




	PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT :	INDIAN OIL CORPORATION LIMITED		
MATERIAL REQUISITION FOR ALLOY STEEL AND STAINLESS STEEL FITTINGS	Project No. 077154C001	Document No. 077154C-000-MR-1330-501	Rev. No. A	Page 1 of 2

MATERIAL REQUISITION FOR ALLOY STEEL AND STAINLESS STEEL FITTINGS

			 Venkatesan R 2025.04.10 14:22:26 +05'30' Written By	 Jayaraman Raja 2025.04.17 12:48:22 +05'30' Checked by	 Lokesh, Jayaraman 2025.04.17 13:33:12 +05'30' Approved By	Morischristophe r Jesumarian	<small>Digitally signed by Morischristophe r Jesumarian DN: cn=Morischristophe r Jesumarian, o=IOCL, ou=IOCL, email=</small>
A	10-Apr-25	ISSUED FOR INQUIRY	RV	JR	JL / SK	JMC	
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED	

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 		PROJECT :		PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY	
		CLIENT :		INDIAN OIL CORPORATION LIMITED	
MATERIAL REQUISITION FOR ALLOY STEEL AND STAINLESS STEEL FITTINGS		Project No. 077154C001	Document No. 077154C-000-MR-1330-501	Rev. No. A	Page 2 of 2
<u>MATERIAL REQUISITION FOR ALLOY STEEL AND STAINLESS STEEL FITTINGS</u>					
This Requisition is composed of the documents hereafter listed:					
Sl. No.	Description	Reference	Rev.	Date of Attachment	Date of Cancellation
1.0 SCOPE OF SUPPLY					
1.1	SUPPLY REQUISITION FOR ALLOY STEEL AND STAINLESS STEEL FITTINGS	077154C-000-SR-1330-501 (PART I & PART II)	A	10-Apr-25	
2.0 APPLICABLE DOCUMENTS					
2.1	JOB SUPPLY SPECIFICATION FOR FITTINGS 2" AND ABOVE	077154C-000-JSS-1330-001	H	10-Apr-25	
2.2	JOB SUPPLY SPECIFICATION FOR FITTINGS 1.5" AND BELOW	077154C-000-JSS-1340-001	G	10-Apr-25	
2.3	SPECIFICATION FOR COLOUR CODING OF PIPING MATERIALS SUPPLIED BY VENDOR	077154C-000-SP-1390-009	D	10-Apr-25	
2.4	SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION AT VENDOR'S WORKS	077154C-000-JSS-6300-002	0	10-Apr-25	
2.5	STANDARD MATERIAL SPECIFICATION FOR LOW ALLOY STEEL MATERIALS	AXEN- IN-042.123	-	10-Apr-25	
3 QUALITY REQUIREMENTS					
3.1	INSPECTION & TEST PLAN FOR FITTINGS	077154C-000-ITP-1330-001	B	10-Apr-25	
4.0 GENERAL					
4.1	INSTRUCTIONS CONCERNING VENDOR DOCUMENTATION	077154C-000-PP-272	A	10-Apr-25	
4.2	VENDOR FINAL DOCUMENTATION	077154C-000-PP-274	A	10-Apr-25	
4.3	PACKING SHIPPING AND TRANSPORTATION DOCUMENTS	077154C-000-PP-034	A	10-Apr-25	
4.4	DOCUMENT MANAGEMENT PROCEDURE	077154C-000-PP-271	A	10-Apr-25	
NOTES:					
1) "Date of attachment" corresponds with the issue date of the MR at which the attachment has been included in the MR. This is not related to the issue date indicated on the attachment itself.					

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PROJECT :

PMC/ EPCM Services for
PETROCHEMICAL AND LUBE
INTEGRATION PROJECT "LuPech" (J-18)
IOCL GUJARAT REFINERY

CLIENT :

INDIAN OIL CORPORATION LIMITED

SUPPLY REQUISITION FOR ALLOY
STEEL & STAINLESS STEEL FITTINGS

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SUPPLY REQUISITION FOR ALLOY STEEL & STAINLESS STEEL FITTINGS

This Supply is composed of two parts

Part I : Equipment / Bulk Material Supply (Annexure 1)

Part II : Documents and Drawings Supply

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED
A	10-Apr-25	ISSUED FOR INQUIRY	RV	JR	JL / SK	JMC

VENKATESAN R
2025.04.10
15:31:14 +05'30'

JAYARAMAN RAJA
2025.04.17 12:44:03
+05'30'

LOKESH, JAYARAMAN
2025.04.17
12:33:55 +05'30'

MORISCHRISTOPHER
JESUMARIAN

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PROJECT :

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SUPPLY REQUISITION FOR ALLOY STEEL &
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A

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PART I : EQUIPMENT / BULK MATERIAL SUPPLY

Main abbreviations used in this document

EA : Each article
IN : Inch
Kg : Kilogram
M : Meter
MM : Millimeter
FT : Feet
Lbs : Pounds
UOM : Unit of measure
GO : Gear Operator
HO : Handwheel Operator
GALV : Galvanization
SCH : Schedule
SUPPLY: Thickness

General Notes :

1. The material description shall be read in conjunction with the documents listed in MR as "APPLICABLE DOCUMENTS".
2. Bidder to note that only when specific service requirements (NACE(Sour Service), IBR, HIC, Hydrogen service, Impact test) are mentioned in material descriptions in SR Part-1 then the corresponding paragraphs in Job supply specification(077154C-000-JSS-1330-001 &077154C-000-JSS-1340-001) shall be referred.
3. Bidder to quote only for the category of items for which they are registered in the IOCL CPMSL.
4. NACE (Sour Service) Requirement of MR0103 shall be met..
5. Bidder to note that where "other requirements" request " Axens specification" it refers the requirement of AXEN Specifications for fittings and document " IN-042.123 (Low Alloy Steel)" Shall be followed.
6. All Alloy steel Fittings shall be supplied in Normalized and Tempered Condition.
7. All stainless steel components shall be supplied in Pickling & Passivated Conditions and shall undergo Intergranular corrosion test ASTM A262 Practice B or Practice E and Practice C as specified in "077154C-000-JSS-1330-001". Items(SS321) shall be supplied in a stabilised condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time and holding temperature for stabilizing heat treatment shall be 4 hours and 900° C respectively.
8. Positive Material identification shall be carried out for Stainless Steel and Alloy steel components as per "077154C-000-JSS-6300-002".
9. Bidder to note that Where "Sour Service" and "Hydrogen Service" and Axens specification is requested in the Material Description of SR-Part-I, then the fittings shall be supplied in Normalized & Tempered condition for alloy steel regardless of thickness. Bidder shall submit the respective Heat treatment chart.
10. Dual Marked Stainless Steel (e.g. 316/316L and 304/304L) shall be supplied provided that the chemical and mechanical properties comply with the requirements of both grades.
11. All IBR Fittings shall be tested and test certificate in form IIIC for Fittings. Duly countersigned by IBR authority.



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
1	C10MR250	DBE920A5CD30010000	6			12.7MM		EA	2	6 IN x 12.7MM 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -, ,	
2	C10MR2UM	DBE920A5CD30010000	8			S-XS		EA	12	8 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -, ,	
3	C15R6CPC	DFSCI055CD3000000	3	0.5		S-10S	S-80S	EA	10	3 IN x S-10S / .5 IN x S-80S Concentric swage, MSS SP-95, ASTM A182 Gr.F316/316L + Sour Service, BE/PE, -, -, ,	
4	C1AENH5J	DBE92055EA30010000	6			S-10S		EA	65	6 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A815 WPS32750, BW Ends, -, -, ,	
5	C1G02R7U	DFSEI055C4300000	2	1		S-40S	S-40S	EA	10	2 IN x S-40S / 1 IN x S-40S Eccentric swage, MSS SP-95, ASTM A182 Gr.F304/304L, BE/PE, -, -, ,	
6	C1G0GL3X	DFSEI055CE3000000	2	1		S-40S	S-40S	EA	10	2 IN x S-40S / 1 IN x S-40S Eccentric swage, MSS SP-95, ASTM A182 Gr.F316/316L, BE/PE, -, -, ,	
7	C1H492PU	DFSCI055CD3000000	3	1.5		S-10S	S-40S	EA	10	3 IN x S-10S / 1.5 IN x S-40S Concentric swage, MSS SP-95, ASTM A182 Gr.F316/316L + Sour Service, BE/PE, -, -, ,	
8	C1H49LSN	DFSEI055CD3000000	2	1.5		S-40S	S-40S	EA	10	2 IN x S-40S / 1.5 IN x S-40S Eccentric swage, MSS SP-95, ASTM A182 Gr.F316/316L + Sour Service, BE/PE, -, -, ,	
9	C1H49RCN	DBRE2055DL30010000	3	2		S-10S	S-40S	EA	10	3 IN x S-10S / 2 IN x S-40S Eccentric reducer, Seamless, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -, ,	
10	C1H4AFLG	DBTR2055DL30010000	3	2		S-10S	S-40S	EA	3	3 IN x S-10S / 2 IN x S-40S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -, ,	
11	C1KW86K	DBE920A5CI30010000	12			S-XS		EA	2	12 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	
12	C1NFHFDK	LTL5I0A5C6L0LE0000	10	1.5	3000 lbs			EA	15	10 IN x 1.5 IN Sockolet, MSS SP-97, ASTM A182 Gr.F5, 3000 Lbs, SW Ends, -, -, ,	
13	C1Y6PJEB	DBE42055DT30030000	12			S-40S		EA	2	12 IN x S-40S 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321 + Sour Service, BW Ends, -, -, ,	
14	C1Y6PK9S	DBE92055DT30030000	10			S-40S		EA	25	10 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321 + Sour Service, BW Ends, -, -, ,	
15	C1Y6PKBU	DBE92055DT30030000	12			S-40S		EA	2	12 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321 + Sour Service, BW Ends, -, -, ,	
16	C249PUC	DBE420A5CI30010000	8			S-STD		EA	4	8 IN x S-STD 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	
17	C24A4NP	DBE920A5CI30010000	2			S-XS		EA	85	2 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	
18	C24A4VE	DBE920A5CI30010000	3			S-STD		EA	8	3 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	
19	C24A50S	DBE920A5CI30010000	8			S-STD		EA	6	8 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	
20	C24ARB8	DBRC20A5CI30010000	10	8		S-STD	S-STD	EA	1	10 IN x S-STD / 8 IN x S-STD Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -, ,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

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CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
21	C24GVAF	DBRE20A5CI30010000	12	10		S-STD	S-STD	EA	1	12 IN x S-STD / 10 IN x S-STD Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
22	C24JPLX	DBRE20A5CI30010000	6	3		S-STD	S-STD	EA	10	6 IN x S-STD / 3 IN x S-STD Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
23	C24R8WSA	DBE42055DX30010001	2			S-405		EA	4	2 IN x S-405 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
24	C24R8X52	DBE42055DX30030001	14			S-405		EA	3	14 IN x S-405 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
25	C24R9PX7	DBRC2055DX30030001	14	8		S-405	S-405	EA	1	14 IN x S-405 / 8 IN x S-405 Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
26	C24R9RR5	DBRC2055DX30030001	16	14		S-405	S-405	EA	1	16 IN x S-405 / 14 IN x S-405 Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
27	C24RAZFA	DBRE2055DX30030001	14	12		S-405	S-405	EA	2	14 IN x S-405 / 12 IN x S-405 Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
28	C24RAZZ7	DBRE2055DX30030001	14	8		S-405	S-405	EA	1	14 IN x S-405 / 8 IN x S-405 Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
29	C25D0HCX	DBE920A5CI30010000	6			S-XS		EA	10	6 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
30	C25D0HEL	DBE920A5CI30010000	8			S-XS		EA	6	8 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
31	C25E2W9M	DFTE2055COLOLE0001	0.5		3000 lbs			EA	50	.5 IN Equal tee, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 3000 Lbs, Hydrogen Service	
32	C25EDM21	DFE420A5C2L0L0G0002	0.75		6000 lbs			EA	10	.75 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	
33	C25EDN1P	DFE920A5C2L0L0G0002	0.5		6000 lbs			EA	20	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	
34	C25EDN1R	DFE920A5C2L0L0G0002	0.75		6000 lbs			EA	54	.75 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	
35	C25EFSUS	DFCF20A5C2L0L0G0002	0.75		6000 lbs			EA	350	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	
36	C2JCVR	DBE42055DF30010000	8			S-105		EA	20	8 IN x S-105 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
37	C2JCVK6	DBE92055DF30010000	8			S-105		EA	100	8 IN x S-105 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
38	C2SZNAW	DFCR20A5C6L0LE0000	1	0.75	3000 lbs			EA	30	1 IN x .75 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 3000 Lbs, -,	
39	C2SZNAZ	DFCR20A5C6L0LE0000	1.5	0.5	3000 lbs			EA	25	1.5 IN x .5 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 3000 Lbs, -,	
40	C2UPN3D7	DBE420A5C830010002	6			S-XS		EA	5	6 IN x S-XS 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
41	C2UPN4AX	DBE920A5C830010002	4			S-XS		EA	10	4 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	
42	C2UPN4DK	DBE920A5C830010002	6			S-XS		EA	5	6 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	
43	C2URS9P8	DFSEI0A5C6300000	2	0.75		S-XS	S-160	EA	10	2 IN x S-XS / .75 IN x S-160 Eccentric swage, MSS SP-95, ASTM A182 Gr.F5, BE/PE, -, -	
44	C2US7ZG2	DFSEI0A5CG300000	2	0.75		S-XS	S-160	EA	10	2 IN x S-XS / .75 IN x S-160 Eccentric swage, MSS SP-95, ASTM A182 Gr.F9, BE/PE, -, -	
45	C2US7ZZ4	DFSEI0A5CG300000	2	1		S-XS	S-XS	EA	10	2 IN x S-XS / 1 IN x S-XS Eccentric swage, MSS SP-95, ASTM A182 Gr.F9, BE/PE, -, -	
46	C4TNDB27	DBE920A5C830010002	14			S-60		EA	2	14 IN x S-60 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	
47	C4YFF62X	DBE920A5CD30030000	16			19.05MM		EA	2	16 IN x 19.05MM 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -	
48	C51M70EC	DFE920A5C2L0LG0010	0.5		6000 lbs			EA	26	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
49	C51M70ED	DFE920A5C2L0LG0010	0.75		6000 lbs			EA	54	.75 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
50	C51M70KB	DBE920A5C830010015	12			S-60		EA	4	12 IN x S-60 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR,Refer to Axens specification IN-042.123 for additional requirements	
51	C51M70T0	DBE920A5C830010015	3			S-XS		EA	10	3 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR,Refer to Axens specification IN-042.123 for additional requirements	
52	C51MG280	DFSCIOA5C2300010	3	1.5		S-XS	S-XS	EA	10	3 IN x S-XS / 1.5 IN x S-XS Concentric swage, MSS SP-95, ASTM A182 Gr.F11 Cl.2, BE/PE, -, IBR,Refer to Axens specification IN-042.123 for additional requirements	
53	C51MT7GG	DFTE20A5C2L0LG0010	0.75		6000 lbs			EA	50	.75 IN Equal tee, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
54	C57H3D3J	DBE920S5DX30010001	8			S-40S		EA	45	8 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
55	C58S3D03	DBE920A5CO30030000	16			S-XS		EA	2	16 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, -	
56	C58SHGHH	DBE920A5CI30030000	24			S-30		EA	1	24 IN x S-30 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -	
57	C58SS6K4	DBE920A5C830010020	3			S-XS		EA	10	3 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, Hydrogen Service, Refer to Axens specification IN-042.123 for additional requirements	
58	C58SS6U9	DBE920A5C830010020	8			S-XS		EA	4	8 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, Hydrogen Service, Refer to Axens specification IN-042.123 for additional requirements	
59	C58SS9J3	DFCR20A5C2L0LE0012	1.5	0.75	3000 lbs			EA	20	1.5 IN x .75 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, Hydrogen Service, Refer to Axens specification IN-042.123 for additional requirements	
60	C58VJ0WN	DBE920S5DE30010000	6			S-80S		EA	20	6 IN x S-80S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, -	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

