 45 DEG	SW	½	1½	3000		B 16.11	ASTM A 105			
	ELBOWS 45 DEG	BW	2	12	M	R= 1.5D	B 16.9	ASTM A 234 GR WPB			
	EQ. TEE	SW	½	1½	3000		B 16.11	ASTM A 105			
	EQ. TEE	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	CON. RDCR	SW	½	1½	3000		B 16.11	ASTM A 105			
	CON. RDCR	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	CAP	SW	½	1½	3000		B 16.11	ASTM A 105			
	CAP	BW	2	12	M		B 16.9	ASTM A 234 GR WPB			
	HALF CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	REDUCED CPLG	SW	½	1½	3000		B 16.11	ASTM A 105			
	NIPPLE	SW /NPT	½	1½	S 80		B 16.11	A106 GRB		5	
	NIPPLE	NPT/NPT	½	1½	S 80		B 16.11	A106 GRB		5	
VALVES	GATE	SW	½	1½	800		API 602	B:A 105; T:13% Cr;St			
	GATE	FL	2	12	600		API 600	B:A216 Gr WCB; T:13% Cr;St			
	GLOBE	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	GLOBE	FL	2	12	600		BS 1873	B:A216 Gr WCB; T:13% Cr;St			
	Reg GLOBE VLV	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	Reg GLOBE VLV	FL	2	12	600		BS 1873	B:A216 Gr WCB; T:13% Cr;St			
	CHECK (PISTON LIFT)	SW	½	1½	800		BS 5352	B:A 105; T:13% Cr;St			
	CHECK	FL	2	12	600		BS 1868	B:A216 Gr WCB; T:13% Cr;St			
B:BODY, T:TRIM, BB:BOLTED BONNET, St:STELLITED											
BOLT & GASKET	STUD + 2NUTS		M12	M27			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	STUD + 2NUTS		M30	M70			B 18.2.1/ 18.2.2	A 193 GR B7/ A194 2H			
	GASKET		½	2	600		B 16.20	NAB MSW (SS304)+ GRAPHITE		8	
	GASKET		3	12	600		B 16.20	NAB MSW (SS304)+ GRAPHITE			
MISC	STEAM TRAP	RF	½	1½	600	THERMO DYNAMIC	MNF. STD.	A 105			
	Y-TYPE STRAINER	SW	½	1½	800		B 16.11	B: A 105; INT: SS 304			
	Y-TYPE STRAINER	FL	2	12	600		B 16.9	B 216 GR WCB			

RECORD OF REVISIONS				
Rev. No.	**Date**	**Revision Details**	**Revised By**	**Approved By**
00	13.01.21	First Issue	ANUPAM	M.S.S.N

तटीय पाइपलाइन हेतु बॉल वॉल्व्ज के लिए मानक विनिर्देश

Annexure B: Standard Specification for Pipeline Ball Valves, Doc. No. 6-71-0014.

STANDARD SPECIFICATION FOR PIPELINE BALL VALVES (ONSHORE)

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
5	17.03.17	REVISED & REISSUED AS STANDARD SPECIFICATION	RB/NR	MSG	VM	RN
4	01.03.12	REVISED & REISSUED AS STANDARD SPECIFICATION	ST	SKJ	VM	DM
3	22.11.06	REVISED & REISSUED AS STANDARD SPECIFICATION	MKM	VM	AS	VC
2	19-10-01	REVISED & REISSUED AS STANDARD SPECIFICATION	MKM	KKS	SJ	GRR
1	16-12-98	REVISED & REISSUED AS STANDARD SPECIFICATION	LD	ASr	VC	AS

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Abbreviations:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell hardness number
DN	Nominal Size
HAZ	Heat Affected Zone
LC	Lock Close (valve locked in full close position)
LO	Lock Open (valve locked in full open position)
MSS-SP	Manufacturers Standardization Society – Standard Practice
NDT	Non Destructive Testing
NPS	Nominal Pipe Size
RJ	Ring Joint
SSPC	The Society for Protective Coatings

Pipeline Engineering Standards Committee

Convenor : Mr. Vinay Mittal

Members: Mr. Brij Raj Meena
Mr. M. S. Gunjiyal
Mr. Gagan Deep Singh
Mr. Raj Kishore
Mr. S. Ghosal (Process-2)
Mr. Rajeev Kumar (PDD)
Mr. R.K. Singh (Inspection)
Mr. K.V.K. Naidu (Projects)

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CONTENTS

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1.0 SCOPE

This specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel ball valves of size DN 50 mm (2") and above and ANSI pressure rating Class 150# thru 900# for use in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).

2.0 REFERENCE DOCUMENTS

2.1 All valves shall be manufactured and supplied in accordance with the American Petroleum Institute (API) Specification 6D, Twenty-Fourth Edition, August 2014, Specification for Pipeline and Piping Valves, with additions and modifications as indicated in the following sections of this specification.

2.2 Reference has also been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following Codes, Standards and Specifications.

ASME B31.3	-	Process Piping.
ASME B31.4	-	Pipeline Transportation Systems for Liquids and Slurries.
ASME B31.8	-	Gas Transmission and Distribution Piping Systems.
ASME B16.5	-	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/ Inch Standard.
ASME B 16.10	-	Face-To-Face and End-To-End Dimensions of Valves.
ASME B 16.25	-	Buttwelding Ends.
ASME B16.34	-	Valves - Flanged, Threaded and Welding Ends.
ASME B16.47	-	Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/ Inch Standard.
API 1104	-	Welding of Pipelines and Related Facilities.
ASME Sec VIII	-	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels
ASME Sec IX	-	Boiler and Pressure Vessel Code - Welding, Brazing and Fusing Qualifications
ASTM A-370	-	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
ASTM B 733	-	Standard Specification for Autocatalytic (Electroless) Nickel-Phosphorous Coatings on Metal.
MSS-SP-6	-	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.
MSS-SP-44	-	Steel Pipeline Flanges.

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SSPC-VIS-1 - Steel Structures Painting Council Visual Standard-Guide and Reference Photographs for Steel Surfaces prepared by Dry Abrasive Blast Cleaning.

2.3 In case of conflict between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred in clause 2.2 above, the requirements of this specification shall govern.

3.0 MATERIALS

3.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standard (suitable for the service conditions indicated in Data Sheet) and shall be subject to approval by Company. In addition, the material shall also meet the requirements specified hereinafter.

All process-wetted parts, metallic and non-metallic, sealant and lubricants shall be suitable for the service specified by the Company. Manufacturer shall confirm that all wetted parts are suitable for treated water/seawater environment, which may be used during field testing.

Non-metallic parts of the valves (including O-rings, soft seals etc.) intended for hydrocarbon gas service shall be resistant to explosive decompression.

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

3.3 The carbon equivalent (CE) of valve end connections which are subject to further field welding by Company shall not exceed 0.43 on check analysis for each heat of steel used, as calculated by the following formula:

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

3.4 Charpy V-notch test on each heat of base material shall be conducted for all pressure containing parts such as Body, End Flanges, Stem and Welding Ends as well as Bolting materials for pressure containing parts.

Test procedure for Charpy V-Notch Test shall conform to ASTM A370.

For Carbon Steel, alloy steel & Stainless Steel (except Austenitic Grades) Materials, The impact test temperature shall be 0^0C or minimum design temperature indicated in valve data sheet, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).

For Low Temperature Carbon Steel Materials, The impact test temperature shall be as per requirement of Material Standard or minimum design temperature indicated in valve data sheet, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).

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Where the material specification requires impact values to be higher than specified in the above paragraphs, the higher values shall apply.

For duplex & super duplex stainless steel the Charpy V-Notch test values and test temperature shall be as per API 6D.

3.5 For Valves specified to be used for Gas service or LPG service, Hardness test shall be carried out as per ASTM A370 for each method of manufacture and each heat of steel used in the manufacture of valves. A full thickness cross section shall be taken for this purpose and the maximum hardness of the materials of valve components shall not exceed 248 HV_{10}.

3.6 For all such valves where Carbon Steel/ Low Temperature Carbon Steel is used as ball material, the ball shall have 75 micrometers (.003 inches) thick Electroless Nickel Plating (ENP) as per ASTM B 733 with following classification:

- SC2, Type II, Class 2.

The hardness of plating shall be minimum 50 RC.

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 Valve design shall meet the requirements of API Specification 6D and shall be suitable for the service conditions indicated in the Valve Data Sheet. The ASME Boiler & Pressure Vessel Code, Section VIII, Division 1 shall be used to design the valve body. Allowable stress requirements shall comply the provisions of above code. In addition, corrosion allowance indicated in Valve Data Sheet shall be considered in valve design. The manufacturer shall have valid license to use API monogram on valves manufactured as per API 6D.