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CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
61	C58VJ3DA	DBE4205SDE30030001	10			S-30		EA	4	10 IN x S-30 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
62	C58VJ3VC	DFE4205SC3L0LE0001	0.75		3000 lbs			EA	10	.75 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, Hydrogen Service	
63	C58VJH0E	DBE9205SDE30010001	3			S-10S		EA	10	3 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
64	C58VJH30	DBE9205SDE30010001	4			S-40S		EA	10	4 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
65	C58VJH8P	DBE9205SDE30010001	8			S-40S		EA	20	8 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
66	C58VJH90	DFE9205SC3L0LE0001	0.75		3000 lbs			EA	30	.75 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, Hydrogen Service	
67	C58VJHFO	DBE9205SDE30030001	10			S-30		EA	12	10 IN x S-30 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
68	C58VJ8S	DBCP205SDE30010001	16			S-40S		EA	2	16 IN x S-40S Cap, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
69	C58W1WNW	DBRE205SDE30030001	10	8		S-30	S-40S	EA	2	10 IN x S-30 / 8 IN x S-40S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
70	C58W7BL7	DFSEI05SC3300001	3	1.5		S-10S	S-40S	EA	10	3 IN x S-10S / 1.5 IN x S-40S Eccentric swage, MSS SP-95, ASTM A182 Gr.F304/304L + Sour Service, BE/PE, -, Hydrogen Service	
71	C58W87DN	DBTE205SDE30030001	10			S-30		EA	1	10 IN x S-30 Equal tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
72	C58WE8GP	DBTR205SDE30030001	10	8		S-30	S-40S	EA	1	10 IN x S-30 / 8 IN x S-40S Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
73	C58Y2G1J	DBRC205SDL30030000	12	6		S-20	S-10S	EA	2	12 IN x S-20 / 6 IN x S-10S Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
74	C58Z6URT	DBRE205SDL30030000	12	10		S-20	S-10S	EA	2	12 IN x S-20 / 10 IN x S-10S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
75	C58Z716T	DBRE205SDL30030000	16	10		S-20	S-10S	EA	1	16 IN x S-20 / 10 IN x S-10S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
76	C58Z9K8A	DBE920ASCO30010001	0.5			S-XXS		EA	20	.5 IN x S-XXS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, Hydrogen Service	
77	C5G9AV8	DBE920A5C830030002	16			S-60		EA	2	16 IN x S-60 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, ,LBR	
78	C5NEPJWT	DBE9205SDE30030001	18			S-40S		EA	2	18 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L + Sour Service, BW Ends, -, Hydrogen Service	
79	C5NR1WZH	DBE9205SDX30010001	3			S-XXS		EA	2	3 IN x S-XXS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
80	C610GGKV	DFTE205SC3L0LE0001	0.75		3000 lbs			EA	10	.75 IN Equal tee, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, Hydrogen Service	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
81	C74MPN8G	DFCP20SSCOR1LE0001	0.5		3000 lbs			EA	30	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F321, NPTF End, -, 3000 Lbs, Hydrogen Service	
82	C74MPUHK	DFNP20A400101020002	0.5			S-160		EA	50	.5 IN x S-160 Seamless, Nipple, L = 75mm, ASME B36.10, ASTM A335 Gr.P11, PE/NPTM End, -, IBR	
83	C74MPUS9	DFNP21S40F3101020001	0.5			S-XXS		EA	120	.5 IN x S-XXS Seamless, Nipple, L = 75mm, ASME B36.19/B36.10, ASTM A312 Gr.TP321, BE/NPTM End, -, Hydrogen Service	
84	C75J77JM	DFNP20A400101020012	0.5			S-160		EA	40	.5 IN x S-160 Seamless, Nipple, L = 75mm, ASME B36.10, ASTM A335 Gr.P11, PE/NPTM End, -, Hydrogen Service, Refer to Axens specification IN-042.123 for additional requirements	
85	C7LSRMM	DFE920SSCELOLE0000	0.5		3000 lbs			EA	20	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
86	C8D28S8	DBE920A5CD30030000	20			S-STD		EA	2	20 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPS Cl.1, BW Ends, -, -,	
87	C95UWU2P	DFNP20A4003101020016	0.5			S-XXS		EA	100	.5 IN x S-XXS Seamless, Nipple, L = 75mm, ASME B36.10, ASTM A335 Gr.P11, BE/NPTM End, -, Sour Service, Hydrogen Service	
88	C95UYA82	DFUNI2A5CDR4LG0000	0.5		6000 lbs			EA	20	.5 IN Union, MSS SP-83, ASTM A182 Gr.F9, NPTF Ends, -, 6000 Lbs, -,	
89	C95UZ7U4	DFUNI2SSCDR4LG0000	0.5		6000 lbs			EA	60	.5 IN Union, MSS SP-83, ASTM A182 Gr.F316/316L + Sour Service, NPTF Ends, -, 6000 Lbs, -,	
90	C95UZ7UF	DFUNI2SSCOR4LG0001	0.5		6000 lbs			EA	30	.5 IN Union, MSS SP-83, ASTM A182 Gr.F321, NPTF Ends, -, 6000 Lbs, Hydrogen Service	
91	C95UZ7V6	DFCP20A5CNR1LG0001	0.5		6000 lbs			EA	40	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F11 Cl.2 + Sour Service, NPTF End, -, 6000 Lbs, Hydrogen Service	
92	C95UZ7V8	DFCP20SSCOR1LG0001	0.5		6000 lbs			EA	40	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F321, NPTF End, -, 6000 Lbs, Hydrogen Service	
93	C95UZ7W1	DFNP20A400101020016	0.5			S-XXS		EA	20	.5 IN x S-XXS Seamless, Nipple, L = 75mm, ASME B36.10, ASTM A335 Gr.P11, PE, -, Sour Service, Hydrogen Service	
94	CAH7HTB	DBTR20S5DF30010000	3	1.5		S-10S	S-40S	EA	2	3 IN x S-10S / 1.5 IN x S-40S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
95	CBMFR3H	DBTE20S5DF30010000	8			S-10S		EA	9	8 IN x S-10S Equal tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
96	CDBBW9EG	DBE420S5DF30010000	3			S-10S		EA	2	3 IN x S-10S 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
97	CDBBW9K8	DBE420S5DF30030000	10			S-10S		EA	15	10 IN x S-10S 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
98	CDBBW9LM	DBE420S5DF30030000	12			S-10S		EA	10	12 IN x S-10S 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
99	CDBBW9PL	DBE420S5DF30030000	16			S-10S		EA	2	16 IN x S-10S 45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
100	CDBBWA50	DBE920S5DF30030000	10			S-10S		EA	120	10 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
101	CDBBWA6D	DBE92055DF30030000	12			S-10S		EA	80	12 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
102	CDBBWA9C	DBE92055DF30030000	16			S-10S		EA	2	16 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
103	CDBBXHXX	DBRE2055DF30030000	12	8		S-10S	S-10S	EA	1	12 IN x S-10S / 8 IN x S-10S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
104	CDBBZ1ZC	DBTE2055DF30010000	4			S-10S		EA	2	4 IN x S-10S Equal tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
105	CDBBZ21B	DBTE2055DF30010000	6			S-10S		EA	3	6 IN x S-10S Equal tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
106	CDBBZ28D	DBTE2055DF30030000	10			S-10S		EA	1	10 IN x S-10S Equal tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
107	CDBBZDZW	DBTR2055DF30010000	6	3		S-10S	S-10S	EA	1	6 IN x S-10S / 3 IN x S-10S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
108	CDBBZF56	DBTR2055DF30010000	6	4		S-10S	S-10S	EA	3	6 IN x S-10S / 4 IN x S-10S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
109	CDBBZZD0	DBTR2055DF30030000	10	6		S-10S	S-10S	EA	2	10 IN x S-10S / 6 IN x S-10S Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
110	CDF5FCAP	DFCP2055CHR11E0000	0.5		3000 lbs			EA	11	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F316L, NPTF End, -, 3000 Lbs, -,	
111	CDFBW9Y1	DFE92055C4L0LE0000	0.5		3000 lbs			EA	150	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
112	CDFBW9Y2	DFE92055C4L0LE0000	0.75		3000 lbs			EA	50	.75 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
113	CDFBW9Y3	DFE92055C4L0LE0000	1		3000 lbs			EA	200	1 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
114	CDFBW9Y5	DFE92055C4L0LE0000	1.5		3000 lbs			EA	20	1.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
115	CDFBW82K	DFCF2055C4L0LE0000	0.75		3000 lbs			EA	20	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
116	CDFBW82L	DFCF2055C4L0LE0000	1		3000 lbs			EA	600	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
117	CDFBW82N	DFCF2055C4L0LE0000	1.5		3000 lbs			EA	30	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
118	CDFBZ1VJ	DFTE2055C4L0LE0000	0.75		3000 lbs			EA	12	.75 IN Equal tee, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
119	CDFD3NSE	DFE42055C4L0LE0000	0.5		3000 lbs			EA	60	.5 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
120	CDFD3NSG	DFE42055C4L0LE0000	1		3000 lbs			EA	21	1 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
121	CIKAEYA	DBTE20ASCD30010000	6			S-XS		EA	2	6 IN x S-XS Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
122	CIKSN6N	DBE920ASCD30010000	12			S-XS		EA	10	12 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
123	CIKSNAX	DBE920ASCD30010000	4			S-XS		EA	10	4 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
124	CIKXYS1	DBTE20ASCD30010000	14			S-XS		EA	1	14 IN x S-XS Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
125	CKA0XD1	DBTR20ASCI30010000	3	2		S-STD	S-XS	EA	2	3 IN x S-STD / 2 IN x S-XS Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
126	CKA8SKB	DBTR20ASCI30010000	6	3		S-STD	S-STD	EA	4	6 IN x S-STD / 3 IN x S-STD Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
127	CKAGWX4	DFE920ASCGL0LG0000	0.5		6000 lbs			EA	20	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 6000 Lbs, -,	
128	CKAMLDE	DFCF20ASCGL0LG0000	0.5		6000 lbs			EA	48	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 6000 Lbs, -,	
129	CKAUC61	DBE920ASCI30010000	3			S-XS		EA	10	3 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
130	CLLGPJE	DBE920ASCO30010000	10			S-XS		EA	4	10 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, -,	
131	CLLGPSX	DBE920ASCO30010000	2			S-XS		EA	10	2 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, -,	
132	CLTC4L15	LTL5I055C4L0LE0000	12	0.75	3000 lbs			EA	3	12 IN x .75 IN Socket, MSS SP-97, ASTM A182 Gr.F304/304L, 3000 Lbs, SW Ends, -, -,	
133	CLTC4L1T	LTL5I055C4L0LE0000	2	1	3000 lbs			EA	25	2 IN x 1 IN Socket, MSS SP-97, ASTM A182 Gr.F304/304L, 3000 Lbs, SW Ends, -, -,	
134	CR2ZVXA	DFCF20ASC6L0LG0000	0.75		6000 lbs			EA	70	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 6000 Lbs, -,	
135	CS95REC	DBE920ASCD30010000	2			S-XS		EA	10	2 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
136	CTNH2D5	DBTR20SSDM30010000	3	1.5		S-40S	S-40S	EA	2	3 IN x S-40S / 1.5 IN x S-40S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP316/316L, BW Ends, -, -,	
137	CV0KCOB	DBE920SSDL30010000	4			S-10S		EA	4	4 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
138	CV2FF6N	DBE420SSDT30010000	2			S-40S		EA	2	2 IN x S-40S 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321 + Sour Service, BW Ends, -, -,	
139	CV2FFWT	DBE920SSDT30010000	3			S-40S		EA	2	3 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321 + Sour Service, BW Ends, -, -,	
140	CW17X50	DBE920ASCD30010000	12			S-STD		EA	10	12 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
141	CX37WE	DBE42055DF30010000	2			S-40S		EA	20	2 IN x S-40S 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
142	CX38Y1	DBE92055DF30010000	2			S-40S		EA	160	2 IN x S-40S 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
143	CX5DSV	DBTE2055DF30010000	2			S-40S		EA	6	2 IN x S-40S Equal tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
144	CXNYJLM	DFE92055CDL0LE0000	1.5		3000 lbs			EA	10	1.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F316/316L + Sour Service, SW Ends, -, 3000 Lbs, -,	
145	CXNYJVB	DBE92055DL30030000	10			S-10S		EA	16	10 IN x S-10S 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
146	CXNYLU0	DBRE2055DL30030000	10	6		S-10S	S-10S	EA	20	10 IN x S-10S / 6 IN x S-10S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
147	CXNYNCU	DBRE2055DL30030000	10	8		S-10S	S-10S	EA	2	10 IN x S-10S / 8 IN x S-10S Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
148	CXNZ2R4	DBTE2055DL30030000	10			S-10S		EA	8	10 IN x S-10S Equal tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
149	CXNZXPR	DBTR2055DL30030000	10	6		S-10S	S-10S	EA	2	10 IN x S-10S / 6 IN x S-10S Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
150	CXPOW43	LTL51055CDL0LE0000	4	0.75	3000 lbs			EA	2	4 IN x .75 IN Socketolet, MSS SP-97, ASTM A182 Gr.F316/316L + Sour Service, 3000 Lbs, SW Ends, -, -,	
151	CYKBYTA	DFE42055CDL0LE0000	0.5		3000 lbs			EA	20	.5 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F316/316L + Sour Service, SW Ends, -, 3000 Lbs, -,	
152	CYKCFM6	DFCF2055CDL0LE0000	0.5		3000 lbs			EA	100	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L + Sour Service, SW Ends, -, 3000 Lbs, -,	
153	CYKPD12	DFE92055CML0LE0000	0.5		3000 lbs			EA	40	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F321 + Sour Service, SW Ends, -, 3000 Lbs, -,	
154	CYSKTZ0	DBTE20A5CD30010000	2			S-160		EA	4	2 IN x S-160 Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
155	CYTGXMC	DBE92055DL30030000	14			S-20		EA	2	14 IN x S-20 90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316/316L + Sour Service, BW Ends, -, -,	
156	CYZAHAB	DFNP2154041101040000	0.5			S-80S		EA	100	.5 IN x S-80S Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP316/316L, PE/NPTM End, -, -,	
157	C103WEUF	DFCF2055CML0LE0000	0.5		3000 lbs			EA	15	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321 + Sour Service, SW Ends, -, 3000 Lbs, -,	
158	C1K8TKDC	DFCF2055C3L0LE0000	1.5		3000 lbs			EA	15	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, -,	
159	C1NFESBU	DFCF20A5C6L0LE0000	1.5		3000 lbs			EA	10	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 3000 Lbs, -,	
160	C1YSRFC5	DFCF20A5C6L0LE0000	1		3000 lbs			EA	10	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 3000 Lbs, -,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
161	C24AK1V	DFCF20ASCGL0LE0000	1		3000 lbs			EA	10	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 3000 Lbs, -,	
162	C24AK1X	DFCF20ASCGL0LE0000	1.5		3000 lbs			EA	10	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 3000 Lbs, -,	
163	C25E2BZN	DFCR20SSC0L0LE0001	1		3000 lbs			EA	20	1 IN x .5 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 3000 Lbs, Hydrogen Service	
164	C4M1ULX4	DBE420SSDX30010001	0.75			S-XXS		EA	15	.75 IN x S-XXS 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
165	C4M1UN16	DBCP20SSDX30010001	1			S-XXS		EA	5	1 IN x S-XXS Cap, Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
166	C51M70EG	DFE920ASC2L0LE0010	1.5		3000 lbs			EA	10	1.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
167	C51MFE8F	DFCP20ASC2L0LG0010	0.75		6000 lbs			EA	15	.75 IN Cap, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW End, -, 6000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
168	C51MFGHP	DFCF20ASC2L0LE0010	1.5		3000 lbs			EA	10	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR,Refer to Axens specification IN-042.123 for additional requirements	
169	C58S59HM	DFCF20ASC2L0LG0012	0.5		6000 lbs			EA	10	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, Hydrogen Service, Refer to Axens specification IN-042.123 for additional requirements	
170	C58VJH8Z	DFE920SSC3L0LE0001	0.5		3000 lbs			EA	40	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, Hydrogen Service	
171	C58VJRF9	DFCF20SSC3L0LE0001	0.75		3000 lbs			EA	20	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, Hydrogen Service	
172	C593CD66	DFNP21S40F101040001	0.75			S-80S		EA	40	.75 IN x S-80S Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP321, PE/NPTM End, -, Hydrogen Service	
173	C7LCXG6	DFTE20SSCELOLE0000	1		3000 lbs			EA	80	1 IN Equal tee, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
174	C7THXJ1	DFCF20SSCELOLE0000	0.75		3000 lbs			EA	15	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
175	C7THXJ4	DFCF20SSCELOLE0000	1.5		3000 lbs			EA	15	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
176	C7THXJ5	DFCR20SSCELOLE0000	0.75	0.5	3000 lbs			EA	100	.75 IN x .5 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
177	C7THXJ0	DFCF20SSCER4LE0000	0.5		3000 lbs			EA	100	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L, NPTF Ends, -, 3000 Lbs, -,	
178	CKSN95	DBE920ASCD30010000	3			S-XS		EA	10	3 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
179	CKAMLDF	DFCF20ASCGL0LG0000	0.75		6000 lbs			EA	80	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 6000 Lbs, -,	
180	CR2ZVX9	DFCF20ASC6L0LG0000	0.5		6000 lbs			EA	30	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 6000 Lbs, -,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
181	CV2FF48	DFE42055CML0LE0000	0.75		3000 lbs			EA	10	.75 IN 45 Degree elbow, ASME B16.11, ASTM A182 Gr.F321 + Sour Service, SW Ends, -, 3000 Lbs, -,	
182	CXEZB4B	DFNP20A403101040000	0.75			S-160		EA	1	.75 IN x S-160 Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P5, PE/NPTM End, -, ,	
183	CXNYKXF	DFCF2055CDL0LE0000	0.75		3000 lbs			EA	30	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L + Sour Service, SW Ends, -, 3000 Lbs, -,	
184	CXNYKXJ	DFCF2055CDL0LE0000	1.5		3000 lbs			EA	10	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F316/316L + Sour Service, SW Ends, -, 3000 Lbs, -,	
185	C4M1UV36	DBRC2055DX30010001	0.75	0.5		S-XXS	S-XXS	EA	6	.75 IN x S-XXS / .5 IN x S-XXS Concentric reducer, Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
186	C9NJ6W35	DFNP20A400101050002	0.75			S-160		EA	30	.75 IN x S-160 Seamless, Nipple, L = 150mm, ASME B36.10, ASTM A335 Gr.P11, PE/NPTM End, -, IBR,	
187	C358XVH0	LTL51055COL0LE0001	14	1	3000 lbs			EA	5	14 IN x 1 IN Socketlet, MSS SP-97, ASTM A182 Gr.F321, 3000 Lbs, SW Ends, -, Hydrogen Service	
188	C7FY4A5	DFCR2055C4L0LE0000	1.5	1	3000 lbs			EA	20	1.5 IN x 1 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F304/304L, SW Ends, -, 3000 Lbs, -,	
189	C7LSRMH	DFTR2055CELOLE0000	1.5	0.75	3000 lbs			EA	10	1.5 IN x .75 IN Reducing tee, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
190	CBMBN9T	DBTR2055DF30010000	2	1.5		S-40S	S-40S	EA	10	2 IN x S-40S / 1.5 IN x S-40S Reducing tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, ,	
191	CHVF4VX	DFSCI055CE300000	2	1.5		S-40S	S-40S	EA	10	2 IN x S-40S / 1.5 IN x S-40S Concentric swage, MSS SP-95, ASTM A182 Gr.F316/316L, BE/PE, -, ,	
192	C1RYR63F	DFCR20A5CGL0L0G0000	0.75	0.5	6000 lbs			EA	30	.75 IN x .5 IN Reducing coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 6000 Lbs, -,	
193	C4M1UMZJ	DBCP2055DX30010001	0.5			S-XXS		EA	50	.5 IN x S-XXS Cap, Seamless, ASME B16.9, ASTM A403 Gr.WP321, BW Ends, -, Hydrogen Service	
194	CS829M36	DBCP20A5CO30010001	0.5			S-XXS		EA	20	.5 IN x S-XXS Cap, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, Hydrogen Service	
195	C67BYA4R	DBRE20A5CO30010001	0.75	0.5		8.74MM	S-XXS	EA	20	.75 IN x 8.74MM / .5 IN x S-XXS Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1 + Sour Service, BW Ends, -, Hydrogen Service	
196	C750VESA	DFNP21S40F3201040001	0.75			S-XXS		EA	60	.75 IN x S-XXS Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP321, BE, -, Hydrogen Service	
197	CK9VPTY	DFNP20A41F1001040000	0.75			S-160		EA	30	.75 IN x S-160 Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P9, PE, -, ,	
198	CKAGXM5	DFCP20A5CGL0L0G0000	0.5		6000 lbs			EA	20	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F9, SW End, -, 6000 Lbs, -,	
199	CACG59PL	DFCF2055COR4LE0001	0.5	0.5	3000 lbs			EA	10	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321 + Sour Service, NPTF Ends, -, 3000 Lbs, -,	
200	CYZAHB0	DFNP21S404101040000	0.75			S-80S		EA	100	.75 IN x S-80S Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP316/316L, PE/NPTM End, -, ,	



PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501



Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
201	C24GTHW	DBRE20A5CI30010000	10	8		S-STD	S-STD	EA	3	10 IN x S-STD / 8 IN x S-STD Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
202	C1AHU0JK	DFCF20SSD0L0L0E0000	0.75		3000 lbs			EA	10	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F53, SW Ends, -, 3000 Lbs, -,	
203	C1R1J0E7	DFCF20ASCNL0LH0000	0.75		9000 lbs			EA	15	.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2+ Sour service, SW Ends, -, 9000 Lbs	
204	C2SEFSUT	DFCF20ASC2L0L0E0002	1		3000 lbs			EA	20	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	
205	C3NXUW44	DFCF20ASCNL0LH0000	0.5		9000 lbs			EA	15	0.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2+ Sour service, SW Ends, -, 9000 Lbs	
206	CADPD091	DFCF20SSCOL0LH0001	0.5		9000 lbs			EA	120	0.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 9000 Lbs, Hydrogen Service	
207	CADPD092	DFCF20SSCOL0LH0001	0.75		9000 lbs			EA	20	0.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 9000 Lbs, Hydrogen Service	
208	CADPD093	DFCF20SSCOL0LH0001	1		9000 lbs			EA	20	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 9000 Lbs, Hydrogen Service	
209	CADPD095	DFCF20SSCOL0LH0001	1.5		9000 lbs			EA	20	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F321, SW Ends, -, 9000 Lbs, Hydrogen Service	
210	CADPD099	DFCF20ASCGL0LG0002	0.75		6000 lbs			EA	15	0.75 IN Full coupling, ASME B16.11, ASTM A182 Gr.F9, SW Ends, IBR -, 6000 Lbs,	
211	CR2ZVXB	DFCF20ASC6L0LG0000	1		6000 lbs			EA	15	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 6000 Lbs,	
212	CAE6EU7E	DFF920SSCOR4LE0001	0.5		3000 lbs			EA	20	.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F321, NPTF Ends, -, 3000 Lbs, Hydrogen Service	
213	CAE6G51S	DFTE20SSCOR6LE0001	0.5		3000 lbs			EA	20	.5 IN Equal tee, ASME B16.11, ASTM A182 Gr.F321, NPTF Ends, -, 3000 Lbs, Hydrogen Service	
214	CLF79MN	DFCF20ASCGR1LG0000	0.5		6000 lbs			EA	30	.5 IN Cap, ASME B16.11, ASTM A182 Gr.F9, NPTF End, -, 6000 Lbs, -,	
215	C74MPUT1	DFNP21S40F3101020001	0.75			S-XXS		EA	70	.75 IN x S-XXS Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP321, PE/NPTM End, -, Hydrogen Service	
216	C2US8JHT	DFNP20A41F1101040000	0.75			S-160		EA	50	0.75 IN x S-160 Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P9, PE/NPTM End, -, -,	
217	CAEB039L	DFNP20A40031010500016	0.75			8.74mm		EA	35	.75 IN x 8.74mm Seamless, Nipple, L = 150mm, ASME B36.10, ASTM A335 Gr.P11, PE/NPTM End, -, SOUR SERVICE, NACE MR0103,	
218	CR2ZVXD	DFCF20ASC6L0LG0000	1.5		6000 lbs			EA	15	1.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F5, SW Ends, -, 6000 Lbs,	
219	C51M70YH	DBE920A5C830010015	6			S-XS		EA	3	6 IN x S-XS 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR, Refer to Axens specification IN-042.123 for additional requirements	
220	C10MR1WP	DBE920A5CD30010000	10			14.27MM	0	EA	3	10 IN x 14.27MM 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPS Cl.1, BW Ends, -, -,	





PART I : EQUIPMENT / BULK MATERIAL SUPPLY
Annexure - 1

PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY
CLIENT :	INDIAN OIL CORPORATION LIMITED
Rev. No. A	Document No. 077154C-000-SR-1330-501

Position	Ident Code	Commodity Code	Size 1	Size 2	Rating	WT1	WT2	Quantity Unit	Inquiry Quantity	Ident Description	Remarks
221	C10MR21A	DBE920A5CD30010000	14			S-STD	0	EA	2	14 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
222	C1Y5W2YG	LTL5I0A5C6L0LE0000	12	1	3000 lbs		0	EA	2	12 IN x 1 IN Socketlet, MSS SP-97, ASTM A182 Gr.F5, 3000 Lbs, SW Ends, -, -,	
223	CKSNMNM	DBE420A5CD30010000	12			S-XS	0	EA	2	12 IN x S-XS 45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP5 Cl.1, BW Ends, -, -,	
224	C1L6M9K	LTL5I0A5CGL0LG0000	6	0.75	6000 lbs		0	EA	3	6 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F9, 6000 Lbs, SW Ends, -, -,	
225	C1L6M9P	LTL5I0A5CGL0LG0000	8	0.75	6000 lbs		0	EA	3	8 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F9, 6000 Lbs, SW Ends, -, -,	
226	C24A4YX	DBE920A5CI30010000	6			S-STD	0	EA	2	6 IN x S-STD 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP9 Cl.1, BW Ends, -, -,	
227	C74AUZEA	LTL5I0A5CGL0LG0002	3	0.75	6000 lbs		0	EA	2	3 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F9, 6000 Lbs, SW Ends, -, IBR	
228	CKAMLDK	DFTE20A5CGL0LG0000	0.5		6000 lbs			EA	2	.5 IN Equal tee, ASME B16.11, ASTM A182 Gr.F9, SW Ends, -, 6000 Lbs, -,	
229	C351HLZ0	LTL5I05SC0L0LE0001	4	0.75	3000 lbs			EA	2	4 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F321, 3000 Lbs, SW Ends, -, Hydrogen Service	
230	C2JCUFA	DFCF2055C4R4LE0000	0.5		3000 lbs			EA	24	.5 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L, NPTF Ends, -, 3000 Lbs, -,	
231	C94MF3V5	DFSCIO55C4I10000	1	0.5		S-405	S-805	EA	7	1 IN x S-405 / .5 IN x S-805 Concentric swage, MSS SP-95, ASTM A182 Gr.F304/304L, PE/NPTM End, -, -,	
232	CDBBWA3V	DBE92055DF30010000	6			S-105		EA	4	6 IN x S-105 90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304/304L, BW Ends, -, -,	
233	CLTC4L2U	LTL5I055C4L0LE0000	6	0.75	3000 lbs			EA	2	6 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F304/304L, 3000 Lbs, SW Ends, -, -,	
234	C1K8RS6F	DFE92055C3L0LE0000	0.75		3000 lbs			EA	2	.75 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304/304L + Sour Service, SW Ends, -, 3000 Lbs, -,	
235	C1K8UU6C	LTL5I055C3L0LE0000	6	0.75	3000 lbs			EA	3	6 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F304/304L + Sour Service, 3000 Lbs, SW Ends, -, -,	
236	CS8WHD25	LTL5I055C3L0LE0001	10	0.75	3000 lbs			EA	3	10 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F304/304L + Sour Service, 3000 Lbs, SW Ends, -, Hydrogen Service	
237	C7LSRMS	DFE92055CELOLE0000	1.5		3000 lbs			EA	2	1.5 IN 90 Degree elbow, ASME B16.11, ASTM A182 Gr.F316/316L, SW Ends, -, 3000 Lbs, -,	
238	C94MEEEX3	DFSCIO55CEI10000	1	0.5		S-405	S-805	EA	14	1 IN x S-405 / .5 IN x S-805 Concentric swage, MSS SP-95, ASTM A182 Gr.F316/316L, PE/NPTM End, -, -,	
239	CXP0W2R	LTL5I055CDL0LE0000	16	0.75	3000 lbs			EA	3	16 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F316/316L + Sour Service, 3000 Lbs, SW Ends, -, -,	
240	CXP0W3T	LTL5I055CDL0LE0000	3	0.75	3000 lbs			EA	2	3 IN x .75 IN Socketlet, MSS SP-97, ASTM A182 Gr.F316/316L + Sour Service, 3000 Lbs, SW Ends, -, -,	
241	C7H1W6CE	DFSC1155C4I20000	1	.5		S-405	S-805	EA	4	1 IN x S-405 / .5 IN x S-805 Concentric swage, MSS SP-95 where applicable, ASTM A182 Gr.F304/304L, PE/NPTF End, -, -,	
242	C2JCUFC	DFCF2055C4R4LE0000	1		3000 lbs			EA	1	1 IN Full coupling, ASME B16.11, ASTM A182 Gr.F304/304L, NPTF Ends, -, 3000 Lbs, -,	

 		PROJECT :	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
		CLIENT :	INDIAN OIL CORPORATION LIMITED		
SUPPLY REQUISITION FOR ALLOY STEEL & STAINLESS STEEL FITTINGS		Project No. 077154C001	Document No. 077154C-000-SR-1330-501	Rev. No. A	Page 3 of 3
<u>PART II : DOCUMENTS AND DRAWINGS SUPPLY</u>					
VDR (1)	Description	First Issue			Final Issue (5)
		Issue Date (2)	Purpose (3)	Quantity Type (4)	Quantity Type (4)
A0001	List of VENDOR's Documents and Drawings	+3 W	IFR	1E	1E
A0401	VENDOR Engineering Data-Book	1 W BEFORE DELIVERY	IFR	1E	6C + 1E
A1101	Cross Sectional and Assembly Drawings (With Part List)	+2 W	IFR	1E	1E
B1002	Fabrication Quality Control Plan	+2 W	IFR	1E	1E
B1004	VENDOR Manufacturing Data Book	1 W BEFORE DELIVERY	IFI	1E	6C + 1E
B1103	Testing and Control Procedures	+3 W	IFR	1E	1E
B1201	PWHT Procedure	+3 W	IFR	1E	1E
B1202	NDT Procedure	+3 W	IFR	1E	1E
B1204	Welders Qualification Certificates	+3 W	IFR	1E	1E
B1209	Hydraulic and Others Shop Tests Records	4 W BEFORE DELIVERY	IFR	1E	1E
B1210	Material Certificates	0 W BEFORE DELIVERY	IFR	1E	1E
C1001	Engineering-Procurement-Manufacturing-Testing and Traffic Schedule	+2 W	IFR	1E	1E
C1002	Progress Report	+3 W	IFR	1E	1E
C1007	Preliminary Packing List	2 W BEFORE DELIVERY	IFR	1E	1E
NOTES : (1) * Priority document subject to penalization or term of payment (2) ISSUE DATE: number of D = Days / W = Weeks / M = Months after purchase order effective date (unless otherwise specified) (3) PURPOSE: IFR = Issue for review and comments / IFI = Issue for information (4) QUANTITY: per type / TYPE : C = Copy, E = Electronic file, CD = CDROM, OR = Original (5) FINAL ISSUE: Document without comments (with document status = 3)					
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	CLIENT	INDIAN OIL CORPORATION LIMITED		
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REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED
H	26-SEP-2022	ISSUED FOR DESIGN	JR	JL	TI/SL	PSSG
G	20-OCT-2021	ISSUED FOR DESIGN	JR	JL	TI/SL	PSSG
F	2-JULY-2021	ISSUED FOR DESIGN	DK	JL	TI	PSSG
E	09-APR-2021	ISSUED FOR DESIGN	DK	VV	TI	BSR/PSSG
D	07-JAN-2020	ISSUED FOR DESIGN	PM	VV	TI	BSR/PSSG
C	03-DEC-2020	ISSUED FOR DESIGN	PM	VV	TI	BSR/PSSG
B	25-JUN-2019	ISSUED FOR USE	CK	VV	TI	BSR/PSSG
A	08-JUN-2018	ISSUED FOR DESIGN	SK	VV	TI	MP/PSSG

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1 INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) raising the capacity of its Gujarat refinery as well as setting up a petrochemical plant at the unit as part of plans for upscaling Petchem business to protect margins.



The project envisages raising the capacity of the Vadodara refinery in Gujarat from 13.7 MMTPA to 18 MMTPA and building a 500 KTPA polypropylene (PP) plant and a 235 KTPA Lube Oil Base Stock (LOBS) unit.

The project would be a building block for the production of niche chemicals in future with a potential to increase petrochemical and specialty products integration index on incremental crude oil throughput which would enhance the refinery margins.

The Gujarat Refinery project is part of IOC's plans to boost petrochemical capacity by more than 70 per cent over the next decade, from 3.2 million tonnes a year currently.

2 DEFINITIONS & ABBREVIATIONS

Abbreviation	Definition /Expanded form
IOCL/ CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design
FEL	Front End Loading
AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.
PART-I	Indicates New AVU, Straight Run LPG Treater Unit and its offsite & integration portion of the PROJECT
PART-II	Indicates all the balance Units / facilities and its off sites, utilities & integration portion of the PROJECT
VENDOR	Any third party supplying the equipment/materials for setting up the Plant
LLI	Long Lead Item – Any equipment / Package / Work order taking 16 months or more completion time from the date of award
PROJECT	Indicates Petrochemical and Lube Integration Project "LuPech" (J18), IOCL Gujarat Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
OISD	Oil Industry Safety Directorate
ASME	American Society of Mechanical Engineers

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API	American Petroleum Institute
P&ID	Piping and Instrumentation Diagram
A/G	Above Ground
U/G	Under Ground
B/L	Battery Limit
ISBL	Inside Battery Limit
EOT	Electrically-operated Overhead Travelling
MTO	Material Take Off

3 SCOPE



This specification defines the technical requirements of carbon steel, alloy steel, Stainless steel and Super duplex stainless steel, butt welding fittings of various types such as elbows, tees, reducers, caps etc. commonly used in refineries, petro-chemical and other chemical / industrial plants.