4.2 For above ground valves, body design shall be either fully welded or bolted type. For buried valves, valve body design shall be fully welded type only. Valve body joints with threads are not permitted.

4.3 Ball shall be of single piece, solid type construction

4.4 Valves shall be Full bore (FB) or Reduced bore (RB) as indicated in the Valve Data Sheet. Full bore valves shall be suitable for the passage of all types of pipeline pigs including instrumented intelligent pigs and regular cleaning, batching and scraper pigs on regular basis without causing damage to either the valve component or the pig. The full bore valve shall provide an unobstructed profile for pigging operations in either direction. Full bore valves shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded.

The bore size of reduced bore valves shall be corresponding to that of a full bore valve of smaller nominal diameter as indicated in Table 4.4 of this specification. For sizes of a particular rating not covered in API 6D, the bore size of the reduced bore valve shall be as per Manufacturer's standard.

TABLE - 4.4

Nominal Valve Size	Nominal Valve size for Reduced Bore	Nominal Valve Size	Nominal Valve size for Reduced Bore
DN mm (NPS inches)	DN mm (NPS inches)	DN mm (NPS inches)	DN mm (NPS inches)
50 (2)	40 (1.5)	600 (24)	500 (20)
80 (3)	50 (2)	650 (26)	550 (22)

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TABLE - 4.4			
Nominal Valve Size	**Nominal Valve size for Reduced Bore**	**Nominal Valve Size**	**Nominal Valve size for Reduced Bore**
DN $_{mm}$ (NPS $_{inches}$)	**DN $_{mm}$ (NPS $_{inches}$)**	**DN $_{mm}$ (NPS $_{inches}$)**	**DN $_{mm}$ (NPS $_{inches}$)**
100 (4)	80 (3)	700 (28)	600 (24)
150 (6)	100 (4)	750 (30)	600 (24)
200 (8)	150 (6)	800 (32)	650 (26)
250 (10)	200 (8)	850 (34)	700 (28)
300 (12)	250 (10)	900 (36)	750 (30)
350 (14)	250 (10)	950 (38)	800 (32)
400 (16)	300 (12)	1000 (40)	850 (34)
450 (18)	350 (14)	1050 (42)	900 (36)
500 (20)	400 (16)	1200 (48)	1050 (42)
550 (22)	450 (18)		

4.5 Ball mounting shall be trunnion or pivot type only. Valve design shall minimize the possibility of debris ingress into the trunnion as far as practicable.

4.6 The valves shall either be a soft seated valve or metal seated valve or with primary metal-to-metal contact and secondary soft seats.

For soft seated valves, Metal seat rings may be provided with soft insert. The same shall be positively locked in position in Metal seat rings.

For valves with primary metal to metal contact and secondary soft seats, O-rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it can not be removed from seat ring and there is no extrusion during opening or closing operation of valve at maximum differential pressure corresponding to valve class rating. The seat rings shall be so designed as to ensure sealing at low as well as high differential pressures.

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

4.8 Valves shall have double block and bleed feature to facilitate complete flush, drain and venting of the valve body cavity.

4.9 Full Bore valves of nominal valve size DN 200 mm (8") & above and Reduced Bore valves of nominal valve size DN 250 mm (10") & above, shall have provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connections shall be provided with a block valve and internal non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Location and arrangement of sealant point shall be as per Fig. 4.9.

4.10 Valves shall be provided with vent and drain connections. Location and arrangement of vents and drains shall be as per Fig. 4.9. Body vent and drain shall be provided with isolation valves (Ball or Plug type). Number and size shall be as per Fig. 4.9.

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

4.12 Full Bore valves of nominal valve size DN 200 mm (8") & above and Reduced Bore valves of nominal valve size DN 250 mm (10") & above, shall be equipped with support foot and lifting

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lugs. Tapped holes and eyebolts shall not be used for lifting lugs. Height of support foot shall be kept minimum. The location and size of support foot/lifting lugs shall ensure unrestrictive operation of vent/drain valves. The design of support foot shall be such that it shall take minimum double the weight of the valve assembly.

4.13 Valve design shall be such as to avoid bimetallic corrosion between carbon steel and high alloy steel components. Suitable insulation shall be provided as required.

4.14 The valve body cavity over-pressure shall be prevented by self-relieving seat rings/assemblies. Valve Cavity relief pressure when added to the valve pressure rating shall not exceed 133% of the pressure rating of the valve at its maximum specified design temperature.

4.15 a) Valve ends shall be either flanged/or butt welded or one end flanged and one end butt welded as indicated in the Valve Data Sheet. Flanges of the flanged end cast/forged body valves shall be integrally cast/forged with the body of the valve. Face to face/end to end dimensions shall conform to API 6D. Face-to-face and end-to-end dimensions for valve sizes not specified in API 6D shall be in accordance with ASME B 16.10. Face-to-face and end-to-end dimensions not shown in API 6D or in ASME B 16.10 shall be as per Manufacturer Standard and shall be subject to approval by Company.

b) Flanged ends, if specified, shall have flanges as per ASME B16.5 for valve sizes upto DN 600 mm (24") excluding DN 550 mm (22"), as per MSS-SP-44 for valve sizes DN 550 mm (22") and as per ASME B 16.47 Series A for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint (RJ) with raised face as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. In case of RJ flanges, the groove hardness shall be minimum 140 BHN.

c) Butt weld end preparation shall be as per ASME B16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in the Valve Data Sheet. In case difference exists between thickness of welding ends of valve and connecting pipe, the welding ends of valve shall have bevel preparation as per ASME B31.4 or ASME B31.8 as applicable.

d) In case of all Butt welded end valves (including soft seated valves or valves with primary metal to metal and secondary soft seats), actual yield strength of valve body shall not be less than 2/3 rd of the specified minimum yield strength (SMYS) of the connecting pipe material.

e) For soft seated valves with Butt welded end, valves shall be provided with pup pieces on either side of length 200 mm each for size up-to 8" & 250 mm for size 10" and above, with material as specified in valve data sheet. Length of pup piece shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment. Pup piece thickness shall be calculated for the class rating. Vendor shall provide for each type (considering size, grade and thickness of the pup pieces used for all offered valves) of pup piece, test rings (500 mm long) from pup piece material for field weld procedure qualification. Valves shall be tested along-with pup piece.

4.16 Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) are not liable to be damaged. The manufacturer shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.

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4.17 Valve shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions. For actuated valves, additionally mechanical means of position indicator shall be provided.

4.18 Valves shall be suitable for either buried or above ground installation as indicated in Valve Data Sheet.

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

a) In case of below ground LTCS valves, Stem extension material shall be equivalent to Stem Material.

b) Valves provided with stem extension shall have water proof outer casing. Length of stem extension shall be as indicated in Valve Data Sheet. The length indicated corresponds to the distance between centerline of the valve opening and the top of mounting flange for valve operating device (gear operator/power actuator as applicable).

c) Vent and drain connections and sealant injection lines shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. The pipe used shall be API 5L Gr. B / ASTM A 106 Gr. B, with Sch. 160 for carbon steel valves and ASTM A 333 Gr. 6, with Sch. 160 for low temperature carbon steel valves. The material for the fittings for carbon steel valves shall be ASTM A105 and material for the fittings for low temperature carbon steel valves shall be ASTM A 350 Gr. LF2 Cl. 1. The fittings and valve ends shall be Socket Welded ANSI 6000# as per ASME B 16.11 (for piping class upto 600#) and BW ends (for piping class 900#).

d) Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving positive drive under all conditions with no possibility of free movement between valve body, stem extension or its operator.

e) Outer casing of stem extension shall have ⅜"" or ½" NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion.

4.20 Operating Devices

a) Valves shall have a power actuator or manual operator as indicated in the Valve Data Sheet. In case of manual operator, valve sizes, DN ≤ 100 mm (4") shall be wrench operated and valve sizes, DN ≥ 150 mm (6") shall be gear operated. The length of the wrench shall not be longer than twice the face-to-face or end-to-end dimension of the valve. Each wrench-operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.

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

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c) For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N. However, failing to meet above requirement , vendor shall offer Gear operated valves. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for operating the valve from full open to full close position. The number of turns shall not exceed 250 for valve sizes up-to 24" and 450 for valve sizes above 24".

d) Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes.

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

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

4.22 When indicated in Material Requisition/ Tender, valves shall have locking devices to lock the valve either in full open (LO) or full close (LC) positions. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.

4.23 All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 and 3.5 of this specification and shall meet the requirements as specified therein.