Cast iron, non-metals, and other special design / special materials fittings etc. are not covered herein. However the specification may be used for any other type of fittings of different design or material of construction by suitably specifying additional requirements as may be applicable.

The requirements specified here are supplementary to Piping Material Specification (PMS).

4 TERMINOLOGY

MR	Material Requisition
PR	Purchase Requisition
PO	Purchase Order
CS	Carbon steel
LTCS	Low Temp. Carbon Steel
AS	Alloy Steel
SS	Stainless steel
WN	Welding Neck
BW	Butt Weld
SW	Socket Weld
SCRD	Screwed
DP	Dye-Penetrant Test
MP	Magnetic Particle Test
NDT	Non Destructive Testing
NPT	National Pipe Threads
PMI	Positive Material Identification
IGC	Inter Granular Corrosion
HIC	Hydrogen Induced cracking



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SSC	Sulfide stress cracking
CRYO	Cryogenic
IBR	Indian Boiler Regulations
AARH	Arithmetic Average Roughness Height
BHN	Brinell Hardness Number
ITP	Inspection Test Plan
TPI	Third Party Inspection
MOC	Material of Construction
PBE	Plain both Ends
TBE	Threaded both Ends
TOE	Threaded one End
TSE	Threaded small end
TLE	Threaded large end

5 REFERENCE CODES & STANDARDS

The following codes shall be applicable, however purchaser may specify any other relevant code for any purpose at any time. The codes latest edition as on date of issue of material requisition shall be applicable. Some BS codes may have been superseded by ISO / BS –EN codes, the latest one shall be acceptable.

Code /Std. No	Description
API 5L	Specification for line pipe
ASME SEC VIII Div.1 UW-51	ASME Boiler and Pressure Vessel Code
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory-Made Wrought Buttwelding Fittings
ASME B16.25	ButtWelding Ends
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME B36.10	Welded and seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe
MSS SP-25	Standard Marking System for Valves, Fittings, Fittings, and Unions
MSS SP-75	High-Strength, Wrought, Butt-Welding Fittings
NACE MR0103	Materials Resistant to Sulphide Stress Cracking in Corrosive Petroleum Refining Environments
NACE MR0175 / ISO 15156	Petroleum, Petrochemical and Natural Gas Industries – Materials for Use In H ₂ S-Containing Environments in Oil And Gas Production

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BS 3799	Specification for Steel Pipe Fittings, Screwed and Socket Welding for the Petroleum Industry
BS EN10204	Metallic Products – Types of Inspection Documents
ASTM Standards	As specified or relevant
077154C-000-SP-1390-009	Specification for colour coding of piping materials by vendors
077154C-000-JSS-6300-002	Specification for Positive Material Identification at Suppliers Works
077154C-000-JSS-1320-001	Job Supply Specification for Pipes

6 GENERAL REQUIREMENTS

- 6.1 Fittings shall be manufactured, inspected and marked as per the manufacturing standards. Any conflict between the requisition, enclosures, and referred standards shall be brought to the notice of the purchaser for clarifications and resolution before proceeding with the manufacture. The purchaser's decision shall be final and binding to the vendor. No deviations shall be permitted except as communicated in writing in deviation permits.
- 6.2 Fittings dimension, tolerances, chemical composition, physical properties, heat treatment, hydro-test (if applicable), and other testing requirements shall conform to relevant codes / standards, latest editions (including their supplementary requirements) as specified in the material requisition. Deviation from the above, if any, shall be specifically highlighted to the purchase by the vendor.
- 6.3 Any conflicts between requirements of this specification, related standards and other attached documents shall be referred to the purchaser for clarification before proceeding with the manufacture, fabrication and procurement of the disputed part.
- 6.4 All threaded Joints, irrespective of pressure and temperature, shall be seal welded with full strength fillet weld



7 DESIGN REQUIREMENTS

7.1 Fitting Dimensions:

- 7.1.1 Fittings dimensions up to 48” size shall conform to ASME B16.9. Fittings dimensions greater than 48” size shall conform to MSS SP-75, Induction bends shall conform to ASME B16.49 Where any other standard is referred or dimensional requirements are specified in MR, vendor shall adhere to the same.
- 7.1.2 All welded carbon steel, alloy steel and stainless steel, Super Duplex Stainless steel fittings shall have maximum negative tolerance same as of pipe.

7.2 Fittings End Schedule / Thickness:

- 7.2.1 Fittings outside diameter and schedule / wall thickness shall match pipe schedule as per ASME B36.10 / B36.19 / API 5L as the case may be. Sloping of inside contour of fittings shall be done wherever necessary to achieve this.
- 7.2.2 For reducing butt weld fittings having different wall thickness at each end, the greater wall thickness of the fitting shall be employed and inside bore at each end shall be matched with the specified inside diameter.
- 7.2.3 Bore of fittings shall correspond to the inside diameter of pipe for specified schedule / wall thickness. Ends shall be bevelled to suit the specified schedule/ thickness.

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7.2.4 Fittings ends shall be in accordance with the following standard.

- ASME B16.9 for NPS 48 and smaller
- MSS SP-75 for NPS above 48

7.2.5 Fittings wall thickness / schedule shall conform to the material requisition. Wall thickness higher or lower than the specified shall not be accepted.

7.2.6 Fittings shall be designed for pressure rating fully equal to those calculated for seamless pipe of the same or equivalent material.

7.2.7 Fittings with diameter over DN 60":

- For diameters, not covered by ASME B16.9 and MSS SP-75, the design of fittings shall be established according to ASME B16.9 paragraph 2.2 (mathematical analysis or proof test).
- Tolerances shall be the same as those specified for fittings of DN 48" diameter (ASME B 16.9). Cross sectional drawing or catalogue drawings shall be supplied for all these items.

7.2.8 Wall thickness of elbows:

- Wall thickness of elbows DN 12" and above shall not be in excess of more than 30 % of the specified wall thickness.

7.2.9 Wall thickness of tee on special request (Tag number)

If specified to meet the ASME B31.3 Appendix D note 11, design of equal and unequal tees will meet the following requirements:

- The crotch thickness of the branch outlet of butt welding tees shall be no less than 150 % of the nominal wall thickness of the tee.
- The crotch radius of the branch outlet of the butt welding tees shall be no less than 12.5 % of the branch outlet outside diameter.

7.3 Bends Radius 5D, 6D and 10D

7.3.1 These elbows are realized in accordance with ASME B31.3. Upstream and downstream of each bending the straight length left during fabrication (and necessary to maintain the pipe) will be cut after bending.

7.3.2 The bends welded from sectors should not be used. Ends will be bevelled ends as per ASME B16.25.



7.3.3 Elbow will have no apparent folds due to the bending operation on the intrados. The elbows will have no apparent stripes or scratches due to the machinery on bending operation. All variation of internal diameter must be reduced. If any, this variation of internal diameter between straight pipe and bending must be smooth.

Example: For 4" pipe diameter, 5D means R=500 mm / 6D means R=600mm,...

7.3.4 Outside diameter at ends: Tolerance is +/- 3 mm for Diameter 10" and more.

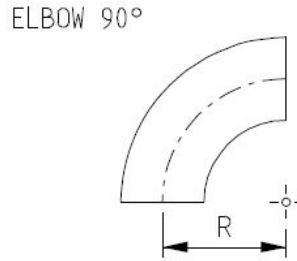
7.3.5 Thickness: The wall thickness reduction must be less than 12.5% of nominal thickness.

7.3.6 After cold bending the bent sections of pipes made of carbon and low-alloy steels should be heat treated, if the ratio of the bend's mean radius to the nominal outside diameter of the pipe is less than 3.5, and the ratio of the nominal pipe wall thickness to its nominal outside diameter exceeds 0.05

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7.3.7 Bend sections of pipes made of austenitic steels should be heat treated regardless of pipe diameter and wall thickness.

Radius = "R": Tolerances: +/- 1% max.



7.4 Bevelled Ends:

All butt weld fittings shall have ends bevelled as per ASME B16.25. The weld contour shall be as follows.

Material	Pipe Wall Thickness	Weld Contour
Carbon Steel (Except Low Temp. Carbon Steel)	Up to 22 mm	Figure 2 Type A
	> 22 mm	Figure 3 Type A
Alloy Steel, Stainless Steel & Low Temp. Carbon Steel	Up to 10 mm	Figure 4
	> 10 mm & Up to 25 mm	Figure 5 Type A
	> 25 mm	Figure 6 Type A

7.5 Stub Ends Facing:



The gasket contact surfaces of stub ends shall be flat with face finish specified in the MR. Interpretation on the specified face finish is as follows:

- Serrated Finish /125 AARH : Serrations with 125 to 250 microns in AARH. (Max).
- Smooth Finish / 125 AARH: Serrations with 125 to 250 microns in AARH (Max).

8 MATERIALS

8.1 General:

- 8.1.1 Material shall be strictly adhered to as specified in the material requisition. Any substitution of materials shall require the prior written approval of purchaser.
- 8.1.2 Material used in the fabrication of all types of fittings shall be new without any corrosion, dents or other damage of any kind.
- 8.1.3 All seamless pipes employed for manufacturing of fittings shall be required to have undergone hydro test to ASTM A530.
- 8.1.4 All fittings shall be seamless in construction unless otherwise specified.
- 8.1.5 Copper or copper alloys shall not be used in any part of the fittings that comes into contact with process fluid (subject to licensor requirements)

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8.1.6 Structural steel grade such as IS2062, SA 36 or any other structural steel grade material shall not be used for manufacture of fittings.

8.1.7 All carbon steel fittings shall be Killed Carbon Steel.

8.2 Chemical composition:

8.2.1 Carbon steels including normalised grade shall have the Carbon content and Carbon equivalent (CE) as specified in the relevant code or as mentioned specifically in the material requisition. However, as a general, the Carbon content should not be more than 0.22% max. (For ferritic alloy steel, 0.14% max.) and CE should not be more than 0.43 for fittings intended for welding.

8.2.2 The Carbon equivalent may be established by using the formula

$$CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

8.2.3 All materials shall be supplied in normalised condition. All impact tested Low Temperature carbon steel supplied as per ASTM A420.

8.2.4 Components with Material ASTM A516 Gr.60 - 70 shall be impact tested in accordance with the requirements of ASTM A420, with test temperature and acceptance criteria specified therein.

8.2.5 Dual Marked Stainless Steel (e.g. 316/316L) shall be supplied provided that the chemical and mechanical properties comply with the requirements of both grades.

8.2.6 L-grade Stainless Steel can be supplied in substitution of relevant dual marked under Client approval.

8.2.7 All Stainless steel components shall be supplied in the pickling and passivated conditions.

8.3 Design and manufacturing:

8.3.1 Carbon steel used for fabrication of fittings shall be produced by open hearth, electric furnace or basic oxygen process. Vendor shall procure forging and other materials from approved sources only in case of outsourcing. Source of supplies shall be indicated in vendor's offer and prior approval is necessary for any changes later.

8.3.2 Welded pipes employed for manufacture of fittings shall be made by automatic welding only. For fittings made out of welded pipe, the welded pipe shall be double BW type and shall be manufactured with the addition of filler metal.

8.3.3 All welded fittings shall be double welded. Inside weld projection shall not exceed 1.6 mm. Welds shall be ground smooth at least 25 mm from the ends.



8.3.4 All fittings shall be seamless in construction unless otherwise specified. Welded fittings shall not be acceptable in place of seamless fittings.

8.3.5 Seamless stub ends shall not have any welds on the body. Stub ends shall be of long pattern type.

8.3.6 Welded tees shall not be of fabricated (stub-in) type.

8.4 Heat treatment:

8.4.1 All welded fittings shall be normalised for C.S and normalised and tempered for A.S and 100% radiographed by X-ray on all welds made by fitting manufacturers and also on the parent materials, in accordance with paragraph UW-51 of ASME boiler and pressure vessel code, Section-VIII, Division 1.

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- 8.4.2 All 1 Cr. – ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo, 9Cr- 1Mo fittings shall be normalized and tempered. The normalizing and tempering heat treatment shall be a separate heating operation, not the hot forming operation.
- 8.4.3 For all 1Cr.- ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo, 9Cr-1Mo the maximum room temperature tensile strength of all pressure retaining components and welds shall be 100,000 psi (7030 kg/cm²).
- 8.4.4 For all 1Cr. - ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo, 9Cr-1Mo accelerated cooling from the austenitizing temperature is acceptable, where permitted by the applicable product from specification.
- 8.4.5 All stainless steel fittings shall be supplied in solution heat-treated and pickled & passivated condition. Solution annealing for stainless steel fittings shall be carried out again after weld repairs.
- 8.4.6 All types of 321 or 347 stainless steel fittings whose service temperature is above 454°C (Subjected to Licensor conditions) shall be in a stabilised heat treated condition.
- 8.4.7 All fittings shall be heat treated in accordance with the applicable code/ standard requirements.
- 8.4.8 Fittings with heat treatment shall be stamped with heat number.
- 8.4.9 For all welded fittings, ultrasound testing of welds in lieu of radiographic examination is not acceptable.
- 8.4.10 Specified heat treatment for carbon steel and alloy steel fittings shall be carried out again after weld repairs.
- 8.4.11 The bevel ends of all butt weld fittings shall undergo 100% MP/DP test.
- 8.4.12 Fittings shall be stress relieved in accordance with applicable material specifications.

9 IMPACT TEST



- 9.1 When impact testing is required as per table 323.2.2 of ASME B31.3, it shall be done in accordance with table 323.3.1 using the testing methods and acceptance criteria described in paragraphs 323.3.2 through 323.3.5.
- 9.2 All welded fittings indicated as CRYO & LTCS in material requisition shall be impact tested as per requirement and acceptance criteria of ASME B31.3. The Impact test temperature shall be

Stainless Steel	-196 °C
LTCS General	-45 °C
LTCS with Low temperature requirement	-48 °C
1Cr-0.5Mo & 1.25Cr-0.5Mo(for services with operating temperature over 440 °C)	-18 °C

10 INTER-GRANULAR CORROSION (IGC) TEST

- 10.1 For all austenitic stainless steel fittings intergranular corrosion (IGC) test shall have to be conducted as per following.
- 10.2 ASTM A262 Practice 'B' with acceptance criteria of '60 mils/year (max.)' for all materials - forged, rolled, wrought and casting.

OR

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- 10.3 ASTM A262 Practice 'E' with acceptance criteria of 'No cracks as observed from 20X magnification' for all materials other than castings. 'Microscopic structure shall be observed from 250X magnification in addition.
- 10.4 For IGC test two sets of samples shall be drawn from each Solution annealing lot, one set corresponding to highest carbon content and other set corresponding to the highest rating and the other to highest pressure rating. When testing is conducted as per Practice “E”, photograph of microscopic structure shall be submitted for record.
- 10.5 For some austenitic stainless steel grades such as SS304, SS304L, 316, 316L, 317, 317L, 321, 347etc. ASTM A262 Practice 'C' with acceptance criteria of ' 15 mils / year (max.) shall be conducted, wherever specified in material requisition.

11 SPECIAL REQUIREMENTS

11.1 IBR Requirements:



- 11.1.1 Fittings under the purview of "IBR"(Indian Boiler Regulations) shall each be individually accompanied by IBR certificate original in Form III-C duly approved by IBR authority / local authority empowered by the Central Boiler Board of India. Photocopy of original certificate duly attested by the local boiler inspector where the supplier is located is the minimum acceptable requirement.
- 11.1.2 For carbon steel fittings under IBR the chemical composition shall conform to the following:
- Carbon (Max.) : 0.25 %
- Others (S ,P & Mn) : As prescribed in IBR regulations.
- 11.1.3 For materials 1 ¼ Cr – ½ Mo (ASTM A 234 Gr. WP11 & WP11W) & 2 ¼ Cr- 1 Mo (ASTM A 234Gr.WP22 & WP22 W) where fittings are manufactured from pipes, from IIC approved by IBR should include the tabulation of Et Sc & Sr values for the entire temperature range given below.

Et, Sc & Sr values shall be such that throughout the temperature range.

Et /1.5 ≥	SA
Sr /1.5 ≥	SA
Sc ≥	SA

S_A (PSI)												
TEMP (F)	500	600	650	700	750	800	850	900	950	1000	1050	1100
A234 Gr WP11 /WP11W.	21700	20900	20500	20100	19700	19200	18700	13700	9300	6300	4200	2800
A234 Gr WP22 /WP22W	17900	17900	17900	17900	17900	17800	14500	12800	10800	7800	5100	3200

- SA Allowable stress at the working metal temperature
- Et Yield point (0.2% proof stress at the working metal temperature)
- Sc The average stress to produce elongation of 1% (creep) in 100000 hrs at the working metal temperature.
- Sr The average stress to produce rupture in 100000 hrs at the working metal temperature and in no case more than 1.33 times the lowest stress to produce rupture at this temperature.

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11.1.4 Allowable Stress (Sa) values to be taken from ASME B31.1/ ASME B31.3. Values shall be as per the latest edition Prevailing.

11.2 Hydrogen Service:

These special requirements are applicable for the fittings to be supplied for Hydrogen service as marked “Hydrogen Service” in material requisition.

11.2.1 Carbon Steel:



- All carbon steel fittings shall be normalized. The normalizing heat treatment shall be a separate heating operation and not a part of the hot forming operation.
- Cold drawn pipes and fittings shall be normalized after the final cold draw pass for all thicknesses. In addition, fittings made from forgings shall have Carbon - 0.35% max and Silicon - 0.35% max. The normalizing heat treatment shall be a separate heating operation and not a part of the hot forming operation.
- The MDMT (Minimum Design Metal temperature) shall be no greater than +32°F (0°C). Figure 323.2.2.A and Table 323.3.5 of ASME B31.3 shall be used to determine impact testing requirements.
- All carbon steel fittings having wall thickness 19.05 (3/4”) mm and above shall be post weld heat treated.
- All welds shall be 100% radiographed.

11.2.2 Alloy Steel:

- All alloy steel (Cr-Mo) fittings shall be normalized and tempered. The normalizing and tempering shall be separate heating operation and not a part of the hot forming operation. The maximum room temperature tensile strength shall be 100,000 psi.
- All alloy steel (Cr-Mo) fittings shall be post weld heat treated irrespective of type or thickness of weld
- The MDMT (Minimum Design Metal temperature) shall be no greater than +32°F (0°C). Figure 323.2.2.A and Table 323.3.5 of ASME B31.3 shall be used to determine impact testing requirements.
- All welds shall be 100% radiographed.
- For 9Cr-1Mo-V Grade 91 material all requirements shall be as per API 938 B-2008.
- Alloy 825 fittings welds shall be 100% radiographed.

11.2.3 Stainless steel:

- All austenitic stainless steel grades shall be solution annealed after welding. 100% radiography of welded joints shall be done both before and after PWHT.
- All types of 321 or 347 stainless steel fittings whose service temperature is above 454°C (Subjected to Licensor conditions) shall be in a stabilised heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time and holding temperature for stabilizing heat Treatment shall be 4 hours and 900° C respectively.
- For all austenitic stainless steels, the weld deposit shall be checked for ferrite content. A Ferrite No. (FN) not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment. FN shall be performed in the “as welded” condition by Ferrite scope prior to post weld heat treatment.

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11.2.4 Impact test for Hydrogen service:

- For all carbon steels and alloy steels fittings with thickness over 19 mm, Charpy -V Notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and in accordance with ASTM A370. Impact energies at 0° C shall average greater than 27J (20 ft-lb) per set of 3 specimens, with a minimum of 19J (15 ft-lb).
- If welding is used in manufacture, impact test of Heat Affected Zone (HAZ) and weld metal shall also be carried out.

11.2.5 Hardness:

- For carbon steel fittings hardness of weld and HAZ shall be limited to 200 BHN (max).
- For alloy steel fittings, hardness of weld and HAZ shall be limited to 225 BHN (max).

11.2.6 Radiography:

All girth welded joints (longitudinal and circumferential) shall be 100% radiographed in accordance with UW-51 of ASME Section VIII, Div-1 and ASME Section V.

11.3 Internally PTFE Coated fittings :



PTFE internally coating shall be carried out for fittings as per ASTM F1545- (Standard specification for Plastic-Lined Ferrous Metal pipe, Fittings and Flanges) when specified in Material requisitions.

11.4 NACE / Sour (Wet H2S) Service

- 11.3.1 All items under this category shall generally be as per NACE MR0103 latest edition. Where NACE MR0175 is specified same shall be applicable.
- 11.3.2 All steels shall be fully killed and fine grained.
- 11.3.3 Hardness of the production weld shall be lower than 200 HB. This value is slightly lower than the one defined for the base metal (22 HRC or 237 HB) in order to anticipate potential non-homogeneity of certain weld deposits.
- 11.3.4 The steel making process shall produce steel with high resistance to hydrogen sulphide attack i.e. HIC & SSC.
- 11.3.5 All steels shall be manufactured by either basic oxygen or electric furnace process only.
- 11.3.6 Carbon content shall be limited below 0.20 % w.
- 11.3.7 CS material shall be supplied in normalized condition (or quenched and tempered), regardless of thickness.
- 11.3.8 Thermal stress relieving required for cold bend zones even if it is not required by code. Level of deformation may require recovery annealing to restore properties of steel.
- 11.3.9 Carbon equivalent (CE) shall be limited to below 0.42% for thickness below 2” and below 0.43% for thickness above 2”

$$CE = C\% + Mn\% / 6 + (CR\% + Mo\% + V\%) / 5 + (Ni\% + Cu\%) / 15$$

- 11.3.10 Fittings, where specified HIC and or NACE, in the material requisition shall comply with latest edition of NACE MR0103 standard specified .

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11.3.11 Chemical composition as per Table 1 as specified against each product are permitted

Table-1

Chemical composition for Fittings

Element	Percentage
C	0.20 % max
Mn	1.35 % max
Si	0.10 % to 0.35 % max
P	0.02 % max
Ni	0.20 % max
S	0.020 % max
Other elements	As per specification

11.3.12 Impurity level shall be controlled to avoid the occurrence of brittle phases during fabrication process or welding.

11.3.13 Fittings may be supplied in quenched and tempered or normalized or normalized and tempered condition. However, all bends by induction heating shall be tempered afterwards to meet hardness requirements.

11.3.14 The Sulphur level shall be restricted to 0.003% wt for all Plates & Rolled Products

11.3.15. For all thickness of plates either vacuum degassing treatment shall be applied during steel making or through-thickness tensile testing shall be carried out in accordance with ASTM A770 with minimum reduction in area being 35% as determined in accordance with ASTM A370 on one plate per heat per heat treatment batch.

11.3.16. No repair welding shall be permitted on plates.

11.3.17. Fittings where Sour Service specified for Stainless steel, Carbon Steel and Low alloy steel, in the material requisition shall comply with latest edition of NACE MR0103 standard.

11.4.1 Chemical Composition:

This shall be carried out on heat as well as on finished product as per relevant product material specifications and shall meet the requirements on Table-1.

11.4.2 Mechanical Properties



The following mechanical properties shall only be acceptable over and above that specified in the relevant product material specification.

Ultimate Tensile Strength = 77000 psi (max) on finished product

Ratio of yield to tensile strength shall not exceed 0.8 on finished product.

11.4.3 Hardness Test

Max hardness shall be limited to 22HRC or 248 HV5 or 237 BHN & Measurement shall be as per ASTM E -18 or E-92 or ASTM E-10.

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Hardness test shall be conducted on sample of each heat and on each finished product. Waiver may be given only for those products which can get damaged due to hardness test. For small products which cannot be hardness tested individually the manufacturer shall be conduct test on a random basis by selecting component from production run or stores batches to ensure that the product complies fully with hardness requirement. The products for which hardness values are found in excess of specified value shall be rejected. If the hardness on the sample of heat is more than the acceptable value, then the entire raw material from the heat shall be rejected.

11.4.4 HIC Test

This shall be carried out on one finished product (material-wise & type of constructions wise i.e. seamless and welded separately) per heat irrespective of size/thickness/type of fittings. HIC test requirement is as follows.

Wrought: The requirements for wrought fittings are the same as for the Seamless or welded pipe from which the fittings are wrought.

SSC test is not required. But in case of deviation of S & P % from Table-1 or the chemical analysis of the finished product or UTS being greater than 77000 psi the manufacturer shall either conduct SSC test on every heat successfully OR reject all the finished products made from that heat.

11.4.5 Selection of Test Samples



- A. Test specimen shall be taken from per heat of the finished product. Where the specimen cannot be taken from the finished product, a representative test specimen shall be taken from the same heat, heat treated in the same batch or charge as the product and shall undergo the same amount of working as the most worked section of the finished product.
- B. In case the finished product is welded type, the test piece shall include the parent metal, weld metal and HAZ.

12 INSPECTION AND TESTING

- 12.1 Vendor shall comply with the inspection test plan (ITP) for fittings attached to the material requisition as a minimum.
- 12.2 However a detailed inspection and test plan (ITP) shall be submitted for review by the purchaser along with bids. All fittings will be subject to inspection in accordance with the purchaser approved inspection and test plan (ITP).
- 12.3 The certificates shall be issued, stamped and signed by the material manufacturer’s inspector, who is part of Manufacturer’s QA/QC department and will be independent of the manufacturer’s production department. This certificate shall also be stamped and verified by the manufacturer’s QA/QC department.
- 12.4 Every fitting shall be subjected to all mandatory tests and checks called in the respective codes by purchaser or any third party as approved by the purchaser. For IBR fittings refer IBR requirements.
- 12.5 CONTRACTOR will carry out stage wise inspection. All assistance shall be provided for the same and timely co-ordination shall be the responsibility of the vendor.
- 12.6 All material test report for physical property, chemical composition, heat treatment, etc. shall be submitted for all mandatory and supplementary tests specified in accordance with applicable codes /standards or attached specifications.

13 POSITIVE MATERIAL IDENTIFICATION (PMI)

- 13.1 Refer specification for “077154C-000-JSS-6300-002” – Specification for Positive Material Identification at Suppliers Works .

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14 MARKING & PAINTING



- 14.1 Marking shall be legible and carried out in accordance with ASME /ASTM /API /MSS/ codes as applicable.
- 14.2 Marking of components 2” NPS and larger shall be by stencilling with indelible paint, Paint / ink used for marking shall be free of any harmful metal or metallic salts such as zinc, lead or copper which may cause corrosive attack on heating, with particular attention being paid to austenitic steel.
- 14.3 In addition to the marking requirements of the relevant product standard and MSS SP-25, the following information shall be marked on each component:
- Type of fitting
 - Nominal diameter
 - Schedule / Wall thickness
 - MOC with grade
 - Purchase order number
 - Ident code No and SAP code No. (if any).
 - Special items shall also be marked. Like “IBR”, ”CRYO”, ”NACE”
- 14.4 Marking shall be carried out on all individual components size 2” NPS and larger and on corrosion resistant metal tags for components less than 2” NPS, the tags being securely attached to each package.
- 14.5 All components shall additionally be hard stamped or vibro etched with heat number. For components manufactured from austenitic steel, marking shall be by vibro etching. Carbon steel and impact tested carbon steel shall be marked by round nosed low stress stamps.
- 14.6 All fittings shall be painted as per specification for color coding of piping materials by vendors Doc No.077154C-000-SP-1390-009
- 14.7 For easy identification, fittings shall be painted as per above Spec. additionally fittings for following specialty services shall also be identified by color markings as per below

IBR: Red, CRYO: Light Purple, NACE: Canary Yellow, HIC: Dark Brown

15 PROTECTION

- 15.1 All fittings shall be well protected against corrosion and mechanical damage and kept dry, clean and free from dirt, moisture, or loose foreign materials of any kind.
- 15.2 Stainless steel fittings shall be protected from the risk of saline corrosion during shipment.
- 15.3 Rust preventive coating on machined surfaces to be welded shall be of easily removable type and shall not be harmful for welding.
- 15.4 Fittings ends shall be suitably protected and the protectors shall be securely and tightly attached.

Beveled End	Wood, metal or plastic cover
Plain End	Plastic cap
Screwed End	Screwed Plastic cap

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15.5 Butt-welding ends of fittings, machined surface (Threads, Bevel end, etc.) shall be coated with a corrosion inhibitor. Steel end protectors for galvanized items shall be galvanized.

16 DESPATCH

16.1 All fittings shall be supplied in separate seaworthy packing / bundles / lots item-wise, size / sch. wise, MOC wise, etc. Packing list shall be included as part of each package.

16.2 Each packing/ bundle/ lot shall be marked with purchase order No., commodity code No., size, schedule / MOC etc..

17 CERTIFICATION & TRACEABILITY

Material certificates for all fittings shall be in accordance with EN 10204 type 3.1. All certificates shall be fully traceable to the item covered and shall be marked with the Purchasers order number, commodity code and tag/part number. They shall be clearly legible, in the English Language.

18 DOCUMENTATION



18.1 Vendor shall submit the documents with the offer as specified in the MR.

18.2 If there is any deviation from the “Purchase Specification for Fittings”, the same shall be listed clause wise. Even clauses which are acceptable shall be categorically confirmed as “Accepted”. The Purchase Specification for fittings marked with deviations shall be returned with offer duly signed and stamped as token of acceptance. Clauses which are not relevant to the supply may be cross marked and mentioned “NA”.

18.3 Material test certificates for physical properties, chemical composition and heat treatment etc. shall be furnished.

19 OTHER REQUIREMENTS

19.1 Guarantee/ Warranty, Quality plan, Inspection, PMI, documentation requirements and others shall be governed by purchase requirements attached with the material requisition.

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REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED
G	26-SEP-2022	ISSUED FOR DESIGN	JR	JL	TI/SL	PSSG
F	20-OCT-2021	ISSUED FOR DESIGN	JR	JL	TI/SL	PSSG
E	2-JULY-2021	ISSUED FOR DESIGN	DK	JL	TI	PSSG
D	09-APR-2021	ISSUED FOR DESIGN	DK	VV	TI	BSR/PSSG
C	03-DEC-2020	ISSUED FOR DESIGN	PM	VV	TI	BSR/PSSG
B	25-JUN-2019	ISSUED FOR USE	CK	VV	TI	BSR/PSSG
A	08-JUN-2018	ISSUED FOR DESIGN	SK	VV	TI	MP/PSSG

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1 INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) raising the capacity of its Gujarat refinery as well as setting up a petrochemical plant at the unit as part of plans for upscaling Petchem business to protect margins.



The project envisages raising the capacity of the Vadodara refinery in Gujarat from 13.7 MMTPA to 18 MMTPA and building a 500 KTPA polypropylene (PP) plant and a 235 KTPA Lube Oil Base Stock (LOBS) unit.

The project would be a building block for the production of niche chemicals in future with a potential to increase petrochemical and specialty products integration index on incremental crude oil throughput which would enhance the refinery margins.

The Gujarat Refinery project is part of IOC's plans to boost petrochemical capacity by more than 70 per cent over the next decade, from 3.2 million tonnes a year currently.

2 DEFINITIONS & ABBREVIATIONS

Abbreviation	Definition /Expanded form
IOCL/ CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design
FEL	Front End Loading
AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.
PART-I	Indicates New AVU, Straight Run LPG Treater Unit and its offsite & integration portion of the PROJECT
PART-II	Indicates all the balance Units / facilities and its off sites, utilities & integration portion of the PROJECT
VENDOR	Any third party supplying the equipment/materials for setting up the Plant
LLI	Long Lead Item – Any equipment / Package / Work order taking 16 months or more completion time from the date of award
PROJECT	Indicates Petrochemical and Lube Integration Project "LuPech" (J18), IOCL Gujarat Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
OISD	Oil Industry Safety Directorate
ASME	American Society of Mechanical Engineers

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API	American Petroleum Institute
P&ID	Piping and Instrumentation Diagram
A/G	Above Ground
U/G	Under Ground
B/L	Battery Limit
ISBL	Inside Battery Limit
EOT	Electrically-operated Overhead Travelling
MTO	Material Take Off

3 SCOPE



This specification defines the technical requirements of carbon steel, alloy steel, Stainless steel and Super duplex stainless steel fittings of various types such as elbows, tees, reducers, caps, weldolets, sockolets, threadolets, couplings, unions, plugs, nipples etc. commonly used in refineries, petrochemical and other chemical / industrial plants.

Cast iron, non-metals, and other special design / special materials fittings etc. are not covered herein. However the specification may be used for any other type of fittings of different design or material of construction by suitably specifying additional requirements as may be applicable.

The requirements specified here are supplementary to Piping Material Specification (PMS).

4 TERMINOLOGY

MR	Material Requisition
PR	Purchase Requisition
PO	Purchase Order
CS	Carbon steel
LTCS	Low Temp. Carbon Steel
AS	Alloy Steel
SS	Stainless steel
WN	Welding Neck
BW	Butt Weld
SW	Socket Weld
SCRD	Screwed
DP	Dye-Penetrant Test
MP	Magnetic Particle Test
NDT	Non Destructive Testing
NPT	National Pipe Threads
PMI	Positive Material Identification
IGC	Inter Granular Corrosion



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HIC	Hydrogen Induced cracking
SSC	Sulfide stress cracking
CRYO	Cryogenic
IBR	Indian Boiler Regulations
AARH	Arithmetic Average Roughness Height
BHN	Brinell Hardness Number
ITP	Inspection Test Plan
TPI	Third Party Inspection
MOC	Material of Construction
PBE	Plain both Ends
TBE	Threaded both Ends
TOE	Threaded one End
TSE	Threaded small end
TLE	Threaded large end

5 REFERENCE CODES & STANDARDS

The following codes shall be applicable, however purchaser may specify any other relevant code for any purpose at any time. The codes latest edition as on date of issue of material requisition shall be applicable. Some BS codes may have been superseded by ISO / BS –EN codes, the latest one shall be acceptable.

Code /Std. No	Description
API 5L	Specification for line pipe
ASME Sec 8 Div.1 UW-51	ASME Boiler and Pressure Code
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory –Made Wrought Buttwelding Fittings
ASME B16.11	Forged Fittings, Socket Welding and Threaded
ASME B16.25	Butt Welding Ends
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME B36.10	Welded and seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe
MSS SP-25	Standard Marking System for Valves, Fittings, Fittings, and Unions
MSS SP-83	Class 3000 Steel Pipe Union, Socket Welding and Threaded

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MSS SP-97	Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded and Buttwelding Ends
NACE MR0103	Materials Resistant to Sulphide Stress Cracking in Corrosive Petroleum Refining Environments
NACE MR0175 / ISO 15156	Petroleum, Petrochemical and Natural Gas Industries – Materials for Use In H ₂ S-Containing Environments in Oil And Gas Production.
BS 3799	Specification for Steel Pipe Fittings, Screwed and Socket Welding for the Petroleum Industry
BS EN10204	Metallic Products – Type of Inspection Documents
ASTM Standards	As specified or relevant
077154C-000-SP-1390-009	Specification for colour coding of piping materials by vendors
077154C -000-JSS-6300-002	Specification for Positive Material Identification at Suppliers Works
077154C -000-JSS-1320-001	Job Supply Specification for Pipes



6 GENERAL REQUIREMENTS

- 6.1 Fittings shall be manufactured, inspected and marked as per the manufacturing standards. Any conflict between the requisition, enclosures, and referred standards shall be brought to the notice of the purchaser for clarifications and resolution before proceeding with the manufacture. The purchaser's decision shall be final and binding to the vendor. No deviations shall be permitted except as communicated in writing in deviation permits.
- 6.2 Fittings dimension, tolerances, chemical composition, physical properties, heat treatment, hydro-test (if applicable), and other testing requirements shall conform to relevant codes / standards, latest editions (including their supplementary requirements) as specified in the material requisition. Deviation from the above, if any, shall be specifically highlighted to the purchase by the vendor.
- 6.3 Any conflicts between requirements of this specification, related standards and other attached documents shall be referred to the purchaser for clarification before proceeding with the manufacture, fabrication and procurement of the disputed part.
- 6.4 All threaded Joints, irrespective of pressure and temperature, shall be seal welded with full strength fillet weld

7 DESIGN REQUIREMENTS

7.1 Fitting Dimensions:

- 7.1.1 Fittings dimensions up to 1 1/2” size shall conform to ASME B 16.11.
- 7.1.2 Forged steel socket welded and threaded fittings shall be in accordance with ASME B16.11 unless otherwise noted. For items not covered under B16.11 reference may be made to BS 3799 or appropriate MSS-SP Std.
- 7.1.3 Special fittings like weldolets sockolet, threadolet etc. which are not covered in ASME, MSS-SP shall be as per manufacturer's std. Contours of these fittings shall meet the requirements of ASME B31.3. Manufacturer shall submit drawings / catalogues of these items along with the offer.
- 7.1.4 Threaded ends shall have NPT taper threads in accordance with ASME B1.20.1.

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7.2 Fittings End Schedule / Thickness:

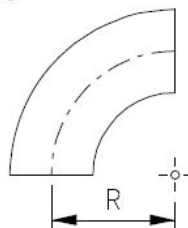
- 7.2.1 Fittings outside diameter and schedule / wall thickness shall match pipe schedule as per ASME B36.10 / B36.19 / API 5L as the case may be. Sloping of inside contour of fittings shall be done wherever necessary to achieve this.
- 7.2.2 For reducing butt weld fittings having different wall thickness at each end, the greater wall thickness of the fitting shall be employed and inside bore at each end shall be matched with the specified inside diameter.
- 7.2.3 Bore of fittings shall correspond to the inside diameter of pipe for specified schedule / wall thickness. Ends shall be bevelled to suit the specified schedule/ thickness.
- 7.2.4 Fittings ends shall be in accordance with ASME B16.11.
- 7.2.5 Fittings wall thickness /schedule shall conform to the material requisition. Wall thickness higher or lower than the specified shall not be accepted.

7.3 Bends Radius 5D, 6D and 10D

- 7.3.1 These elbows are realized in accordance with ASME B31.3. Upstream and downstream of each bending the straight length left during fabrication (and necessary to maintain the pipe) will be cut after bending.
- 7.3.2 The bends welded from sectors should not be used. Ends will be bevelled ends as per ASME B16.25 or plain ended as specified in the PMS.
- 7.3.3 Elbow will have no apparent folds due to the bending operation on the intrados. The elbows will have no apparent stripes or scratches due to the machinery on bending operation. All variation of internal diameter must be reduced. If any, this variation of internal diameter between straight pipe and bending must be smooth.

Radius = "R": Tolerances: +/- 1% max.



ELBOW 90°



- 7.3.4 Example: For 4” pipe diameter, 5D means R=500 mm / 6D means R=600mm,...
- 7.3.5 Outside diameter at ends: Tolerance is +/- 3 mm for Diameter 10” and more.
- 7.3.6 Thickness: The wall thickness reduction must be less than 12.5% of nominal thickness.
- 7.3.7 After cold bending the bent sections of pipes made of carbon and low-alloy steels should be heat treated, if the ratio of the bend’s mean radius to the nominal outside diameter of the pipe is less than 3.5, and the ratio of the nominal pipe wall thickness to its nominal outside diameter exceeds 0.05
- 7.3.8 Bend sections of pipes made of austenitic steels should be heat treated regardless of pipe diameter and wall thickness.

7.4 Bevelled Ends:

All butt weld fittings shall have ends bevelled as per ASME B16.25. The weld contour shall be as follows.

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Material	Pipe Wall Thickness	Weld Contour
Carbon Steel (Except Low Temp. Carbon Steel)	Up to 22 mm	Figure 2 Type A
	> 22 mm	Figure 3 Type A
Alloy Steel, Stainless Steel & Low Temp. Carbon Steel	Up to 10 mm	Figure 4
	> 10 mm & Up to 25 mm	Figure 5 Type A
	> 25 mm	Figure 6 Type A



8 MATERIALS

8.1 General:

- 8.1.1 Material shall be strictly adhered to as specified in the material requisition. Any substitution of materials shall require the prior written approval of purchaser.
- 8.1.2 Forged fittings shall conform to the material specified, substitution of materials shall not be considered.
- 8.1.3 Swage nipples (concentric / eccentric) if specified as pipe materials are acceptable in forging materials (up to 1 ½”) made of corresponding CS/AS/SS material grades.
- 8.1.4 Carbon steel used for fabrication of fittings shall be produced by open hearth, electric furnace or basic oxygen process. Vendor shall procure forging and other materials from approved sources only in case of outsourcing. Source of supplies shall be indicated in vendor’s offer and prior approval is necessary for any changes later.
- 8.1.5 Material used in the fabrication of all types of fittings shall be new without any corrosion, dents or other damage of any kind.
- 8.1.8 Copper or copper alloys shall not be used in any part of the fittings that comes into contact with process fluid (subjected to licensor requirements).
- 8.1.9 Structural steel grade such as IS2062, SA 36 or any other structural steel grade material shall not be used for manufacture of fittings.
- 8.1.10 All carbon steel fittings shall be killed carbon steel.

8.2 Design and Manufacturing:

- 8.2.1 Threaded fittings shall be class 2000, 3000 or 6000 as specified in MR.
- 8.2.2 Socket welding fittings shall be class 3000, 6000 or 9000 as specified in MR.
- 8.2.3 Correlation of fitting class with pipe schedule shall generally conform to table-7 of ASME B 16.11 unless specified otherwise in MR.
- 8.2.4 Unions shall be in accordance with MSS-SP-83, Threaded unions used for utility services shall be limited to 3000 Class, and unions of higher class shall not be used.
- 8.2.5 Plugs shall be heavy hexagonal fabricated from solid bar stocks of compatible material as the valves or fittings.
- 8.2.6 Length of long half couplings shall be 100 mm unless otherwise specified in MR



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8.3 Chemical composition:

- 8.3.1 Carbon steels including normalised grade shall have the Carbon content and Carbon equivalent (CE) as specified in the relevant code or as mentioned specifically in the material requisition. However, as a general, the Carbon content should not be more than 0.22% max. (For ferritic alloy steel, 0.14% max.) and CE should not be more than 0.43 for fittings intended for welding.
- 8.3.2 The Carbon equivalent may be established by using the formula
- $$CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/16$$
- 8.3.3 All materials shall be supplied in a normalised condition. All impact tested carbon steel supplied to ASTM A350 LF2 shall be class 1.
- 8.3.4 Components with Material ASTM A516 Gr. 60- 70 shall be impact tested in accordance with the requirements of ASTM A350, with test temperature and acceptance criteria in accordance with Grade LF2 class 1.
- 8.3.5 Dual Marked Stainless Steel (e.g. 316/316L) shall be supplied provided that the chemical and mechanical properties comply with the requirements of both grades.
- 8.3.6 L-grade Stainless Steel can be supplied in substitution of relevant dual marked under Client approval.
- 8.3.7 All Stainless steel components shall be supplied in the pickling and passivated conditions.

8.4 Heat treatment:

- 8.4.1 All welded fittings shall be normalised for CS and normalised and tempered for AS and 100% radio graphed by X-ray on all welds made by fitting manufacturers and also on the parent materials, in accordance with paragraph UW-51 of ASME boiler and pressure vessel code, Section-VIII, Division 1.
- 8.4.2 All 1 Cr. – ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo, 9Cr-1Mo fittings shall be normalized and tempered. The normalizing and tempering heat treatment shall be a separate heating operation, not the hot forming operation.
- 8.4.3 For all 1Cr- ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo, 9Cr-1Mo, the maximum room temperature tensile strength of all pressure retaining components and welds shall be 100,000 psi (7030 kg/cm²).
- 8.4.4 For all 1Cr. - ½ Mo and 1 ¼ Cr. – ½ Mo and 2 ¼ Cr. – 1 Mo , 9Cr-1Mo, accelerated cooling from the austenitizing temperature is acceptable, where permitted by the applicable product from specification.
- 8.4.5 All stainless steel fittings shall be supplied in solution heat-treated and pickled & passivated condition. Solution annealing for stainless steel fittings shall be carried out again after weld repairs.
- 8.4.6 All types of 321 or 347 stainless steel fittings whose service temperature is above 454°C (Subjected to Licensor requirements) shall be in a stabilised heat treated condition.
- 8.4.7 Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time and holding temperature for stabilizing heat Treatment shall be 4 hours and 900° C respectively.
- 8.4.8 All fittings shall be heat treated in accordance with the applicable code/ standard requirements.
- 8.4.9 Fittings with heat treatment shall be stamped with heat number.
- 8.4.10 The bevel ends of all butt weld fittings shall undergo 100% MP/DP test.

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8.4.11 Fittings shall be stress relieved in accordance with applicable material specifications.

9 IMPACT TEST

- 9.1 When impact testing is required as per table 323.2.2 of ASME B31.3, it shall be done in accordance with table 323.3.1 using the testing methods and acceptance criteria described in paragraphs 323.3.2 through 323.3.5.
- 9.2 All forged fittings indicated as CRYO & LTCS in material requisition shall be impact tested as per requirement and acceptance criteria of ASME B31.3. The Impact test temperature shall be
- | | |
|----------------------------------------------------------------------------------|--------|
| Stainless Steel | -196°C |
| LTCS General | -45°C |
| LTCS with Low temperature requirement | -48°C |
| 1Cr-0.5Mo & 1.25Cr-0.5Mo(for services
with operating temperature over 440 °C) | -18 °C |

10 INTER-GRANULAR CORROSION (IGC) TEST



- 10.1 For all austenitic stainless steel fittings intergranular corrosion (IGC) test shall have to be conducted as per following.
- 10.2 ASTM A262 Practice 'B' with acceptance criteria of '60 mils/year (max.)' for all materials - forged, rolled, wrought and casting.
- OR
- 10.3 ASTM A262 Practice 'E' with acceptance criteria of 'No cracks as observed from 20X magnification' for all materials other than castings. 'Microscopic structure shall be observed from 250X magnification in addition.
- 10.4 For IGC test two sets of samples shall be drawn from each Solution annealing lot, one set corresponding to highest carbon content and other set corresponding to the highest rating and the other to highest pressure rating. When testing is conducted as per Practice "E", photograph of microscopic structure shall be submitted for record.
- 10.5 For some austenitic stainless-steel grades such as SS304, SS304L, 316, 316L, 317, 317L, 321, 347etc. ASTM A262 Practice 'C' with acceptance criteria of '15 mils / year (max.)' shall be conducted, wherever specified in material requisition.

11 SPECIAL REQUIREMENTS

11.1 IBR Requirements:

- 11.1.1 Fittings under the purview of "IBR"(Indian Boiler Regulations) shall each be individually accompanied by IBR certificate original in Form III-C duly approved by IBR authority / local authority empowered by the Central Boiler Board of India. Photocopy of original certificate duly attested by the local boiler inspector where the supplier is located is the minimum acceptable requirement.
- 11.1.2 For carbon steel fittings under IBR the chemical composition shall conform to the following:

Carbon (Max.)	: 0.25 %
Others (S ,P & Mn)	: As prescribed in IBR regulations.

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11.1.3 For materials 1 ¼ Cr – ½ Mo (ASTM A 234 Gr. WP11 & WP11W) & 2 ¼ Cr- 1 Mo (ASTM A 234Gr.WP22 & WP22 W) where fittings are manufactured from pipes, from IIC approved by IBR should include the tabulation of Et Sc & Sr values for the entire temperature range given below.

Et, Sc & Sr values shall be such that throughout the temperature range.

Et/1.5 ≥ SA

Sr/1.5 ≥ SA

Sc ≥ SA

S _A (PSI)												
TEMP (F)	500	600	650	700	750	800	850	900	950	1000	1050	1100
A234 Gr WP11 /WP11W.	21700	20900	20500	20100	19700	19200	18700	13700	9300	6300	4200	2800
A234 Gr WP22 /WP22W	17900	17900	17900	17900	17900	17800	14500	12800	10800	7800	5100	3200

SA Allowable stress at the working metal temperature

Et Yield point (0.2% proof stress at the working metal temperature)

Sc The average stress to produce elongation of 1% (creep) in 100000 hrs at the working metal temperature.

Sr The average stress to produce rupture in 100000 hrs at the working metal temperature and in no case more than 1.33 times the lowest stress to produce rupture at this temperature.



11.1.4 Allowable Stress (S_a)” values to be taken from ASME B31.1/ ASME B31.3. Values shall be as per the latest edition Prevailing.

11.2 Hydrogen Service:

These special requirements are applicable for the fittings to be supplied for Hydrogenservice as marked “Hydrogen Service” in material requisition.

11.2.1 Carbon Steel:

- All carbon steel fittings shall be normalized. The normalizing heat treatment shall be a separate heating operation and not a part of the hot forming operation.
- Cold drawn pipes and fittings shall be normalized after the final cold draw pass for all thicknesses. In addition, fittings made from forgings shall have Carbon - 0.35% max and Silicon - 0.35% max. The normalizing heat treatment shall be a separate heating operation and not a part of the hot forming operation.
- The MDMT (Minimum Design Metal temperature) shall be no greater than +32°F (0°C). Figure 323.2.2.A and Table 323.3.5 of ASME B31.3 shall be used to determine impact testing requirements.
- All carbon steel fittings having wall thickness 19.05 (3/4”) mm and above shall be post weld heat treated.

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11.2.2 Alloy Steel:

- All alloy steel (Cr-Mo) fittings shall be normalized and tempered. The normalizing and tempering shall be separate heating operation and not a part of the hot forming operation. The maximum room temperature tensile strength shall be 100,000 psi.
- All alloy steel (Cr-Mo) fittings shall be post weld heat treated irrespective of type or thickness of weld
- The MDMT (Minimum Design Metal temperature) shall be no greater than +32°F (0°C). Figure 323.2.2.A and Table 323.3.5 of ASME B31.3 shall be used to determine impact testing requirements.
- For 9Cr-1Mo-V Grade 91 material all requirements shall be as per API 938 B-2008.
- Alloy 825 fittings welds shall be 100% radiographed.

11.2.3 Stainless steel:

- All austenitic stainless steel grades shall be solution annealed after welding. 100% radiography of welded joints shall be done both before and after PWHT.
- For all austenitic stainless steels, the weld deposit shall be checked for ferrite content. A Ferrite No. (FN) not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment. FN shall be performed in the “as welded” condition by Ferrite scope prior to post weld heat treatment.