4.24 Repair by welding is not permitted for fabricated and forged body valves. However repair by welding as per ASME B16.34 is permitted for cast body valves. Such repairs shall be carried out at casting supplier's care only. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 and 3.5 of this specification and shall meet the requirements as specified therein. Heat treatment and radiography shall be repeated after the weld repair.

4.25 No casting is permitted for stem and stem extension material of all valves. Valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure corresponding to applicable class rating. The combined stress shall not exceed the maximum allowable stresses specified in ASME section VIII, Division 1. For power actuated valves, the valve stem shall be designed for maximum output torque of the selected power actuator (including gear box, if any) at valve stem.

4.26 Wherever specified for the parts of valve in valve datasheets, minimum thickness of stelliting shall be 1.6 mm.

4.27 All soft seated valves shall be fire safe design and qualified as per API 6FA/ API 607/ ISO 10497.

4.28 Soft-seated valves shall have an antistatic device.

5.0 INSPECTION AND TESTS

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

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5.1.1 All valves shall be visually inspected. The internal and external surfaces of the valves shall be free from any strikes, gouges and other detrimental defects. The surfaces shall be thoroughly cleaned and free from dirt, rust and scales.

5.1.2 Dimensional check on all valves shall be carried out as per the Company approved drawings.

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

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

a) Body castings of all valves shall be radiographically examined as per ASME B16.34. Procedure and acceptance criteria shall be as per ASME B16.34. The extent of the radiography shall be as under:

Pressure Class Rating	Valve Size	Extent of Radiography
ANSI 150 # Class	≤ DN 600 mm (24") ≥ DN 650 mm (26")	Nil 100%
ANSI 300 # Class	≤ DN 400 mm (16") ≥ DN 450 mm (18")	Nil 100%
ANSI 600 # Class and above	All sizes	100%

Radiography shall be performed after the final heat treatment also.

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B16.34.

b) All valves, with body fabricated from plates or made by forgings, shall be ultrasonically examined in accordance with the procedure and acceptance standard of Appendix IV of ASME B16.34.

All forgings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B16.34.

c) Bodies and bonnets made by welded assembly of segments of castings, forgings, plates or combinations thereof shall be examined, as applicable, by methods of 5.1.4 (a) for cast components or 5.1.4 (b) for forged components and plates.

5.1.5 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per ASME B 31.4 or ASME B31.8 as applicable and API 1104.

5.1.6 Welds, which in Company's opinion cannot be inspected by radiographic methods, shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Sec. VIII, Division 1, Appendix 12 and Appendix 6 respectively.

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

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

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c) After final machining, all bevel surfaces shall be inspected by dye penetrant or wet magnetic particle methods. All defects longer than 6.35 mm are rejected, as are the defects between 6.35 mm and 1.59 mm that are separated by a distance less than 50 times their greatest length. Rejectable defects must be removed. Weld repair of bevel surface is not permitted.

5.1.8 All valves shall be tested in compliance with the requirements of API 6D. During pressure testing, valves shall not have sealant lines and other cavities filled with sealant, grease or other foreign material. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. Test pressure shall be held for at least 30 minutes for both Shell & Seat test. No leakage is permissible during hydrostatic testing. The body cavity self-relieving feature meeting the requirements of clause 4.14 of this specification shall also be checked.

5.1.9 A supplementary air seat test as per API 6D (Annex H, Para H.3.3, Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.1.10 Valves shall be subjected to Operational Torque Test as per API 6D (Annex H, Para H.6) under hydraulic pressure equal to maximum differential pressure corresponding to the applicable ANSI class rating of valve. It shall be established that the force required to operate the valve does not exceed the requirements stated in section 4.20 (c) of this specification.

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

Hand operator provided on the actuator shall also be checked after above testing, for satisfactory manual over-ride performance.

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

5.1.12 Subsequent to successful testing as specified in clause 5.1.10 and 5.1.11 above, one (1) valve out of the total ordered quantity shall be randomly selected by the Company Representative for cyclic testing as mentioned below:

a) The valve shall be subjected to at least 100 Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating.

b) Subsequent to the above, the valve shall be subjected to hydrostatic test and supplementary air seat test in accordance with clause 5.1.8 and 5.1.9.

In case this valve fails to pass these tests, the valve shall be rejected and two more valves shall be selected randomly and subjected to testing as indicated above. If both valves pass these tests, all valves manufactured for the order (except the valve that failed) shall be deemed acceptable. If either of the two valves fails to pass these tests, all valves shall be rejected or each valve shall be tested at the option of manufacturer.