11.2.4 Impact test for Hydrogen service:

- For all carbon steels and alloy steels fittings with thickness over 19 mm, Charpy -V Notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and in accordance with ASTM A370. Impact energies at 0° C shall average greater than 27J (20 ft-lb) per set of 3 specimens, with a minimum of 19J (15 ft-lb).
- If welding is used in manufacture, impact test of Heat Affected Zone (HAZ) and weld metal shall also be carried out.

11.2.5 Hardness:

- For carbon steel fittings hardness of weld and HAZ shall be limited to 200 BHN (max).
- For alloy steel fittings, hardness of weld and HAZ shall be limited to 225 BHN (max).

11.2.6 Radiography:

All girth welded joints (longitudinal and circumferential) shall be 100% radiographed in accordance with UW-51 of ASME Section VIII, Div-1 and ASME Section V.



11.3 Internally PTFE Coated fittings :

PTFE internally coating shall be carried out for fittings as per ASTM F1545- (Standard specification for Plastic-Lined Ferrous Metal pipe, Fittings and Flanges) when specified in Material requisitions.

11.4 NACE / SOUR (Wet H₂S) Service

11.3.1 All items under this category shall generally be as per NACE MR0103 latest edition. Where NACE MR 0175 is specified, same shall be applicable.

11.3.2 All steels shall be fully killed and fine grained.



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- 11.3.3 Hardness of the production weld shall be lower than 200 HB. This value is slightly lower than the one defined for the base metal (22 HRC or 237 HB) in order to anticipate potential non-homogeneity of certain weld deposits.
- 11.3.4 The steel making process shall produce steel with high resistance to hydrogen sulphide attack i.e. HIC & SSC.
- 11.3.5 All steels shall be manufactured by either basic oxygen or electric furnace process only.
- 11.3.6 Carbon content shall be limited below 0.20 % w.
- 11.3.7 CS material shall be supplied in normalized condition (or quenched and tempered), regardless of thickness.
- 11.3.8 Thermal stress relieving (PWHT) required for seamless piping welds as minimum, even if it is not required by code.
- 11.3.9 Thermal stress relieving required for cold bend zones even if it is not required by code. Level of deformation may require recovery annealing to restore properties of steel. Carbon equivalent (CE) shall be limited to 0.43
- $$CE = C\% + Mn\% / 6 + (CR\% + Mo\% + V\%) / 5 + (Ni\% + Cu\%) / 15$$
- S & P % shall be within 0.010 & 0.020 wt % respectively. Ni shall be less than 1%.
- 11.3.10 Fittings where specified HIC and or NACE, in the material requisition shall comply with latest edition of NACE standard specified.
- 11.3.11 Impurity level shall be controlled to avoid the occurrence of brittle phases during fabrication process or welding.
- 11.3.12 Fittings may be supplied in quenched and tempered or normalised or normalised and tempered condition. However, all bends by induction heating shall be tempered afterwards to meet hardness requirements.
- 11.3.13 Chemical composition as per Table 1 as specified against each product are permitted.

**Table-1
Chemical composition for Fittings**

Element	Percentage
C	0.20 % max
Mn	1.35 % max
Si	0.10 % to 0.35 % max
P	0.02 % max
Ni	0.20 % max
S	0.01 % max
Other	As per specification

- 11.3.14 Fittings where Sour Service specified for Stainless steel and Low alloy steel, in the material requisition shall comply with latest edition of NACE MR0103 standard.

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11.4.1 Chemical Composition:

This shall be carried out on heat as well as on finished product as per relevant product material specifications and shall meet the requirements on Table-1.

11.4.2 Mechanical Properties

The following mechanical properties shall only be acceptable over and above that specified in the relevant product material specification.

Ultimate Tensile Strength = 77000 psi (max) on finished product

Ratio of yield to tensile strength shall not exceed 0.8 on finished product.

11.4.3 Hardness Test

Max hardness shall be limited to 22HRC or 248 HV5 or 237 BHN & Measurement shall be as per ASTM E -18 or E-92 or ASTM E-10.

Hardness test shall be conducted on sample of each heat and on each finished product. Waiver may be given only for those products which can get damaged due to hardness test. For small products which cannot be hardness tested individually the manufacturer shall be conduct test on a random basis by selecting component from production run or stores batches to ensure that the product complies fully with hardness requirement. The products for which hardness values are found in excess of specified value shall be rejected. If the hardness on the sample of heat is more than the acceptable value, then the entire raw material from the heat shall be rejected.

11.4.4 HIC Test

This shall be carried out on one finished product (material-wise & type of constructions wise i.e. seamless and welded separately) per heat irrespective of size/thickness/type of fittings. HIC test requirement is as follows.

Forged : HIC testing is not required if chemical composition does not exceed Table-1 limits. Otherwise HIC test shall be carried out.



SSC test is not required. But in case of deviation of S & P % from Table-1 or the chemical analysis of the finished product or UTS being greater than 77000 psi the manufacturer shall either conduct SSC test on every heat successfully OR reject all the finished products made from that heat

11.4.5 Selection of Test Samples

- A. Test specimen shall be taken from per heat of the finished product. Where the specimen cannot be taken from the finished product, a representative test specimen shall be taken from the same heat, heat treated in the same batch or charge as the product and shall undergo the same amount of working as the most worked section of the finished product.
- B. In case the finished product is welded type, the test piece shall include the parent metal, weld metal and HAZ.

12 INSPECTION AND TESTING

- 12.1 Vendor shall comply with the inspection test plan (ITP) for fittings attached to the material requisition as a minimum.
- 12.2 However a detailed inspection and test plan (ITP) shall be submitted for review by the purchaser along with bids. All fittings will be subject to inspection in accordance with the purchaser approved inspection and test plan (ITP).
- 12.3 The certificates shall be issued, stamped and signed by the material manufacturer's inspector, who is part of Manufacturer's QA/QC department and will be independent of the manufacturer's

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production department. This certificate shall also be stamped and verified by the manufacturer's QA/QC department.

- 12.4 Every fitting shall be subjected to all mandatory tests and checks called in the respective codes by purchaser or any third party as approved by the purchaser. For IBR fittings refer IBR requirements.
- 12.5 CONTRACTOR will carry out stage wise inspection. All assistance shall be provided for the same and timely co-ordination shall be the responsibility of the vendor.
- 12.6 All material test report for physical property, chemical composition, heat treatment, etc. shall be submitted for all mandatory and supplementary tests specified in accordance with applicable codes /standards or attached specifications.



13 POSITIVE MATERIAL IDENTIFICATION (PMI)

- 13.1 Refer specification for “077154C-000-JSS-6300-002” – Specification for Positive Material Identification at Suppliers Works .

14 MARKING & PAINTING

- 14.1 Marking shall be legible and carried out in accordance with ASME /ASTM /API /MSS/ codes as applicable.
- 14.2 Marking shall be carried out by attaching corrosion resistant metal tags for small bore fitting up to 1 ½” size, the tags shall be securely attached to each package.
- 14.3 All components shall additionally be hard stamped or vibro etched with heat number. For components manufactured from austenitic steel, marking shall be by vibro etching. Carbon steel and impact tested carbon steel shall be marked by round nosed low stress stamps.
- 14.4 Paint / ink used for marking shall be free of any harmful metal or metallic salts such as zinc, lead or copper which may cause corrosive attack on heating, with particular attention being paid to austenitic steel.
- 14.5 In addition to the marking requirements of the relevant product standard and MSS SP-25, the following information shall be marked on each component:
- Type of fitting
 - Nominal diameter
 - Schedule / Wall thickness
 - MOC with grade
 - Purchase order number
 - Ident code No and SAP code No. (if any).
 - Special items shall also be marked. Like “IBR”, ”CRYO”, ”NACE”
- 14.6 All fittings shall be painted as per specification for colour coding of piping materials by vendors Doc No.077154C-000-SP-1390-009.
- 14.7 For easy identification, fittings shall be painted as per above Spec. additionally fittings for following speciality services shall also be identified by colour markings as per below

IBR: Red, CRYO: Light Purple, NACE: Canary Yellow, HIC: Dark Brown

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15 PROTECTION

- 15.1 All fittings shall be well protected against corrosion and mechanical damage and kept dry, clean and free from dirt, moisture, or loose foreign materials of any kind.
- 15.2 Stainless steel fittings shall be protected from the risk of saline corrosion during shipment.
- 15.3 Rust preventive coating on machined surfaces to be welded shall be of easily removable type and shall not be harmful for welding.
- 15.4 Fittings ends shall be suitably protected and the protectors shall be securely and tightly attached.

Beveled End	Wood, metal or plastic cover
Plain End	Plastic cap
Screwed End	Screwed Plastic cap

- 15.5 Butt-welding ends of fittings, machined surface (Threads, Bevel end, etc.) shall be coated with a corrosion inhibitor. Steel end protectors for galvanized items shall be galvanized.

16 DESPATCH

- 16.1 All fittings shall be supplied in separate seaworthy packing / bundles / lots item-wise, size / sch. wise, MOC wise, etc. Packing list shall be included as part of each package.
- 16.2 Each packing / bundle / lot shall be marked with purchase order No., commodity code No., size, schedule / MOC etc..

17 CERTIFICATION & TRACEABILITY

Material certificates for all fittings shall be in accordance with EN 10204 type 3.1. All certificates shall be fully traceable to the item covered and shall be marked with the Purchasers order number, commodity code and tag/part number. They shall be clearly legible, in the English Language.

18 DOCUMENTATION

- 18.1 Vendor shall submit the documents with the offer as specified in the MR.
- 18.2 If there is any deviation from the “Purchase Specification for Fittings”, the same shall be listed clause wise. Even clauses which are acceptable shall be categorically confirmed as “Accepted”. The Purchase Specification for fittings marked with deviations shall be returned with offer duly signed and stamped as token of acceptance. Clauses which are not relevant to the supply may be cross marked and mentioned “NA”.
- 18.3 Material test certificates for physical properties, chemical composition and heat treatment etc. shall be furnished.

19 OTHER REQUIREMENTS

- 19.1 Guarantee/ Warranty, Quality plan, Inspection, PMI, documentation requirements and others shall be governed by purchase requirements attached with the material requisition.

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			 <small>Written By</small> Jayaraman Raja 2022.09.30 12:04:53 +05'30'	 <small>Checked by</small> Lokesh, Jayaraman 2022.09.30 12:23:07 +05'30'	 <small>Approved By</small> Loganathan Sudarshan 2022.09.30 16:02:57 +05'30'	 <small>Approved By</small> Venkatesh Venkatesh 2022.09.30 16:04:14 +05'30'
D	19-SEP-2022	ISSUED FOR DESIGN	JR	JL	SL	PSSG/KV
C	25-MAR-2022	ISSUED FOR DESIGN	KSK	JL	SL	PSSG/KV
B	03-DEC-2020	ISSUED FOR DESIGN	PM	VV	TI	BSR/PSSG
A	10-JUL-2018	ISSUED FOR DESIGN	SK	VV	TI	MP/PSSG

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REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED
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1. INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) raising the capacity of its Gujarat refinery as well as setting up a petrochemical plant at the unit as part of plans for upscaling Petchem business to protect margins.

The project envisages raising the capacity of the Vadodara refinery in Gujarat from 13.7 MMTPA to 18 MMTPA and building a 500 KTPA polypropylene (PP) plant and a 235 KTPA Lube Oil Base Stock (LOBS) unit.

The project would be a building block for the production of niche chemicals in future with a potential to increase petrochemical and specialty products integration index on incremental crude oil throughput which would enhance the refinery margins.

The Gujarat Refinery project is part of IOC's plans to boost petrochemical capacity by more than 70 per cent over the next decade, from 3.2 million tonnes a year currently.

2. DEFINITIONS & ABBREVIATIONS

Abbreviation	Definition /Expanded form
IOCL/ CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design
FEL	Front End Loading
AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.

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PART-I	Indicates New AVU, Straight Run LPG Treater Unit and its offsite & integration portion of the PROJECT
PART-II	Indicates all the balance Units / facilities and its off sites, utilities & integration portion of the PROJECT
VENDOR	Any third party supplying the equipment/materials for setting up the Plant
LLI	Long Lead Item – Any equipment / Package / Work order taking 16 months or more completion time from the date of award
PROJECT	Indicates Petrochemical and Lube Integration Project "LuPech" (J18), IOCL Gujarat Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
OISD	Oil Industry Safety Directorate
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute
P&ID	Piping and Instrumentation Diagram
A/G	Above Ground
U/G	Under Ground
B/L	Battery Limit
ISBL	Inside Battery Limit
EOT	Electrically-operated Overhead Travelling
MTO	Material Take Off

3. **SCOPE**

The specification defines the method of identification of the various piping raw materials by colouring using paints so as to avoid mix-up between materials of different metallurgy / grades, but which are similar in physical appearance.

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4. REFERENCE CODES & STANDARDS

The following BIS Code and relevant purchase specification shall be referred

- ASME A13.1: Scheme for the Identification of Piping Systems
- PFI ES-22: Recommended Practice for Color Coding of Piping Materials
- IS: 5-2007: Specification of Colours for Ready Mixed Paints and Enamels
- IS 2379: Colour code for identification of pipe lines - Includes Amendment 1
- Purchase Specification (For Pipes, Fittings, Flanges, Gaskets, Fasteners)

5. GUIDELINES FOR IDENTIFICATION BY COLOUR CODING

Materials shall be painted with one colour or combination of colours as set out in this specification.

Paints used for colour coding shall be of quality so as to last for at least 5 years.

Colour identification is not required on galvanized-materials and non-ferrous metals such as copper, lead, bronze, aluminium because these can be distinguished by their specific colour and characters.

One strip of water-proof paint / ink shall be provided for each valve according to colour table-2. Strip location shall be on the edge of flange ends, or on bonnet/body connection. In addition, all IBR valves shall be painted red in body-bonnet / body-cover joint. Any other Special items (SP Items) like bellows, strainer, sight glasses, steam traps, hose, hose couplings, corrosion coupons etc. do not require colour identification as these items are also tagged with their identification.

Discrimination colour shall be marked on the inner and outer surface of pipes & fittings.

The length of inner surface painting

- Shall be not less than 4 inch (100 mm) at both ends of pipes.
- Shall be about 2 inch (50 mm) at any one end of fittings.

6. IDENTIFICATION COLOURS

Paint colours to be used for identification shall be in accordance with Table-1.

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Application of various colours for identification shall be as per colour coding defined in this specification.

7. METHOD OF COLOUR CODING

All pieces shall be marked with a stripe of water-proof / ink in accordance with the colour code specification.

Colours and locations of colour identification on pipes, fittings, flanges, Gaskets, studs / bolts, nuts shall be in accordance with Table -2 to 4 and Annexure-1.

The identification colour on gaskets shall be painted on the peripheral face of each gasket (refer Annexure-1).

Weld ends, Machined surfaces shall not be painted.

Width of colour band shall be a minimum of 6 mm for 2.5" and smaller size components, and 25 mm for 3" and larger size ones, unless otherwise specified.

Wherever combination of two or more colours is specified, materials shall be Painted in parallel colour bands as close to each other as possible (Refer Annexure-1).


Paints containing chlorine, chlorides, sulphur, lead, zinc or any contents detrimental to materials are not acceptable. The contractor shall satisfy and produce documents / carry out tests as required by the owner.

A query shall be raised with Owner for materials not covered by this specification.

If continuous stencilling of material specification is available then colour coding on stainless steel material may be avoided.

8. APPLICABLE TABLES

Table No.	Titles
1	Basic colour of identification
2	Colour identification on pipes, fitting, flanges and valves
3	Colour identification on Bolts / Nuts / studs
4	Colour identification on Gaskets

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Annexure-1: Schematic representation of colour identification

TABLE -1

BASIC COLOURS FOR IDENTIFICATION (IS: 5 - 2007)

(Approximate Munsell Value Reference)

Name of Colour shade	Sl. No.	Indian colour (ISC) No.	Munsell Value		Equivalent RAL Number
			Hue	Value/Chroma	
Dove Grey	100	694	2.3G	5.53/0.48	7005
Salmon Pink	68	443	2.5YR	6.31/4.7	3022
India Brown	65	415	2.7YR	3.76/3.02	8016
Canary yellow	39	309	4.8Y	7.89/11.02	1012
Deep orange	87	591	8.9R	5.04/10.38	2011
Lincoln Green	27	276	0.3G	3.53/2.81	6009
Sea Green	14	217	6.2GY	6.12/6.15	6018
Sky Blue	1	101	8.3G	60.09/2.86	5015
Navy Blue	6	106	6.2PB	2.61/0.95	5014
Light Purple Brown	73	449	3.2R	3.07/2.14	8025
Dark Violet	104	796	6.1P	3.5/4.27	4005
Chocolate	74	451	3.5YR	2.82/0.67	8017
Maroon	83	541	1.3R	2.9/1.36	3005
Post Office Red	81	538	4.2R	3.55/8.39	3002
Satin Blue	12	177	2.8B	7.4/3.17	5012
Grass Green	15	218	8.2GY	4.65/5.52	6010
Olive Green	17	220	6.0GY	3.44/2.17	6003
Silver Grey	89	628	1.5GY	5.96/1.59	7001
Crimson	82	540	2.9R	2.95/3.96	3018
Traffic Green	25	267	2.5G	3.73/3.79	6024
Beige	58	388	0.9Y	7.2/3.73	1001

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Name of Color	SI.No.	Indian Colour (ISC)	Munsell Value		Equivalent RAL Number
			Hue	Value/chrome	
Indian Saffron	86	574	8.2R	5.21/10.57	1017
Dark Admiralty grey	93	632	8.1B	4.42/1.01	9023
Golden brown	64	414	4.6YR	4.54/5.41	8000
Traffic Yellow	53	368	4.8YR	6.21/10.05	1023
Light Brown	60	410	7.2YR	4.77/4.44	8025
Deep Cream	41	353	2.4Y	8.01/6.73	9001
French Blue	8	166	3.8PB	4/6.13	5019

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TABLE – 2

COLOUR CODES FOR PIPES, FITTINGS, FLANGES & VALVES

Pipe	Elbows, Reducers, Tee's Caps	Flange/Blind Flange / Valves	SI. No.	Indian Std. Colour (ISC) No.	Colour Shades
	A 234 Gr. WPB	A-182	—	—	None
	A 234Gr. WPBW	A-105	—	—	None
API 5L GR B - SMLS	—	—	—	—	None
API 5L Gr. B- EFSW	—	—	—	—	None
API 5L Gr.B- ERW	—	—	6/65	106/415	Navy Blue & India Brown
A 106 Gr. B & A672	A 234 Gr. WPB	A105N / A 216 Gr.WCB	87	591	Deep Orange
A 106 Gr. B & A672(Normalized)	A 234 Gr WPB (N)	A105N / A 216 Gr.WCB/ A516N Gr.70	87/14	591/217	Deep Orange & Sea Green
	A 234 Gr. WPBW (N)		87/14	591/217	Deep Orange & Sea Green
IS1239 / IS3589 Gr.410			73	449	Light Purple Brown
IS 3589 Gr. 330			73/6	449/106	Light Purple Brown & Navy Blue
A 333 Gr. 6 & A671	A 420 Gr. WPL 6	A350 Gr.LF2 / A352 Gr.LCB	83	541	Maroon
	A 420 Gr. WPL 6W		83	541	Maroon
A 335 Gr. P11	A 234 Gr. WP11	A182 Gr.F11/ A217 Gr.WC6	27	276	Lincoln Green
A 691 Gr.1.25 Cr. CL.42 (EFW)	A 234 Gr.WP11W	A182 Gr. F11/ A217 Gr.WC6	27	276	Lincoln Green

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TABLE – 2
COLOUR CODES FOR PIPES, FITTINGS, FLANGES & VALVES (....Contd.)

Pipe	Elbows, Reducers, Tee's Caps	Flange/ Blind Flange / Valves	SI. No.	Indian Std. Colour (ISC) No.	Colour Shades
A 335 Gr. P22	A 234 Gr.WP22	A 182Gr. F22 / A217 Gr.WC9	14	217	Sea Green
A 691 Gr. 2.25 Cr. CL.42 (EFW)	A 234 Gr.WP22W	A 182Gr. F22 / A217 Gr.WC9	14	217	Sea Green
A 335 Gr. P5	A 234 Gr.WP5	A 182 Gr.F5	6	106	Navy Blue
A691 Gr. 5 Cr Cl.42	A 234 Gr.WP5W	A217 Gr.C5 / A387 Gr.5	6	106	Navy Blue
A 335 Gr. P91	A 234 Gr. WP91	A 182 Gr. F91	104	796	Dark Violet
A691 Gr.P91	A 234 Gr.WP91W	A 182 Gr. F91	104	796	Dark Violet
B622 UNS N10276	B366 WPHC276	B564 UNS N10276/ A494 Gr.CW12MW	68	443	Salomon Pink
B165 UNS N0440	B366 Gr.WPNC	B564 UNS N04400 / A494 Gr.M35-	39	309	Canary Yellow
B423 UNS N08825	B366 Gr.WPNICM	B564 UNS N08825 / A494 Gr.CU5MCuC	58	388	Beige
A 312 Gr.304/304L A 358 Gr.304/304L	A403 Gr.304/304L	A 182 Gr.F304/304L/ A351 Gr.CF3/CF8	12	177	Satin Blue
A 312 Gr.316/316L A 312 Gr.316/316L	A403 Gr.316/316L	A 182 Gr.F316/316L/ A351 Gr.CF3M/CF8M	15	218	Grass Green
A 312 Gr.321 A358 Gr.321	A403 Gr.WP321	A 182 Gr.F321 A240 Gr.321	17	220	Olive Green
A 312 Gr.347	A403 Gr.347	A 182 Gr.F347	87	591	Deep Orange
A335 Gr.P9 A691 Gr. 9 Cr CL42	A182 Gr.F9 A234 Gr.WP9	A182 Gr.F9 A217 Gr.C12 A387 Gr.9	86	574	Indian Saffron

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Pipe	Elbows, Reducers, Tee's Caps	Flange/ Blind Flange / Valves	SI. No.	Indian Std. Colour (ISC) No.	Colour Shades
A312 Gr. TP304H A358 Gr. TP304H	A182 Gr. F304H A403 Gr. WP304H	A182 Gr. F304H A240 Gr. 304H	93	632	Dark Admiralty Gray
A312 Gr. TP347H A358 Gr. TP347H	A182 Gr. F347H A403 Gr. WP347H	A182 Gr. F347H A351 Gr. CF8C A240 Gr. 347H	64	414	Golden Brown
A312 Gr. TP317L A358 Gr. TP317L	A403 Gr. WP317L	A182 Gr. F317L A240 Gr. 317L	53	368	Traffic Yellow
A790 UNS32750	A182 Gr F53 A815 WPS32750	A182 Gr F53	8	166	French Blue
A672 Gr. 70+Clad	A105N+Clad A516N Gr. 70+Clad	A105N+Clad A516N Gr. 70+Clad	87/1	591/101	Deep Orange & Sky blue
A106 Gr. B+ Epoxy coat	A234 WPB+ Epoxy Coat	A105N + Epoxy Coat A516N + Epoxy Coat	87/41	591/353	Deep Orange & Deep Cream

NOTE For SI. No. refer Table-1

- For Hydrogen service, white colour band shall be applied in addition to above
- For IBR material, Post Office red shall be applied in addition to above.
- For NACE(SOUR) material, Canary Yellow shall be applied in addition to above.
- For NACE(SOUR)+HIC material, Dark Brown shall be applied in addition to above.