Previously carried out test of similar nature shall be considered acceptable if the same has been carried out by Manufacturer in last two years. Valves of two sizes below and two sizes

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above the size of valve previously tested, and rating similar or one rating lower of valve tested previously, shall be qualified.

5.1.13 Checks shall be carried out to demonstrate that the dissimilar metals used in the valves are successfully insulated as per the requirement of clause 4.13 of this specification.

5.1.14 Anti-static testing for soft seated valves in accordance with H.5 of API 6D.

5.2 Company reserves the right to perform stage wise inspection and witness tests as indicated in clause 5.1 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Company's Inspector. Company reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be to Manufacturer's account.

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

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

6.0 TEST CERTIFICATES

Manufacturer shall submit the following certificates:

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

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

c) Test reports of radiograph and ultrasonic inspection.

d) Test report on operation of valves conforming to clause 5.1.10, 5.1.11 and 5.1.12 of this specification.

e) All other test reports and certificates as required by API 6D and this specification.

The certificates shall be considered valid only when signed by Company's Inspector. Only those valves which have been certified by Company's Inspector shall be dispatched from Manufacturer's works.

7.0 PAINTING, MARKING AND SHIPMENT

7.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SA-2½ / SSPC-SP10. For coastal area, painting shall be suitable for industrial marine environment. For the valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of buried portion of the valve shall be painted with 100% solid high build epoxy with a minimum dry film thickness of 800 microns or 1.5 mm thick polyurethane coating.

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

7.3 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other

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suitable material. All valves shall be provided with suitable protectors for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic or high impact plastic bevel protectors.

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

7.5 Packaging and shipping instructions shall be as per API 6D.

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

a) Order Number

b) Manufacturer's Name

c) Valve size and rating

d) Tag Number

e) Serial Number

8.0 SPARES AND ACCESSORIES

8.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.

8.2 Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of valves and price for such spares shall be quoted separately.

9.0 DOCUMENTATION

Documentation to be submitted by Manufacturer to Company is summarized below. Number of Copies (Hard copies / soft copies etc.) shall be as indicated in CONTRACT document.

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

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

b) Torque curves for the power actuated valves along with the break torque, running torque for the valve stem and maximum allowable stem torque.

c) Copy of valid API 6D Certificate.

d) Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.

e) Details of support foot including dimensions and distance from valve centreline to bottom of support foot.

f) List of recommended spares required during start-up and commissioning & 2 years of normal operation and maintenance.

9.2 After placement of order, the Manufacturer shall submit the following drawings, documents and specifications for Company's approval:

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a) General arrangement & detailed sectional drawings showing all parts with reference numbers and material specifications, overall dimensions and features. Number of turns of hand wheel required for operating the valve from full open to full close position for Gear Operated valves, painting/ coating scheme, Complete dimensional details of support foot (where applicable), shall be indicated in the GA.

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

9.3 Within 30 days from the approval date, Manufacturer shall submit to Company the approved drawings, documents and specifications as listed in clause 9.2 above.

9.4 Prior to shipment, Manufacturer shall submit to Company following:

a) Test certificates as per clause 6.0 of this specification.

b) Manual for installation, erection, maintenance and operation instructions including a list of recommended spares for the valves.

9.5 All documents shall be in English language only.

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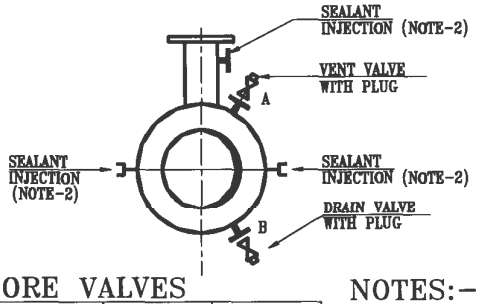
ABOVE GROUND INSTALLATION



FULL BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 150	–	15
200 TO 600	15	25
650 & ABOVE	15	40