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TABLE - 3

COLOUR CODE (POWDER COATING) – STUDS / BOLTS AND NUTS

Bolts / Nuts	ASTM STD.	SL. NO	Indian Std. Colour (ISC) No.	Colour Shades
Bolt	A 193 Gr. B7	—	—	Canary Yellow
Nut	A 194 Gr. 2H	—	—	Canary Yellow
Bolt	A 307 Gr. B	65	415	India Brown
Nut	A 307 Gr.B	65	415	India Brown
Bolt	A 193 Gr. B16	27	276	Lincoln Green
Nut	A 194 Gr. 4 or 7	27	276	Lincoln Green
Bolt	A 320 Gr. L7	82	540	Crimson
Bolt	A 320 Gr. B 8	87	591	Deep Orange
Nut	A 194 Gr. 8	87	591	Deep Orange
Bolt	A 193 B7M	6	106	Navy Blue
Nut	A 194 2HM	6	106	Navy Blue
Bolt	A 453 Gr.660 CL.A	74	451	Chocolate
Nut	A 453 Gr.660 CL.A	74	451	Chocolate

NOTE : For schematic representation, Refer Annexure-1

For Sl. No. refer Table-1



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TABLE - 4

COLOUR CODE FOR GASKETS

Gasket Type	ASTM code/ Description	SL. NO.	Indian STD. Colour (ISC) NO.	Colour Shades
Comp. Natural Fibre (Ring)	IS 2712 W/1 (Full Face)	100	694	Dove Grey
	IS 2712 Gr. 0 / 1 (Ring)	-	-	None
	IS 2712 Gr. W / 3 (Ring)	1	101	Sky Blue
	IS 2712 Gr. A / 1 (Ring)	14	217	Sea Green
	Teflon Jacketed Asbestos (Ring)	74	451	Chocolate
Spiral Wound	SS 304 SPR WND + CA Filler	6	106	Navy Blue
	SS 304 H + Grafoil Filler	68	443	Salmon Pink
	SS 304 + Grafoil Filler (Cryo)	73	449	Light Purple
	SS 304 + Teflon Filler	65	415	Brown
	SS 304 L SPR WND + CA Filler	83	541	India Brown
	SS 316 SPRWND + CA Filler	87	591	Maroon
	SS 316 L SPR. WND + CA Filler	27	276	Deep Orange
	SS 316 H SPR. WND + Grafoil Filler	39	309	Lincoln Green
	Teflon Jacketed SPR. WND Asbestos	104	796	Canary Yellow
SS321 + Grafoil Filler	17	220	Olive Green	
Octagonal Ring Gasket	5 Cr, 1/2 Mo (Max. 120 BHN)	25	267	Traffic Green
	Soft Iron (Max. 90 BHN)	89	628	Silver Grey
	SS 317L	53	368	Traffic Yellow
	SS 321L	17	220	Olive Green

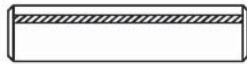
NOTE: For schematic representation, Refer Annexure-1

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ANNEXURE - 1

SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION

A. COLOUR IDENTIFICATION OF PIPES

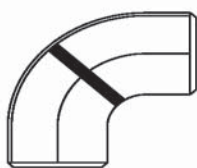


ONE COLOUR



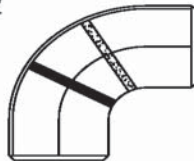
TWO COLOUR

B. COLOUR IDENTIFICATION OF FITTINGS

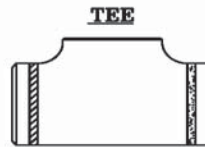


ONE COLOUR

ELBOW

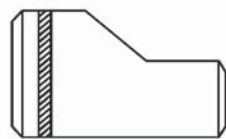


TWO COLOUR



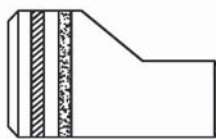
TEE

ONE OR TWO COLOUR(S)

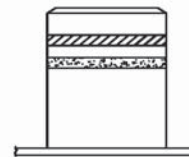


ONE COLOUR

REDUCER

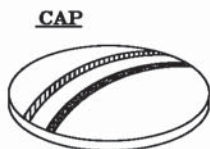


TWO COLOUR



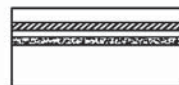
ONE OR TWO COLOUR(S)

STUB END



ONE OR TWO COLOUR(S)

CAP



ONE OR TWO COLOUR(S)

COUPLING

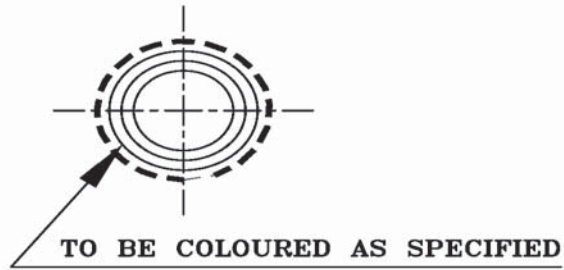
 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
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SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION

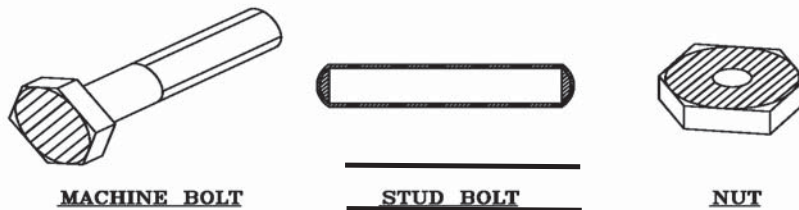
C. COLOUR IDENTIFICATION OF FLANGES





D. COLOUR IDENTIFICATION OF GASKET











E. COLOUR IDENTIFICATION OF STUD/BOLTS & NUTS



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SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION AT VENDOR’S WORKS

			 	 	 	
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REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. INTRODUCTION

Indian Oil Corporation (IOC), raising the capacity of its Gujarat refinery as well as setting up a petrochemical plant at the unit as part of plans for upscaling Petchem business to protect margins.

The project envisages raising the capacity of the Vadodara refinery in Gujarat from 13.7 MMTPA to 18 MMTPA and building a 500 KTPA polypropylene (PP) plant and a 235 KTPA Lube Oil Base Stock (LOBS) unit.

The project would be a building block for the production of niche chemicals in future with a potential to increase petrochemical and specialty products integration index on incremental crude oil throughput which would enhance the refinery margins.

The Gujarat Refinery project is part of IOC's plans to boost petrochemical capacity by more than 70 per cent over the next decade, from 3.2 million tonnes a year currently.



2. REFERENCE DOCUMENTS

Sl. No	Document Title	Document Reference
1	IOCL Tender Document	RHQCC17071
2	IOCL's Contract	KK/RHQCC17071-1/AGT/201802019



3. GENERAL INFORMATION

3.1 DEFINITIONS & ABBREVIATIONS

Abbreviation	Definition /Expanded form
CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design

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AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.
VENDOR	Any third party supplying the equipment/materials for setting up the Plant/ Entity that supplies Equipment and / or services according to Purchase order
PROJECT	Addition of Motor driven Process Air Compressor
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
PMI	Positive Material Identification
XRF	X-Ray Fluorescence
OES	Optical Emission Spectroscopy
Alloy Material	Any metal (including filler metals for welding alloy materials) retaining alloying elements such as chromium, nickel, or molybdenum, that are intentionally added to enhance mechanical or physical properties and/or corrosion resistance. Does not include high-strength low-alloy (micro alloyed) steels and impact-tested carbon steels
Pressure-retaining Components	Components acting as pressure envelope or boundary; breach of this envelope or boundary would lead to loss of containment and discharge of process fluids. Examples include, but not limited to, product forms used for the fabrication of pressure piping and equipment such as shells, heads, tube sheets, nozzles, tubes, flange bolting, gaskets, forgings, flanges, individual pipe lengths and fittings (tees, elbows, reducers, special pipe components), valve bodies and bonnets, pressure-retaining welds, weld overlays/cladding, expansion joints and bellows.
Non-pressure Components	Items that are not part of the pressure-retaining envelope, and, therefore, do not affect the pressure retaining capacity of pressured components
Representative Sampling	PMI testing of a sample, which consists of one or more pieces (components), selected at random from an inspection lot, which will be examined to determine acceptability of the inspection lot
Material Specification	ASME Sec II A, B and C, or relevant ASTM, any other material specifications, as per contract
Equipment Manufacturer	The Company responsible for the plant or shop manufacturing of pressure equipment that is within the scope of this standard.

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Fabricator	The company, organization, or agency responsible for the shop or field fabrication or assembly of piping and pressured equipment within the scope of this standard.
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4. SCOPE

- a. This specification specifies the basic requirements for conducting the Positive Material Identification (PMI) tests on ferrous and non-ferrous metal alloy materials and welds in the vendor shop.
- b. This specification is intended to ensure nominal composition of the alloy components and associated welds, have been correctly supplied and installed as specified in Drawing/ Documents.
- c. The test methods outlined in this specification are intended to identify alloy materials and are not intended to establish the exact conformance of a material to a particular alloy specification.
- d. PMI shall not be considered as a substitute for required material test reports, and material test reports shall not be considered as acceptable PMI.
- e. This Specification covers the extent of parts to be checked, sampling requirements, approved testing methods, acceptance/rejection criteria and marking requirements of PMI.
- f. This Specification is applicable to all the alloy material specifications except where alloying elements are added as trace for enhancing the strength of micro alloyed steel.
- g. The elements of the basic alloy materials to be verified shall be in accordance with the below Table.

TABLE

Basic alloy	Elements to be verified
Carbon-Molybdenum, Manganese-Molybdenum and Chromium-Molybdenum Steels, Chromium-Molybdenum Vanadium Steel	Chromium, Molybdenum and Vanadium
Copper - based alloys	Copper, Zinc and other elements specified in applicable material specifications.

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Regular Carbon grade stainless steels	Chromium, Nickel and Molybdenum
Stabilized Stainless steels	Chromium, Nickel, Molybdenum, Titanium and Niobium
Nickel based alloys	Nickel, Iron, Copper, Chromium and Molybdenum
Nickel Steels	Nickel



5. CONFLICTS, DEVIATIONS AND CLARIFICATIONS

Any conflicts, Deviations between this standard and other applicable engineering specifications shall be dealt with the following orders of precedence.

- Licensor’s Specification
- Particular technical specification issued for the specific material/item
- This Specification
- International standards and codes

6. APPLICABLE CODES AND STANDARDS

ASME II Part A	Ferrous Material Specifications
ASME II Part B	Non-Ferrous Material Specification
ASME II Part C	Specification for welding rods, Electrodes and Filler metals
ASME IX	Welding and Brazing Qualifications
ASME B31.3	Process Piping
ASME B31.1	Power Piping
API RP 578	Material Verification Program for New and Existing Alloy Piping System
ASTM A751	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM E353	Standard Test Methods for Chemical Analysis of Stainless, Heat-Resisting, and other Similar Chromium-Nickel-Iron Alloys
ASTM E354	Standard Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys



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7. ALLOY VERIFICATION-GENERAL REQUIREMENTS

- a. The fabricator or supplier shall certify that all PMI has been performed at the point in time that will ensure the correct material has been used.
- b. Vendor or appointed PMI agency shall ensure that all involved parties fully understand the PMI requirements. That includes the verification method to be used, the period during fabrication when verification will be conducted, and the method of marking verified material.
- c. The PMI personnel and procedures shall be subject to review by CONTRACTOR as follows:
 - The fabricator or supplier or any third-party agency shall submit the alloy verification procedures to CONTRACTOR for review, including complete descriptions of the methods and equipment to be used and personnel qualification procedures.
 - CONTRACTOR shall review the procedure and qualifications and witness sample alloy verification tests to the extent necessary to confirm that the procedures, equipment and personnel can provide consistent and accurate results.
 - CONTRACTOR shall check procedures to ensure that positively identified materials are traceable to the purchase order and / or any required material documentation or mill test reports.
 - CONTRACTOR shall have the right to witness the performance of any PMI test.
 - If the performance of any verification activity is unacceptable to CONTRACTOR, or if any material has been incorrectly identified, all further tests shall be subject to approval by CONTRACTOR until the problem is corrected.
 - Shop-fabricated equipment & all shop fabricated spools requiring PMI shall have the verification testing done in the vendor’s shop.
 - Where items are rejected after analysis, all remaining pieces of the item from the same supplier shall be sampled and analyzed as described in Section 10.

8. VERIFICATION METHODS



- a. The instruments or methods used for the examination shall be suitable for identifying the material by quantitative measurement of the major alloying elements required in the applicable material specification or welding procedure specification, provide recordable results.

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- b. The preferred method is X-ray Emission Fluorescence (XRF) analysis or Optical Emission Spectrograph (OES) analysis by a calibrated portable instrument. Selection of equipment to be used for PMI should consider material type, thickness, hardness requirements and surface finishes.
- c. Any burn caused by OES shall be removed by Buffing/Grinding, ensuring that the minimum thickness requirement of the component is not compromised
- d. The material manufacturer, supplier or fabricator performing the verification shall submit a dedicated procedure for PMI to CONTRACTOR/CONSULTANT's approval
- e. If there is any discrepancy in the PMI results using portable instrument as specified in paragraph 7 b, a chemical analysis as outlined in ASTM A751, ASTM E353 and ASTM E354, may be used to establish conformance to the original material specification
- f. Reference Block with chemical analysis certificate shall be used for In - situ calibration before proceeding with the actual job.
- g. The surface to be analyzed shall be clean bare metal, free of grease or oil, free from dust with a surface finish as specified by the instrument manufacturer.
- h. The PMI shall be done at three stages- During raw material receipt, during in process stage and during final inspection
- i. Additional PMI testing methods as listed in API RP 578 will be considered for use only upon request and approval.

9. OPERATOR QUALIFICATIONS

- a. The person performing the PMI Test shall be qualified, experienced and competent to operate the equipment, conduct the test, store and retrieve the data as appropriate. Operator must possess a documented Training record for verification.
- b. Must have the necessary interpretation skills essential for the operation of the portable equipment.
- c. The PMI Instrument shall have been serviced within 6 months' period of use to verify the suitability of Batteries, sources etc. Records of such service shall be available for review. The accuracy of the non-destructive testing equipment shall be verified immediately before use and re-verified during use as recommended by the testing equipment manufacturer. Calibration shall be to a standard of the alloy being tested. The alloy standard shall be traceable to a reference standard as described in ASTM A751.
- d. Reference Block with full traceability with chemical analysis certificate shall be used.

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- e. PMI shall be performed on the surface that will be in contact with the process fluid. The only exception shall be where small-bore components or piping assembly closure weld prevent access to the internal surface

10. EXTENT OF VERIFICATION



10.1 FOR PRESSURE CONTAINING EQUIPMENT, PACKAGES etc.,

- a. PMI Testing shall be performed at the point of use and typically at the supplier’s shop during fabrication or immediately prior to fabrication/assembly.
- b. PMI of weld material shall be performed in the same manner as for the adjacent base metal. Weld overlay and Clad restoration welds also shall be PMI verified as appropriately.
- c. Alloy pressure retaining components in critical service shall undergo 100% PMI. The requirement of PMI shall be in accordance with this specification and will be indicated in Material requisition attached to Purchase order.
- d. PMI shall be performed 100% for RTJ Gaskets (RTJ Gaskets shall only be inspected by using X ray fluorescence instruments), and for Fasteners it shall be 10% Random.
- e. One uncoated electrode/alloy welding filler wire shall undergo PMI from each heat. The remainder of the lot from that heat shall be identified with the tested sample and proper records maintained.
- f. Double side welded joints in Alloy steel material, shall be PMI tested on both inside and outside of the welds wherever accessible. (i.e.) weld capping layer inside and outside. Minimum one spot per 100 feet for horizontal and vertical welds should be considered
- g. PMI of heat exchanger tubes shall be done 100% by the supplier and 10% at the fabrication shop. Care shall be taken not to damage the tubes by arc strike.
- h. In addition to PMI verification of heater tubes, shop and field welds on alloy heater tubes require 100% PMI verification.
- i. All alloy components direct contact with service fluid & Internals shall require random PMI of 10% of the sample population on a heat/lot basis.

10.2 BULK MATERIALS

PMI examination of bulk piping components shall be on a heat/lot basis by the manufacturer or Vendor as indicated below.

Bulk piping components consist of pipe, fittings and flanges procured directly from Manufacturers.

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- a. If the heat/lot consists of five (5) items or less, PMI shall be performed on all items.
- b. If the heat/lot consists of 5 - 200 items, perform random PMI on five (5) items or 5% of the total, whichever is greater.
- c. If the heat/lot consists of more than 200 items, perform random PMI on 10 items or 3% or the total, whichever is greater.
- d. Where there is reason to suspect problems, longitudinally welded alloy pipe and fittings should receive 100% PMI testing verification of the base metal and weld metal.

100% PMI verification is required for pressure-containing components procured from bulk item Stockists.

10.3 FASTENERS & GASKETS

- a. All alloy stud bolts and nuts require random PMI of b. 5% of each lot unless otherwise specified.
- b. Gaskets – only for RTJ Gaskets, 100% PMI shall be performed.

10.4 OTHERS

Valves – All types for Piping and Instrumentation – Pressure retaining & contact with service fluid- external components shall be 100% performed.

Pumps, Compressors, Turbines etc.– Pressure retaining external components shall be 100% performed.

Inline Instruments, Components (orifice plate etc.) – Pressure retaining & contact with service fluid -external components shall be 100% performed.

Tanks – Pressure retaining/Holding components -Bottom Plate, Shell Plate, Roof and Nozzles shall be 100% performed.



10.5 EXCEPTIONS

Non-pressure retaining Components

Components made from Carbon Steel or Cast iron and filler metals, other than wet sour service, potential for catastrophic failure, other related provisions in the Project QA Plan.

Rotating Equipment internals, associated seal, lube oil, cooling water systems etc.

Valve internals, all instrumentation provided with Isolation valve etc.

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Gaskets other than Ring type metallic gaskets (RTJ)

PMI for the following piping materials may be exempted:

- Steam / air / drain traps
- Metallic flexible hoses
- Hose couplings



For instrument bulk materials like instrument tubing's, fittings etc., PMI is not required. This includes instrument tubing, fittings mounted inside skid assembled packages.

11. ACCEPTANCE CRITERIA

- a. For acceptance, it must be demonstrated that materials contain the amount of alloying elements shown in the material specification. Alloys shall be acceptable if the alloying elements are each within 10% specified range of values.
- b. Deposited weld metal or undiluted weld metal deposits shall be within a tolerance of 12.5% of the ranges allowed by ASME Section II C for each element.
- c. Acceptance criteria for dissimilar metal alloy welds shall be such that the weld meets the chemical composition requirements. The effects of dilution during deposition should be considered for deposited (diluted) weld metal.

12. REJECTION CRITERIA



- a. If the PMI testing results fall outside the acceptable range using a method described in Section 7, the Equipment Manufacturer or the Fabricator, as applicable, has the option to conduct a more accurate analysis at his own expense to determine the component acceptance such as obtaining a chemical analysis performed by an independent testing laboratory using the 'referee, method referenced by the material specification. If no referee method is referenced, an appropriate method of chemical analysis as per Clause 7.e shall be used. Results of this analysis shall govern.
- b. If any material component or weld is found to be unacceptable, all other represented materials, components, or welds shall be considered suspect. The supplier has the option of the following:
 - Scrapping all those represented materials and components and replacing with new components or filler metals (as applicable)

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- Performing 100% examination of the remainder of the represented materials, components, or welds and replacing each item that fails the positive material identification check.
- c. When one lot of components or filler metal is found to contain unacceptable items, then the next two lot of components from the same supplier shall be examined 100%. If both lots are acceptable, or when two successive lots are acceptable, the sampling percentage described in Section 9 may be resumed.
- d. The supplier shall be responsible for segregating rejected items and assuring that they are properly identified to prevent their un-authorized re-use or removal.

13. MARKINGS



- a. Materials, items and welds that are found to be unacceptable during verification testing shall be marked immediately with a circled RED cross (X) for identification purposes with water soluble material that contain no substances that harmfully affect the metal at ambient and elevated temperature.
- b. All verified materials with an acceptable analysis shall be marked with the letters “PMI OK” using a certified low stress stamp, except that the components and welds in the completed equipment at vendor’s shop such as vessel, heat exchanger etc., need not be marked provided that each positively identified materials and welds can be traceable to PMI records prepared by vendor in accordance with paragraph 13
- c. When any heat treatment or pre-heat is performed after PMI, the identification marking must be recognizable after such heat application. When a material is cut after PMI has been performed, the markings shall be transferred onto the unmarked piece/s.
- d. Items sampled by lot or which cannot be marked individually shall be tagged with the identification information placed on tags. For items sampled by lot, tags may be affixed to their containers.
- e. Markings shall be placed as follows:
 1. Plates — Adjacent to heat numbers.
 2. Pipes — Two marks, 180 degrees apart, 75mm from each end of each length of pipe on the outer surface.
 3. Forgings and Fittings — Adjacent to the Vendor's markings.
 4. Valve — Adjacent to the Vendor’s marking on bodies and other pressure parts.

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5. Casting — Adjacent to the Vendor’s marking and heat numbers.
 6. Studs and Bolts — On the end.
 7. Nuts — On one flat.
 8. Weld — Adjacent to welder's mark on the weld
- f. Unacceptable components and welds shall be identified and quarantined immediately

14. RECORDS OF VERIFICATION TESTING

- a. A report should be made to identify each component that has been PMI verified and the results of the testing. Test results should include measured percentage of alloying element, accepted, rejected, rejected but accepted based on independent chemical analysis, and so on.
- b. The report shall identify each component to an individual shop-fabricated equipment item, assembly, line number etc. Each equipment manufacturer shall develop the detailed recording / reporting procedure to CONTRACTOR.
- c. The equipment manufacturer shall prepare a detailed PMI map of the pressures equipment being fabricated
- d. Reference to the PMI test procedure(s) used, Date of testing, Test instrument identification number or serial number where appropriate, Name of each person and company performing the tests, Basis and action for resolving and documenting PMI test non-conformances including those that have been left in service shall be recorded.
- e. A PMI report must include the following data
 - Supplier's, or nominated sub-supplier's, name
 - PMI sub-contractor's name and address, if applicable
 - Purchase Order No. and Contract No.
 - Equipment Item No.
 - Location and date of PMI examination
 - Description of method/ instrument used
 - Instrument no. and date of last service

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- Results of PMI examination
- Type of alloy examined per item
- Conclusion

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STANDARD MATERIAL SPECIFICATIONS
Low Alloy Steel Materials
(1.25Cr-0.5Mo, 2.25Cr-1Mo, 2.25Cr-1Mo-V)
For Pressure Vessels
IN-042.123

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1 General

1.1 Scope

This specification is Axens standard requirements for Low Alloy Steels (LAS) 1.25Cr-0.5Mo, 2.25Cr-1Mo and 2.25Cr-1Mo-V materials for fabrication of unfired pressure vessels with wall thickness above 12.7mm (1/2") by welding: Drums, Separators, Columns, Reactors and Heat Exchangers (heat exchanger tubes are excluded due to their low thickness). Vessels with internal stainless steel cladding or overlay are also covered. It is the result of Axens/IFPEN experience regarding pressure vessels in the field of hydro-processing and reforming units, and it should be used by the Detailed Engineering Contractor during the call-for-bid.

1.2 References

ASME II part A

ASME II part B

ASME BPVC section VIII div.1

ASME BPVC section VIII div.2

API Publication 938-A

API RP 934-A

API RP 934-B

API RP 934-C

API RP 934-D

API RP 934-E

1.3 Abbreviations

LAS: Low Alloy Steels 1.25Cr-0.5Mo, 2.25Cr-1Mo and 2.25Cr-1Mo-V

MDMT: Minimum Design Metal Temperature. It is the lowest temperature resulting from depressurization or weather conditions and at which the equipment can possibly be operated close to design pressure.

PWHT: Post-Weld Heat Treatment

MPT: Minimum Pressurization Temperature. It is the temperature above which the vessel can be operated at design pressure without risks of brittle fracture at low temperature.

t: Thickness of the material or wall thickness of the vessel

T: Temperature

na.: Not applicable

UT: Ultrasonic testing

RT: Radiographic examination

WPS: Welding Procedure Specification

PQR: Welding Procedure Qualification Record

MT: Magnetic Particles Examination

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PT:	Dye Penetrant Examination
NDE:	Non-Destructive Examinations
DBTT:	Ductile-to-brittle transition temperature. It is the temperature below which materials or welded assemblies become brittle and must not be operated under pressure. DBTT increases with hydrogen embrittlement and thermal ageing.
QA:	Quality Assurance
QC:	Quality Control
BM:	Base Metal
WM:	Weld Metal
HAZ:	Heat Affected Zone

1.4 Design

Reference is made to ASME BPVC section VIII div.1 construction code for design, fabrication, inspection and testing of pressure vessels, but another internationally recognized construction code for fabrication of pressure vessels may also be selected and interpreted under the responsibility of Detailed Engineering Contractor. Construction code shall be supplemented by rules in this specification, also taking into account local regulations and good engineering practice.

Reaching the properties targeted in this specification usually requires discussions between the vessel manufacturer and steel producers in order to optimize chemical composition, mechanical properties at low and design temperature after fabrication, and resistance to metallurgic transformations at high temperature.

The vessel designer is responsible for performing relevant stress and thermal analyses, and the vessel manufacturer is responsible for the mechanical resistance of the pressure vessel at design pressure, design temperature and MDMT. Vessel manufacturer must also develop Pressure-Temperature charts showing vessel safe operating envelop in terms of operating pressure and operating temperature, also taking into account the effect of thermal ageing (temper embrittlement) and the influence of hydrogen on the toughness of the material at low temperature. The definition of the Minimum Pressurization Temperature (MPT) at which the vessel should be heated before increasing the pressure above 25% of design pressure is based on these charts.

The selection of LAS grades over carbon steel can be dictated by mechanical considerations (creep, design temperature, low temperature toughness, etc.) but also by their resistance to High Temperature Hydrogen Attack (HTHA), see Axens document IN-045 for additional information on LAS grade selection versus HTHA.

1.5 Low temperature

Limitation of tramp elements is required for base material and welding consumables in order to control the risks of brittle fracture at low temperature. LAS materials for fabrication of pressure vessels must also be impact tested. The reference temperature for impact testing should be lower than the MDMT specified on Axens Equipment Data Sheet. Maximum reference temperatures for impact testing are defined in Table 1 for LAS materials. Only a lower reference temperature may be considered for impact testing.

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	1.25Cr-0.5Mo	2.25Cr-1Mo	2.25Cr-1Mo-V
Impact test reference temperature	-18°C	-29°C	-29°C

Table 1: Maximum reference temperatures for impact testing

In case the MDMT specified on Axens Equipment Data Sheet for a LAS material grade is lower than the given maximum reference temperature for impact testing (cf. Table 1), then a change of metallurgy should be considered. When MDMT lower than maximum reference temperature is due to local outdoor conditions and not due to process conditions, then the application of a MPT and the following of Pressure-Temperature charts from the vessel manufacturer could allow a safe pressurization of the vessel.

Impact testing to be performed during the fabrication of pressure vessels shall be in accordance with the requirements of ASME Section VIII div.1 exception made that there shall be no exemptions for impact testing.

1.6 Thermal Ageing (Temper embrittlement)

During operation at high temperature, LAS materials can be subjected to metallurgic transformations (Thermal Ageing or Temper Embrittlement) that may impair the low temperature toughness. Supplementary requirements have to be implemented in order to limit the effects of Temper Embrittlement when LAS materials are operated above the temperature limits presented in Table 2. These supplementary requirements include additional limitations on the chemistry of all LAS materials and implementation of impact testing after step cooling heat treatment for 2.25Cr-1Mo and 2.25Cr-1Mo-V materials. Transient operations in the embrittlement temperature range shall be discussed case-by-case with Contractor/Owner.

	1.25Cr-0.5Mo	2.25Cr-1Mo	2.25Cr-1Mo-V
Supplementary requirements apply above	380°C	350°C	350°C

Table 2: Operating temperature limit above which supplementary requirements apply to LAS materials for controlling temper embrittlement at high operating temperature

1.7 Hydrogen Embrittlement

Exposition to hydrogen during operation at high temperature may impair the low temperature toughness of LAS materials. Manufacturer of pressure vessels to be operated in hydrogen service must take the effect of hydrogen embrittlement into account during development of Pressure-Temperature charts showing vessel safe operating envelop.

1.8 Limitations for 1.25Cr-0.5Mo materials

For 1.25Cr-0.5Mo LAS materials, maximum thickness should be limited below 75mm for plates and forgings because mechanical properties (toughness) can be difficult to achieve for higher thicknesses.

Metallurgy upgrade to 2.25Cr-1Mo or 2.25Cr-1Mo-V can be used as an alternative to 1.25Cr-0.5Mo in order to ensure properties are met for wall thickness above 75mm.

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1.9 Heat treatments

Reference to the following heat treatments will be made in this document:

- ISR (Intermediate Stress Relieving)

Used to reduce the hydrogen content in the welds and reduces residual stresses in the welded joints. The temperature for ISR is typically between 590°C-600°C while holding time will depend on thickness (minimum 2h). Different holding temperature may be accepted when vessel manufacturer has recognized experience. The definition of ISR is under vessel vendor scope and shall be approved by the Contractor. It is the standard practice to require ISR for restrained welds such as nozzle attachment welds and main welds that will not be immediately post weld heat treated.

- DHT (Dehydrogenation Treatment)

It is used to reduce the hydrogen content in the welds to prevent from hydrogen induced cracking. This alternative lower temperature heat treatment may be allowed only upon approval of the Contractor. This heat treatment is performed at around 300°C (min.1h) for limiting the possibility of chromium carbide precipitation in stainless steel clad and weld overlay.

- Minimum PWHT:

Post Weld Heat Treatment (*) to be performed at completion of vessel fabrication, it includes ISR when relevant, and final PWHT

- Maximum PWHT:

Post Weld Heat Treatment (*) to be performed at completion of vessel fabrication, it includes ISR when relevant, final PWHT, and additional heat treatments (*) to be defined by Contractor/Owner in provision for potential fabrication and on-site repairs

- Step Cooling (Heat Treatment adapted from ASTM A387 S63.1.2 and similar to the step cooling heat treatment described in API 934-A, which are both also acceptable):
 - First 595°C +/- 10°C (1h) then cool at 5°C/h max. to 540°C
 - Then 540°C +/- 10°C (15h) then cool at 5°C/h max. to 525°C
 - Then 525°C +/- 10°C (24h) then cool at 5°C/h max. to 495°C
 - Then 495°C +/- 10°C (60h) then cool at 3°C/h max. to 470°C
 - Then 470°C +/- 10°C (100h) then cool at 25°C/h max. to 315°C
 - Then Cooling in still air to ambient temperature

When applicable, the procedure of step cooling heat treatment is subjected to Contractor/Owner approval.

(*) Temperature and holding time to be defined as a function of material grade after consultation of steel producer for achievement of required mechanical properties.

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2 Base Materials

2.1 Material grades

Low Alloy Steels materials should be obtained by electric furnace and vacuum degassing process. Basic oxygen furnace process with heated ladle refining and vacuum degassing is also acceptable.

Materials at delivery must have been thermally treated. The following heat treatment delivery conditions are acceptable:

- Annealed (*)
- Normalized + Tempered (*)
- or Normalized + Accelerated Cooling + Tempered (*)

(*) Temperature and holding time to be defined as a function of material grade after consultation of steel producer for achievement of required mechanical properties

Vessels for pressure service made from LAS shall be fabricated from plates, forgings, seamless fittings and seamless pipes. Other product forms are not allowed exception made for tubes of heat exchangers. Forgings should preferably be obtained from hollow ingots. The ASME grades that are allowed are presented in Table 3.

Basic ASME material specifications must be supplemented by the other requirements in present specification.

	1.25Cr-0.5Mo	2.25Cr-1Mo	2.25Cr-1Mo-V
Plates	SA-387 gr. 11	SA-387 gr. 22	SA-542 type D (or SA-832 gr. 22V for thickness < 150mm)
Forgings	SA-336 gr. F11 (or SA-182 gr. F11 for weight < 4500kg)	SA-336 gr. F22 (or SA-182 gr. F22 for weight < 4500kg)	SA-336 gr. F22V (or SA-182 gr. F22V for weight < 4500kg)
Fittings	SA-234 WP11 (seamless)	SA-234 WP22 (seamless)	-
Seamless Pipes	SA-335 P11	SA-335 P22	-
Heat Exchanger Tubes	SA-213 T11	SA-213 T22	-

Table 3: ASME grades allowed for fabrication of pressure vessels by welding

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2.2 Chemical composition

2.2.1 General limitations

Plates, forgings, seamless fittings and seamless pipes for the construction of pressure vessels by welding shall conform to basic ASME material specification supplemented by the following limitations on the chemical composition (Table 4).

	1.25Cr-0.5Mo	2.25Cr-1Mo	2.25Cr-1Mo-V
%C	0.17	0.14 (0.15 for t > 125mm)	0.15
%P	0.007	0.007	0.007
%S	0.005	0.010	0.010
%Ni	0.30	0.30	0.25
%Cu	0.30	0.20	0.20

Table 4: Limitations on chemical composition in addition to basic ASME material specification

2.2.2 Supplementary chemical limitations for 1.25Cr-0.5Mo, 2.25Cr-1Mo and 2.25Cr-1Mo-V operated at high temperature

When operated at high temperature (ref. section 1.6 and Table 2), the supplementary chemical limitations of Table 5 shall apply to LAS materials in order to mitigate the effects of thermal ageing. The "J" factor of LAS materials must also verify the following (composition specified in %):

For 1.25Cr-0.5Mo: $J = (Si + Mn) * (P + Sn) * 10^4 < 120$ (target 100)

For 2.25Cr-1Mo and 2.25Cr-1Mo-V: $J = (Si + Mn) * (P + Sn) * 10^4 < 100$ (target 80)

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Mandatory Limitations	1.25Cr-0.5Mo Operation above 380°C	2.25Cr-1Mo Operation above 350°C	2.25Cr-1Mo-V Operation above 350°C
%C	0.15 (0.16 for forgings)	0.14 (0.15 for t > 125mm)	0.15
%S	0.005	0.008	0.008
%Ni	0.25	0.25	0.25
%Cu	0.20	0.20	0.20
%O2	0.003 (30 ppm)	0.003 (30 ppm)	0.003 (30 ppm)
%H2	na.	3 ppm for t > 150 mm	3 ppm for t > 150 mm
%P + %Sn	0.015	0.015	0.015
Recommended Limitations	1.25Cr-0.5Mo Operation above 380°C	2.25Cr-1Mo Operation above 350°C	2.25Cr-1Mo-V Operation above 350°C
%Si	0.65	0.30	0.10
%Al	0.040	0.045	0.045
%V	0.010	0.010	na.
%Sn	0.010	0.010	0.010
%As	0.012	0.012	0.012
%Sb	0.004	0.004	0.004
%N2	0.008 (80 ppm)	0.008 (80 ppm)	0.008 (80 ppm)
%Nb	0.010	0.010	0.070
%Ti	0.010	0.010	0.030

Table 5: Supplementary limitations on chemical composition (heat analyses) for 1.25Cr-0.5Mo materials operated above 380°C, and for 2.25Cr-1Mo and 2.25Cr-1Mo-V materials operated above 350°C

2.3 Mechanical tests

Mechanical tests should be carried out as per ASME SA-20 and ASME SA-370 on LAS materials in their heat treatment delivery conditions and after minimum and maximum PWHT (ref. section 0). Impact testing after a step cooling heat treatment procedure of minimum PWHT material may also be required for 2.25Cr-1Mo and 2.25Cr-1Mo-V operated at high temperature (ref. section 2.3.5). Mechanical tests shall allow enduring that the mechanical properties will remain acceptable after fabrication and heat treatments.

2.3.1 Tensile properties

Tensile tests must be carried out at room temperature on materials with heat treatment delivery conditions, with heat treatment delivery conditions supplemented by minimum PWHT, and with heat treatment delivery conditions supplemented by maximum PWHT (sampling at t/4 supplemented by sampling at t/2 for t > 40mm). Room temperature tensile properties shall meet the requirements of the material standard.

Hot tensile test at design temperature may eventually be requested by Contractor specification for information. In that case, the yield strength at design temperature should meet the value taken into account in calculation notes and the Ultimate Tensile Strength may be given for information.

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2.3.2 Z-Quality testing

The plates with thickness above 1” should have a guaranteed through thickness ductility. This guarantee is given by the “Z” parameter value which is the average reduction of area on 3 specimens taken in the “Z” direction. Tests specimens, subjected to anticipated heat treatment cycle, are taken through the thickness and the said reduction shall not be less than 35% of the initial cross section: this corresponds to “Z35” quality. Test could be carried out following ASTM A770.

2.3.3 Impact tests

Impact tests shall be carried out considering reference temperature for impact tests (ref. section 1.5 and Table 1) on materials with heat treatment delivery conditions and with heat treatment delivery conditions supplemented by minimum PWHT (sampling at t/2 supplemented by sampling at t/4 for t > 40mm).

The average of three specimens shall not be less than 55J (40ft.lb), without individual value below 47J (35ft.lb).

The fracture surface area shall have minimum 25% of shear fracture. The relative lateral expansion should also be reported.

2.3.4 Hardness testing

Materials with heat treatment delivery conditions and with heat treatment delivery conditions supplemented by minimum PWHT shall be hardness tested. The hardness of LAS materials shall be as defined in Table 6.

Material grade	1.25Cr-0.5Mo	2.25Cr-1Mo	2.25Cr-1Mo-V
Maximum allowable hardness (HB)	220	225	235

Table 6: Maximum allowable hardness for LAS materials

2.3.5 Supplementary tests for 2.25Cr-1Mo and 2.25Cr-1Mo-V materials operated above 350°C

When operated at high temperature (ref. section 1.6 and Table 2), impact testing of 2.25Cr-1Mo and 2.25Cr-1Mo-V plate and forging materials shall be conducted after application of a step cooling heat treatment (ref. section 0) for evaluation of the resistance to thermal ageing (temper embrittlement). Ductile-to-Brittle transition temperature (DBTT) curve (impact test energy vs. impact test temperature) shall be developed for thickest materials having J factor above 80 with minimum PWHT before and after application of the step cooling heat treatment (sampling at t/2).

The materials’ 55 Joules transition temperature (DBTT55) and its variation (Δ DBTT55) after step cooling heat treatment has become an accepted tool for the determination of the susceptibility to temper embrittlement.

$$\Delta \text{DBTT55} = \text{DBTT55 (Min. PWHT + step cooling)} - \text{DBTT55 (Min. PWHT)}$$

The 55 Joules transition temperature and its variation must meet the following requirement:

$$\text{BDTT55 (Min. PWHT)} + 2.5 \Delta \text{DBTT55} \leq 10^\circ\text{C}$$

Note: Based on their know-how and demonstrated experiences, major steel suppliers can propose to avoid step cooling heat treatment for base metal provided that the specified impact test energy criterion is verified at temperature of -60°C and that J factor remains below 100.

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Ductile-to-brittle transition curves are still required for weld production coupons and during qualification of welding procedures.

2.3.6 Mechanical tests summary table for base materials

Specimen must be taken at $t/2$ and $t/4$ from the material surface when $t > 40\text{mm}$. Specimens for mechanical tests should be taken transverse to the rolling direction for plates and transverse to the major working direction for forgings and pipes. The mechanical tests that are to be conducted on base materials are summarized in Table 7.

BASE MATERIALS	Tensile (cf. 2.3.1)	Z-Quality (plates with $t > 25\text{mm}$) (cf. 2.3.2)	Impact Test at reference temperature (cf. 2.3.3)	Hardness (cf. 2.3.4)	BDTT Curve (cf. 2.3.5)
Steel Grade	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	2.25Cr-1Mo 2.25Cr-1Mo-V
Heat Treatment Status	Delivery conditions Delivery conditions + Min. PWHT Delivery conditions + Max. PWHT	Delivery conditions + Min. PWHT	Delivery conditions Delivery conditions + Min. PWHT	Delivery conditions Delivery conditions + Min. PWHT	Delivery conditions + Min. PWHT Delivery conditions + Min. PWHT + Step cooling
Location	$t/4$ + $t/2$ for $t > 40\text{mm}$		$t/2$ + $t/4$ for $t > 40\text{mm}$	Near surface	$t/2$
Orientation (Gauge center)	Transverse (BM)	Through thickness (Middle of plate)	Transverse (BM)	na. (BM)	Transverse (BM)

Table 7: Summary of mechanical tests to be conducted on base metal of LAS materials

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2.4 Non-Destructive Examinations of base materials

2.4.1 Ultrasonic testing of plates and forgings

LAS plates and forgings should be ultrasonically examined (UT) with 100 % scanning:

- Plates: Examinations as per ASME SA-435 and ASME SA-578, Level C, Supplementary Requirement S1, before forming
- Forgings: Examinations as per ASME-388

2.4.2 Wet Magnetic Particle and Dye Penetrant examinations of forgings

All forgings must be 100% examined by Wet Magnetic Particle or Dye Penetrant examination with acceptance criteria from ASME BPVC VIII div.2 section 7.5.6 and 7.5.7.

3 Welding, Welding Procedure and Weld Production Coupons

The vessel Manufacturer shall not subcontract fabrication involving welding to others without the written approval of the Contractor.

The plate or forging edge preparation for welding as well as the nozzle openings will be carried out by machining. Flame cutting may sometimes be allowed by the Contractor provided the heat affected zone is completely removed by machining or grinding (ex: Nozzles openings in shell or head).

Only approved WPS with PQR are to be used for fabrication. Welding procedures submitted to the Contractor shall include details variables and welding parameters for each used welding process. Qualification test shall be made using filler metal, flux and / or inert gases of same type, brand, chemistry and size as the ones to be used on work.

3.1 Welding processes

Welding processes are:

- SAW: Submerged Arc Welding
 - The Manufacturer and brand name or grade of all welding consumables shall be specified in the welding procedure and submitted to the Contractor for approval.
- SMAW: Shielded Manual Arc Welding
 - Only low hydrogen electrodes shall be used (refer to ASME II Part C SFA 5.5). Dedicated procedure for electrodes drying/conditioning shall be submitted to Contractor for approval.
- GTAW: Gas Tungsten Arc Welding (mainly for nozzles)

Remark:

- FCAW: Flux Cored Arc Welding may be considered as acceptable.
- GMAW: Gas Metal Arc Welding may be used for welds not subjected to pressure.

Note: All the pressure retaining welds in hydrogen service, including the internals welded on pressure parts, have to be full penetration type. If this is not possible, there will be a vent drill-hole of the not welded area. External attachments are not concerned.

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3.2 Welding consumables

Low hydrogen welding consumables (maximum 8mL diffusible hydrogen per 100g of weld metal) should be used. The deposited weld metal should match with the nominal chemical composition of the base material and the mechanical properties of the deposited weld metal shall meet those of the base material.

Note: Main alloying components such as Chromium and Molybdenum contents of the weld deposits shall be within the range specified in ASME Section II, Part C for the specified electrodes.

Material Certificates shall be delivered for each batch, lot, diameter of covered electrodes, wire/flux combination to be used for fabrication.

Note: A procedure for flux conditioning so as to guarantee potential diffusible hydrogen content consistent with the recommendations of the welding consumables manufacturer shall be submitted to contractor's approval. As the same manner, the procedure for electrodes conditioning shall also be submitted for approval.

Furthermore, the high purity level of the steel shall be such that P, Sn, Sb and As be as low as possible to meet BRUSCATO parameter in the weld deposit X (Composition specified in ppm):

$$X = (10P + 4Sn + 5Sb + As) / 100 < 20\text{ppm (target 15ppm)}$$

3.3 Intermediate heat treatments

Intermediate Heat treatment definition is under vessel vendor scope and shall be approved by the Contractor:

- DHT (Dehydrogenation Treatment) to be typically performed.
- DHT uses to reduce the hydrogen content in the welds to prevent from hydrogen induced cracking.
- This heat treatment, to be achieved before the weld is cooled down below the pre-heating temperature, is typically conducted at around 350°C (min.2h). However if vessel manufacturer has previous experience with lower temperature and holding time, he may propose other conditions supported by data.

3.4 Post Weld Heat Treatment

The equipment should receive PWHT as required by applicable ASME Code Cases or other specific codes (API, etc.), or when required for corrosion reasons. Unless otherwise specified by steel maker, a typical recommended range of temperature could be 655-700°C. Holding time and temperature are to be defined by reactor manufacturer according to wall thickness and code and taking into account the anticipated number of heat treatment cycles.

Note: Vessel Manufacturer has the full responsibility of the mechanical behavior of the vessel. For this reason, PWHT specification shall be optimized and defined by himself (in accordance with steel Manufacturer) so as to guaranty, at one and the same time, mechanical and toughness characteristics on the delivered equipment. The given typical temperature range may accordingly be reconsidered so as to get the fine balance between strength and toughness.

All welds performed on pressure boundary elements (including potential weld repairs), and also clad and weld overlay operation, will be completed before final PWHT excepted where special care has been taken to avoid necessity of PWHT (buttering with high alloy deposits).

Note: Local PWHT shall not be permitted. In case of any furnace size limitation, vessel Manufacturer shall obtain specific derogation from the Contractor to perform local PWHT at the closing seam of shell.

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3.5 Mechanical tests

3.5.1 Tensile properties

Tensile tests must be carried out at room temperature on specimens with 'As welded + Min. PWHT' and 'As welded + Max. PWHT' heat treatment status and sampled in the weld metal transverse to the weld, during the development of welding procedures and in weld production coupons (sampling at t/4 supplemented by sampling at t/2 for t > 40mm). Room temperature tensile properties shall meet the requirements of the base material standard.

3.5.2 Impact tests

Impact tests shall be carried out considering reference temperature for impact tests (ref. section 1.5 and Table 1) on specimens with 'As welded + Min. PWHT' and 'As welded + Max. PWHT' heat treatment status and sampled in the weld metal and heat affected zone transverse to the weld, during the development of welding procedures and in weld production coupons (sampling at t/2 supplemented by sampling at t/4 for t > 40mm). The fracture surface area shall have minimum 25% of shear fracture. The relative lateral expansion should also be reported.

The average of three specimens shall not be less than 55J (40ft.lb), without individual value below 47J (35ft.lb).

3.5.3 Hardness testing

Hardness testing shall be conducted near the surface on welded assembly with 'As Welded + Min. PWHT' and 'As Welded + Max. PWHT' heat treatment status, during the development of welding procedures and in weld production coupons.

3.5.4 Supplementary tests for welded 2.25Cr-1Mo and 2.25Cr-1Mo-V materials operated above 350°C

Ductile-to-Brittle transition temperature curve (impact test energy vs. impact test temperature) shall be developed by vessel manufacturer for specimens with 'As welded + Min. PWHT' and 'As welded + Min PWHT + Step Cooling' heat treatment status and sampled in the weld metal and heat affected zone transverse to the weld, during the development of welding procedures and in weld production coupons (sampling at t/2 supplemented by sampling at t/4 for t > 40mm).

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3.5.5 Mechanical tests summary table for welding procedure qualification and weld production coupons

Specimen must be taken at t/2 and t/4 from the material surface when t > 40mm. Specimens for mechanical tests to be sampled during development of welding procedure and in weld production coupons shall be taken transverse to the weld. The mechanical tests that are to be conducted on weld production coupons and during development of welding procedure are summarized in Table 8.

	Tensile (cf. 3.5.1)	Impact Test at reference temperature (cf. 3.5.2)	Hardness (cf. 3.5.3)	BDTT Curve (cf. 3.5.4)
Steel Grade	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	1.25Cr-0.5Mo 2.25Cr-1Mo 2.25Cr-1Mo-V	2.25Cr-1Mo 2.25Cr-1Mo-V
Heat Treatment Status	As welded + Min. PWHT As welded + Max. PWHT	As welded + Min. PWHT	As welded + Min. PWHT	As welded + Min. PWHT As welded + Min. PWHT + Step cooling
Location	t/4 + t/2 for t > 40mm	t/2 + t/4 for t > 40mm	Near surface	t/2
Orientation (gauge center)	Transverse (BM) Across weld (WM), (HAZ)	Across weld (WM), (HAZ)	Line across weld (BM), (WM), (HAZ)	Across weld (WM), (HAZ)

Table 8: Minimum mechanical test requirement during welding procedure qualification and on production weld coupons

3.6 Non Destructive Examinations

For vessels designed and constructed in accordance with the rules of ASME BPVC Section VIII, Div.1, Inspection Plan and Testing Plan shall be submitted to Engineering (EPC) for approval.

For vessels designed and constructed in accordance with the rules of ASME BPVC Section VIII, Div.2, non-destructive examination (NDE) as a minimum shall comply with the ASME Table 7.2.

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3.6.1 Minimum requirements

Minimum requirements for NDE should typically include the following non-destructive tests:

- Radiographic examination (RT) on all pressure welds (prior to PWHT only, provided that UT is made before and after PWHT). RT is not so effective after PWHT for detecting potential cracks. RT is sensitive for volumetric flaw such as slags inclusion but not sensitive for shape cracks which could appear during PWHT. Nevertheless, the final decision, relative to RT examination sequences, belongs to the Contractor.
- Ultrasonic examination (UT) for all pressure welds (prior/after PWHT and after hydrotest)
- Positive Material Identification (PMI) on all alloyed material if any (cladding, overlay, etc.). In addition, contractor may require for some PMI (Positive Material Identification) to be applied on deposited metal in the aim at checking the steel grade conformity.
- Mill test report shall be supplied for all materials
- Magnetic Particles Examination (MT) after PWHT
- Hardness measurement
- The ferrite content of stainless steel clad and weld overlay must be evaluated by magnetic feritscope during fabrication. Acceptance criteria of ferrite content by magnetic feritscope shall be 3% to 10%. The magnetic instrument shall be calibrated and certified per AWS A4-2.
- Dye penetrant examination (PT) of all weld overlay surfaces after PWHT. If Vendor can duly establish that weld-overlay has been performed continuously, thus guarantying that no change in welding conditions has been encountered while depositing on vessel shell, then PT could be performed on some representative w/o width lines only. Procedure's acceptance shall be submitted to Owner/Contractor decision. Whatever the approved procedure will be, 100% complementary visual inspection always remains mandatory.

3.6.2 Weld Repairs

Major defects, such as cracks, lack of fusion or others leading to weld repair shall be officially notified to contractor though Non-Conformance report to be considered within the QA/QC procedure. Proposed repairing procedures shall be submitted to the contractor for acceptance.

3.6.3 Pressure Testing

Hydrostatic test shall be performed after completion of all internal and external welding.

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4 Cladded Plates and Weld Overlay

4.1 Cladding

High-Alloy clad materials shall be in accordance with the ASME Section II, Part A, Specification SA-264 for Stainless Chromium-Nickel Steels-Clad Plate. Cladding shall also be applied by considering specific design codes requirement (API, etc.).

Cladding shall be 3mm minimum thickness SA-240 or as specified on Axens' drawings. 140MPa minimum shear strength as per SA-264 is required. The clad plate shall be ultrasonically examined in accordance with SA-578 supplementary requirements S7 using Level 1 acceptance criteria.

4.2 Weld Overlay

4.2.1 Application

Generally speaking (when clad is specified as SS 321 or SS 347, or overlay is specified as SS 347, on data sheet), the weld overlay is applied using a two layers technique as follows:

- First layer: SS 309L
- Second layer: SS 347 (SS 321 cannot be used for welding and overlay)

Minimum effective thickness of undiluted alloy (after final machining if any) shall be those required on equipment data sheet specification

However, single layer weld deposit overlay (type 309LNb as typical) may be used provided the fabricator can demonstrate to the Contractor the use of a qualified and acceptable procedure.