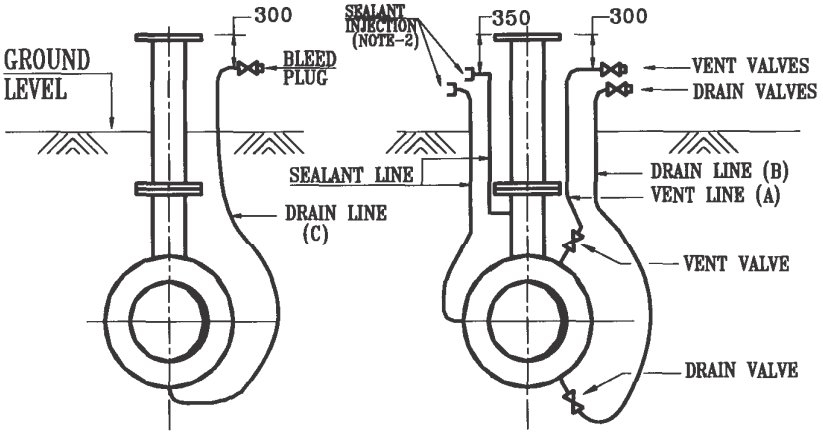
REDUCED BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 200	–	15
250 TO 750	15	25
ABOVE 750	15	40

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.
3 ALL VENT/DRAIN CONNECTION SHALL BE WELDED WITH THE BODY.

UNDERGROUND INSTALLATION



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

FULL BORE (FB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 150	–	–	15
200 TO 300	25	25	–
350 TO 600	25	25	–
650 & ABOVE	40	40	–

REDUCED BORE (RB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 200	–	–	15
250 TO 400	25	25	–
450 TO 750	25	25	–
800 & ABOVE	40	40	–

NOTES:–

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.
3 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION. ALL PIPING INCLUDING VALVE ENDS IN BURIED PORTIONS OF VENT & DRAIN SHALL BE WELDED TYPE.

FIGURE-4.9

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Annexure-16A: Sub Vendor List		
	Item	**Vendor Name**
1	LIQUID LEVEL GAUGES	V AUTOMAT AND INSTRUMENTS PVT LTD
		IGEMA GmbH
		BLISS ANAND PVT. LTD.,
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT
		CHEMTROLS INDUSTRIES PVT LTD.
		PUNE TECHTROL PVT LTD
		NISAN SCIENTIFIC PROCESS
		GAUGES BOURDON INDIA PVT. LTD.
		Sigma Instruments Company
		D.K.INSTRUMENTS (P) LTD.,
2	PRESSURE GAUGES	FORBES MARSHALL (HYD) PVT LIMITED,
		ALTOP INDUSTRIES LIMITED
		PRECISION MASS PRODUCTS PVT LTD
		H.GURU INSTRUMENTS(S.I)PVT.LTD
		WALCHANDNAGAR INDUSTRIES LIMITED
		SCIENTIFIC DEVICES (BOMBAY) PVT. LT
		BAUMER TECHNOLOGIES
		GAUGES BOURDON INDIA PVT. LTD.
		A.N. INSTRUMENTS PVT. LTD.
		PROTECH CONTROL INSTRUMENTS
3	PR. & DIFF. PR. TRANSMITTERS (ELECTRONIC - SMART)	EMERSON PROCESS MGT (I) PVT LTD
		ABB INDIA LIMITED, HYD
		YOKOGAWA INDIA LIMITED
		ENDRESS + HAUSER (INDIA) PVT. LTD.
		HONEYWELL AUTOMATION INDIA LIMITED
4	LEVEL TRANSMITTER (GUIDED WAVE RADAR TYPE)	EMERSON PROCESS MGT (I) PVT LTD
		V AUTOMAT AND INSTRUMENTS PVT LTD
		ENDRESS + HAUSER (INDIA) PVT. LTD.
		VEGA INDIA LEVEL & PRESSURE
5	DIFFERENTIAL PRESSURE INDICATORS/ GAUGES	A.N. INSTRUMENTS PVT. LTD.
		SWITZER PROCESS INSTRUMENTS
		GAUGES BOURDON INDIA PVT. LTD.
		SAMSON CONTROLS PVT LTD.,
		BAUMER TECHNOLOGIES
		WALCHANDNAGAR INDUSTRIES LIMITED
		PRECISION MASS PRODUCTS PVT LTD
6	JUNCTION BOXES (EXPLOSION PROOF)	FCG FLAMEPROOF CONTROL GEARS
		FLAMEPROOF EQUIPMENTS PVT.LTD.
		SAFEX FLAMEPROOF CONTROLS (P) LTD
		FCG POWER INDUSTRIES
		KAYSONS TECHNO EQUIPMENTS PVT. LTD.

NOTE: For those items not covered in above list, bidder shall take prior approval approval from BHEL before placing the order.