Note 1: When clad is specified as SS 317L (or SS 316L) or overlay is specified as SS 317L (or SS 316L) on data sheet, the weld overlay is applied using a two layers technique as follow:

- First layer: SS 309LMo or SS 309L
- Second layer: 317L (or 316L) (Single layer not allowed)

Note 2: The number of weld layers in production shall not be less than the number of layers deposited for weld overlay procedure qualification tests.

When required by the Owner/User, a method to evaluate the weld overlay for susceptibility to hydrogen disbonding shall be agreed between the Fabricator and Owner/User. In such a case, the Owner/User shall define testing requirements and acceptance criteria. An example of a standard disbonding test may be found in ASTM G146.

Welding processes are the same than in paragraph 4.1, using strips or wires for SAW process.

GMAW process is not allowed, except for structural attachments welding on overlay.

FCAW with gas shielding may also be used for some limited location such as overlay on Cr-Mo joint, internal support rings, etc.

Both of GMAW and FCAW processes shall be authorized by the Contractor. As the same manner, the use of Electroslag (ESW) process remains subject to Contractor's acceptance.

4.2.2 Ferrite Content

Before fabrication, the Ferrite Number (FN) of the weld deposits should be evaluated by comparison on WRC-diagrams and should remain between 3 and 8 in order to prevent hot cracking.



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4.3 Nozzles and Manways

Nozzles and Manways (neck, flange, and blind) in clad vessels, or in clad section of vessels, shall be of the same base material as the vessel and surfaces in contact with process fluid must be clad or overlaid with the same high alloy as the shell.

Loose lining, lap-joint flanges, welding of nozzle of different material than the vessel are not permitted.

The thickness of the cladding or overlay shall be at least equal to that of the cladding or overlay of the vessel.

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INSPECTION & TEST PLAN FOR FORGED AND WROUGHT FITTINGS

CRITICALITY RATING INSPECTION LEVEL

QA CATEGORY : C

LEVEL OF SURVEILLANCE 3

INSPECTION AUTHORITY : Third Party Inspection Agency




REMARKS :

Rev	Date DD/MM/YY	Revision Description	WRITTEN BY (name & visa)	CHECKED BY (name & visa)	APPROVED BY (name & visa)
B	09.12.2021	IFI - ISSUED FOR QUOTATION	JR	GM/PSK	KV / LA
A	6-Aug-21	IFI - ISSUED FOR QUOTATION	KDV	GM/PSK	KV / VV

DOCUMENT REVISIONS

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CONFIDENTIAL - Not to disclose without Authorization

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HOLDS

HOLD n°	REF. §	DESCRIPTION
1		N/A



PROJECT :

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INTEGRATION PROJECT "LuPech" (J-18)
IOCL GUJARAT REFINERY**

CLIENT :

INDIAN OIL CORPORATION LIMITED

**Project No.
077154C001**

**Document No.
077154C-000-ITP-1330-001**

**Rev. No.
B**

Inspection and Test Plan - Forged and Wrought Fittings

1. SCOPE

This Inspection and test plan is an engineering document which defines for each type of equipment:

- The type and extent of CONTRACTOR and OWNER/OWNER Representative involvement in each phase of fabrication, control and testing requiring an inspection. This document does not define the type and extent of test to be performed.
- The resulting VENDORS contractual obligations, in accordance with applicable Project General Purchase Conditions.

Note: The inspection and test plan of CONTRACTOR may under no circumstances be used as a substitute for the VENDORS Quality Control Plan.

2. DEFINITION OF CONTRACTOR INVOLVEMENT

The nature of CONTRACTOR involvement is indicated against each activity of fabrication and testing by means of the letters, H, W, R and M the meaning of which is the following:

H: (Hold) Point

The VENDOR cannot carry out the specified controls and tests without Inspector attendance.

Consequently, the attendance to witnessing is mandatory. The VENDOR must notify CONTRACTOR by email or project communication tool of the dedicated inspection activity at least fifteen (15) days in advance.

The VENDOR cannot deviate from this rule unless written approval has been given by involved operating center.

W: (Witness)

The VENDOR must notify to CONTRACTOR of the dedicated inspection activity at least fifteen (15) days in advance. CONTRACTOR representative witnessing is not mandatory, but optional. When a percentage value is indicated (i.e. W 10%) the inspection activities will be witnessed on spot basis as per percentage indicated.

If CONTRACTOR representative do not elect to be present, the VENDOR may proceed with his own inspection, provided controls and tests records are made available to Inspector for review.

R: (Review) - Review of Documents

The VENDOR has either to submit to Inspector for comments the documents required prior to the performance of the dedicated activity or to transmit or make available for the review of Inspector the results of the controls and tests conducted, as the case may be.

M: (Monitoring)

CONTRACTOR's witnessing is not mandatory, but optional. No notification is required. CONTRACTOR's may witness the activity during monitoring.

If CONTRACTOR does not elect to be present, the VENDOR may proceed with his own inspection, provided controls and tests records are made available to CONTRACTOR for review.

TP: Technip India Limited and or assigned TPIA

Client : IOCL

3. VENDOR'S FABRICATION AND QUALITY CONTROL PLAN

- The VENDOR must issue a Fabrication and Quality Control Plan for each equipment.
- The VENDOR's Fabrication and Quality Control Plan is a document which defines in a chronological manner the list of the operations of fabrication, controls and tests in accordance with his own "know-how" and with the requirements specified in Material Requisition.
- Following information shall be clearly specified against each operation:
 - Reference documents (drawings, procedures, etc.)
 - Acceptance criteria (code, etc.)
 - Recording documents for controls and tests
 - Involvement of the Quality Control department of the VENDOR and/or his sub-Vendor

This VENDOR's Fabrication and Quality Control Plan will have to include all inspection activities defined in Inspection and Test Plan as well as all inspection activities scheduled by the Independent Inspection Authority and/or the OWNER.

- For equipment of inspection levels 1, 2 and 3, the VENDOR's Fabrication and Quality Control Plan will have to be submitted compulsory to CONTRACTOR for comments before the pre-inspection meeting is held.

4. INSPECTION RELEASE CERTIFICATE

This document issued by CONTRACTOR inspector, permits the VENDOR to proceed with the packing and to notify the shipment



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INDIAN OIL CORPORATION LIMITED

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 077154C001**

**Document No.
 077154C-000-ITP-1330-001**

**Rev. No.
 B**

Inspection and Test Plan -Forged Fittings

Rev	PACKAGE	TYPE:								MR:	
		LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4			APPLICABLE DOCUMENTS AND REMARKS
		TP	Client	TP	Client	TP	Client	TP	Client		
	Supplier Quality Control Plan(Incl.Sub-suppliers QCP if any) Raw material Certificate					R					
DURING FABRICATION	Identification of Raw materials 7 Cutting					R				Correlation of mTCs and Marking As per JSS "077154C-000-JSS-1330-001" W-10%	
	Forging / Forming										
	Heat Treatment					R					
	Sampling					W					
	Mechanical Test/Chemical Analysis					W					
	Hardness (if applicable)					W					
	Intergranular Corrosion Test(For Stainless steel Fittings) & any other corrosion tests					W					
Machining											
CONTROL & FINAL TEST	Dye Penetrant/ Magnetic Particle					W					
	Pickling and Passivation(For Stainless steel Fittings)					R					
	Visual examination					W				W-100%	
	Dimensional check/conformity					W				W-10%	
	Positive Material Identification(For Stainless steel Fittings)					W				As per JSS "077154C-000-JSS-6300-002"	
	Test & Inspection Reports/records Review					R					
	Material Test Certificates (IBR certification as applicable)					R				EN 10204 Type 3.1	
	Marking / Colour Coding					W				W-10%	
	Final Inspection					W				W-10%	
	Final Examination coating/painting					W				W-10%	
DOCUMENTATION	Packing					R					
	Marking for Shipment					R					
DOCUMENTATION	Manufacturing Data Record book					H				Refer to applicable T.EN Standard	
	Inspection Release					H					

NOTES (1) Specific QCP developed by Vendors shall be discussed project by project



PROJECT :

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**PETROCHEMICAL AND LUBE
 INTEGRATION PROJECT "LuPech" (J-18)
 IOCL GUJARAT REFINERY**

CLIENT :

INDIAN OIL CORPORATION LIMITED

Project No.
077154C001



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Inspection and Test Plan -Wrought Fittings

Rev	PACKAGE	TYPE								MR:
		LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		
	Inspection Stages	TP	Client	TP	Client	TP	Client	TP	Client	APPLICABLE DOCUMENTS AND REMARKS
	Supplier Quality Control Plan(Incl.Sub-suppliers QCP if any) Welding Book WPS+PQR Review of raw materail (plate,pipe,Forging etc) Certificate					R				
DURING FABRICATION	Identification Raw material					R				Correlation of mTCs and Marking As per JSS "077154C-000-JSS-6300-002" As per JSS "077154C-000-JSS-1330-001"
	Forming/Forging/Extrusion etc									
	Tacking / Welding									
	Control of Welding parameters					R				
	RT/UT Inspections of But joints					R				
	Positive Material Identification(For Stainless steel Fittings)					R				
	Heat Treatment					R				
	Hardness (If applicable)					W				
	Radiography/ Dye Penetrant/ Magnetic Particle					R				
	Sampling					W				
Intergranular Corrosion Test(For Stainless steel Fittings) & any other corrosion tests					W					
Mechanical Test/Chemical Analysis					W					
Bevel Preparation(DPT/MPT)					W					
Pickling and Passivation(For Stainless steel Fittings)					R					
CONTROL & FINAL TEST	Visual examination					W				W-100% W-10% As per Relevant JSS As per JSS "077154C-000-JSS-6300-002" EN 10204 Type 3.1
	Dimensional check/conformity					W				
	Coating Integrity Check(If Applicable)					M				
	Positive Material Identification(For Stainless steel Fittings) and Ferrite Check					W				
	Test Reports & Inspection records					R				
	Material Test Certificates (IBR certification as applicable)					R				
	Marking / Colour Coding					W				
	Final Inspection					W				
	Final Examination coating/painting					W				
Packing					R					
Marking for Shipment					R					
DOCUMENTATION	Manufacturing Data Record book					H				Refer to applicalbe T.EN Standard
	Inspection Release					H				

NOTES (1) Specific QCP developed by Vendors shall be discussed project by project

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A	22.03.2021	ISSUED FOR IMPLEMENTATION	KA	RS	VSD	PSSG
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 9th April 2018 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for BDEP preparation for Open Art units, FEED & DFR preparation, Detailed Engineering, Procurement & Expediting services, Tendering & Award of LSTK contracts, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for capacity expansion (From 13.7 to 18 MMTPA) of Gujarat Refinery in Vadodara, Gujarat, India.

However after completion of PMC-1 services covering Detailed Feasibility Report and + 10% cost estimate, due to the Fuel demand forecasts and to meet the increased demand for petrochemicals, IOCL decided to change the process configuration envisaged under “J18 Capacity expansion Project” and included some additional units and accordingly made its Financial Investment Decision in September 2020. IOCL after the change in the configuration of original J18 has renamed the project to “**Petrochemical and Lube Integration Project “LuPech” (J18)**”.



2. DEFINITIONS / ABBREVIATIONS

OWNER or IOC or IOCL	INDIAN OIL CORPORATION LIMITED.
PMC or CONSULTANT	TECHNIP INDIA LIMITED
CONTRACTOR	The bidder selected by the OWNER for performing the scope of works specified in the bid documents.
AUTHORISED REPRESENTATIVE	OWNER’s/CONSULTANT’s representative authorized to act for and on behalf of OWNER/CONSULTANT, as the case may be
VENDOR	Any third party selected by either the OWNER or CONSULTANT for supplying any of the equipment/materials for the Unit specified in the bid documents
PROJECT	Petrochemical and Lube Integration Project “LuPech” (J18)
UNIT	The totality of the units and facilities comprised in the Scope of work, which forms a distinct operating system

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Diacritical Mark	<p>A term used in this procedure to designate any character that is nor a figure nor a letter.</p> <p>Most diacritical marks are not allowed and must be avoided.</p> <p>E.g. caret (^), slash (/), anti-slash (\), full stop (.), comma (,), semi-colon (;), dash line (-).</p>
Document	<p>A general term for a vendor document or drawing required from VENDOR in the SR Part II.</p> <p>It is either a drawing of size A1, A2, A3 or A4 in one or more sheets or a several A4 size sheets document.</p> <p>It is submitted by VENDOR to TECHNIP for review by means of the VDB Mailbox and it is recorded in the VDB by TECHNIP.</p>
Document Series	<p>Vendor documentation is organized in homogeneous sets as follows:</p> <ul style="list-style-type: none"> - Engineering, construction and start-up documents A series, e.g. A0001, A0101, etc. - Inspection documents B series, e. g. B1001, B1002, etc. - Expediting documents C series, e. g. C1001, C1002, etc.
Document Items	<p>Synonyms Document Codes, Technip Codes</p> <p>Special codes created by TECHNIP to group documents of the same type.</p> <p>They are defined in the SR Part II and in Annexe 1</p> <p>E.g. B1002 is used for Quality Control Plans.</p>
Document Reference	<p>A unique and unchangeable document identification number given by VENDOR. VENDOR must indicate it on all documents, in the document title block.</p>
Equipment Tag Number	<p>Synonym Equipment Item Number.</p> <p>A unique equipment identification number defined in the SR Part I.</p> <p>E.g. 702-C-03 is used for Stripper Column Internals.</p> <p>Equipment Tag Number must be defined in Document Titles of all documents relevant to the following engineering disciplines: Furnaces and Boilers, Pressure Vessels, Rotating Equipment, Package Equipment. It is not applicable for piping itemized material, civil bulk material, electrical bulk material, instrument and electrical cables.</p>

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MR	Material requisition that includes: - Requisition for purchase listing: <ul style="list-style-type: none"> the documents relating to the scope of supply, the applicable documents, with their reference number and revisions - Scope of supply.
PDF	Adobe® Portable Document Format. It is the only electronic format that vendor should submit thru mailbox.
Priority Documents	Priority documents are subject to penalization or term of payment. Priority documents can be recognized by the letter P (or *).
PO	Purchase Order.
RI	Requisition Issuer: a person within TECHNIP in charge of the technical follow-up of VENDOR.
SR SR Part I SR Part II	Scope of supply of the material Requisition . An attachment to the material requisition including Part I: equipment/bulk material supply and Part II: documents supply.
VDB	Vendor Documents data Base. It is the documents control system software used by TECHNIP.
VDB Mailbox	A Vendor Documents Mailbox is a platform linked with the VDB. VENDOR will send new and process commented documents to this mailbox.
VDC	Vendor Document Controller. A contact person in TECHNIP in charge of Document Control.

3. PURPOSE

This document outlines the requirement to be implemented by VENDOR for the supply of the documentation listed on “SR-Scope of Supply” Part II on the Petrochemical and Lube Integration Project “Lupech” (J-18) IOCL Gujarat Refinery.

The required documentation is an **integral part of the supply** and its omission shall be considered as a non-fulfilment of the Purchase Order.

This procedure doesn't apply for VENDOR final documentation.

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4. REFERENCE DOCUMENTS

Sl. No.	Document Reference	Document Title
1	077154C-000-PP-271	Vendor Document Management Procedure.
2	077154C-000-PP-274	Vendor Final Documentation

5. DOCUMENT MINIMUM CONTENT:

The required documents shall contain all the necessary information for:

- Checking of supply during all phases (schedule, design, procurement, fabrication, testing, etc.);
- Installation of the equipment and/or material supply at site.

The minimum information in documentation is described in Annex 1 (document items) if applicable in SR Part II.

Information Requirements listed in SR Part II shall be provided in the documentation. Different information requirements can be grouped in the same document; In this case, IR shall reflect the merging of information into one document at the submission time.

E.g.: a General Arrangement Drawing (GAD) can contain information relative to IR n° A2001, A0108, and A2006.


6. KEY INTERFACE DATA:

It is critical for project execution to agree on interfaces between VENDOR and CONSULTANT as early as possible and avoid any change after. This is in order to secure design, procurement and fabrication activities on both VENDOR and CONSULTANT sides and avoid delays and reworks.

The following tabulation, describes the document items containing Key Interface Data for Process, Structural, Civil, Piping, Electrical and Instrumentation (hard and soft), applicable per type of Material Requisition as indicated in SR Part II.



In Annex 1, the Key Interface Data (KID) are indicated in bold and with a star (*). This means:

- Information / data to be provided for the first issue of the VENDOR document
- Information / data to be frozen as per indicated date in the purchase order (if any)

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Material Requisition Type	Equipment	Electrical Equipment	Bulk Instrumentati on / Piping
VENDOR information			
PROCESS:			
Interface (line size, piping class, instrumentation signals)	A0103 / A0111		
Utilities consumers	A1014		
CIVIL / STRUCTURAL:			
Civil / Structural drawings	A2006 / A2011		
General Arrangement or/and detail drawings showing the equipment dimensions, location of supports, details of support points, jacking points or/and levelling screws location	A2001 / A2010	A2001	A2001
Load reactions	A2001 / A2006		
PIPING AND INSTALLATION:			
Overall dimensions	A0201 / A2001	A2001	A2001
Saddle or pads positions	A2001		
Equipment Nozzles arrangement and dimensions, and other tie-ins, with acceptable loads	A0201 / A2001 / A2301		
VENDOR line isometrics subject to validation by CONSULTANT (i.e. process critical lines, or interconnecting piping)	A2005		
ELECTRICAL:			
Overall dimensions	A4201/ A2001	A4201	
Electrical consumers list	A4001		
Electrical data sheets	A4101 / A4102	A4101 / A4102	
Termination and Terminal Arrangements	A4206	A4211 / A4206	
Cable tray interface drawing / cable entries	A2001		
INSTRUMENTATION HARDWARE DATA :			
Instruments and I/O lists	A3001		
Outline dimensional drawing	A3204		A3201 / A3204
Junction boxes, cabinets and panels wiring diagrams	A3403		
Electrical power consumption for instrumentation and heat dissipation calculation	A3301		

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Material Requisition Type VENDOR information	Equipment	Electrical Equipment	Bulk Instrumentation / Piping
	Cable tray interface drawing / cable entries	A2001	
INSTRUMENTATION SOFTWARE DATA:			
Piping and instrument Diagram (P&ID)	A0103		
Control and Safety Systems Description, Operating Principles, Functional Design Specification	A3501		
Control and Logic Diagrams (Interlock and Safety), Sequence Diagrams, Cause and Effect Charts	A3505		
Software Database Exchange Table (for P3 equipment)	A3507		

7. FREEZE DATES:

The Key Interface Data, relative to the discipline shall be frozen between VENDOR and CONSULTANT at the latest at the date indicated in the SR.

This does not mean that all drawings shall be in code 3 at this time, but that interfaces will not change, either due from VENDOR and CONSULTANT side.

Sometime before freeze date for said discipline, a maturity review (meeting or conference call) will be organized between VENDOR and CONSULTANT specialists.

After this successful review, a document will be issued in VDB and stamped in code 3 for the concerned discipline, using the document code for freeze date (e.g. A2014 for piping). No technical information will be added in this document; only a VDB frontpage using project template is awaited. The issuance of this document by VENDOR means that all interface for the said discipline are considered frozen and will not be modified. Stamp of this document in code 3 means that CONSULTANT will not modify interfaces for the same discipline.

The issuance of this document may be subject to payment term as indicated in PO. Physical change of interface after freezing may be subject to penalties if indicated in PO.

During tendering phase, VENDOR to review its execution plan to check and confirm the possibility to reach design maturity (freeze dates) at requested date.

8. MAJOR DOCUMENT SYSTEM REQUIREMENTS

8.1. Software:

VENDORS must use at least the following version of the softwares below:

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- Autodesk AutoCAD 2017
- Bentley Microstation V8i Select Series 3
- Adobe Acrobat© XI
- Microsoft Office 2016

All the documents not issued by the site shall be produced in CAD system, as far as practicable.

It is not applicable for As-Built documents (documents produced on the construction site). Any deviation shall be reported to CONSULTANT for agreement prior submission.

8.2. Language and Units

All drawings and documents shall be written in ENGLISH.

All units and dimensions shall be in the metric system unless otherwise specified. Specifically piping and equipment nozzles connected to piping shall be expressed in inches.

8.3. Documents Size and Format

Document size shall be according to ISO rules. The largest size for drawings is A2 (420x594mm) and the smallest A4 (210x297mm). The A1 format may be used for General outline drawing and PID's and with prior authorization of TECHNIP for other documents.


A1 and A2 size document must be legible in A3 size when printed.

Documents shall be produced on CAD system, as far as practicable.

8.4. Documents not Managed in VDBX:

Inspection test records and certificates reviewed by Inspection will not be managed in VDBX. The documents are some examples of documents not managed in VDB/VDBX:

- Non-Conformance Report and associated Concession Requests,
- Statutory or third-party reports/certificates,
- Material certificates summary and material test reports,
- Welding consumables list and certificates,
- Welder's list and welder's qualifications,
- Qualification of operators: non-destructive examination, painting, explosion-proof installation,
- Non-destructive test reports,
- Destructive test reports of production test pieces,
- Heat treatment chart,
- Hydrostatic and /or pressure leak test reports,
- Visual & dimensional test reports,
- Balancing test report rotating,
- Mechanical (performance, run) test reports

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- Electrical test reports and certificates
- Instrumentation test reports, calibration certificates,
- Explosion proof certificate
- Painting and other Test Certificates

8.4.1. Electronic Files

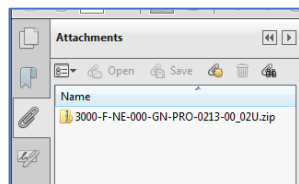
8.4.1.1. PDF / Native Files:

During the project execution, VENDOR must produce and provide all document electronics files (drawings, spreadsheets, etc) in Acrobat© PDF format.

Native files are required only for the final documentation but not for each documents revision. This requirement concerns only documents managed electronically. For Inspection documents and Certificates (not managed electronically) native files are not required.

In case of several native files, a zip type file shall be generated (extension .zip). The native files shall be attached in the PDF in the “Attachments Panel” before uploading in VDBx.

In case of native file missing, documents will be rejected.





8.4.1.2. PDF Characteristics:

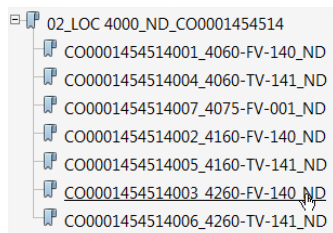
All technical documents and drawings in PDF format shall be generated from the application used to create the document, i.e. from native files. The PDF files shall be vector based and contain the colors only if the black & white make the document not understandable.

However, color is mandatory for track changes use, for comments made by CONSULTANT and OWNER or modifications made by VENDOR.

PDF format must be under “text” mode (and not “html” mode), which corresponds to an "electronic print" of the document. PDF files shall be 100 % text-searchable, with commenting enabled.

- PDF files shall not be protected.
- All PDF files shall be virus checked.
- PDF files shall have detailed bookmarks on the left panel.

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In some cases, where no native file are available (certificates, etc...), scanned copies of wet ink signature are acceptable as long as the following requirements are met:

- Only those pages which are wet ink signed shall be scanned.
- Those pages shall be scanned at their original size from the original hard-copy as far as practically possible
- Images shall be scanned in an orientation that allows viewing without rotation

Those pages shall be legible and shall be scanned at 600 dpi minimum with OCR option enabled.

8.5. Legibility and Quality of Documents:

A1 and A2 size document must be legible when printed in A3 size. A3 size legibility must need VENDOR to consider that:

- The text height for notes and dimensions or line thickness must be suitable for reading after reduction.
- Information to be shown on the document must be strictly limited to information required by CONSULTANT.
- Documents shall be readable on screen without needing to rotate any page.
- All pages shall be numbered, including attachments.

Documents shall be of sufficient quality to allow immediate and accurate use, without any interpretation due to possible illegibility. Any illegible or indecipherable drawing will be systematically returned to VENDOR who shall in no case allege documents being returned as a reason for any delay affecting delivery.

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8.6. Specific Projects Requirements

8.6.1. Concerned Documents:

8.6.1.1. Documents Managed in VDBX:

Prior to placing the Purchase Order (P.O) it is necessary to clearly define with the Bidder which documents have to be submitted, and to adapt, as much as possible, the Part II of the SR.



CONSULTANT document codes are classified in 4 homogeneous sets as follows:

- Engineering, construction/operation and start-up documents A series, e.g. A0001, A0101, etc. First digit after the letter indicates the main concerned discipline:
 - A0xx for General information
 - A1xx for Equipment information
 - A2xx for Structural, Civil, Installation and Piping information
 - A3xx for Instrumentation information
 - A4xx for Electrical information
 - A5xx for Construction, Commissioning and Start-up information
 - A6xx for Health, Safety and Environment information
- A defined list for Fabrication and Testing procedures (Inspection) B series, e.g. B1001, B1002, etc.
- A defined list of Expediting and Traffic documents C and TR series, e.g. C1001, C1002, TR1001, etc.
- All documents corresponding to Certification with E series.

8.6.1.2. Documents Not Managed in VDBX:

The documents corresponding to the document codes below will not be managed in VDBx:

- Following Inspection documents of B series will be handed-over to ENGINEER. Refer to final documentation procedure for more details.
- Following Expediting and Traffic documents of C and TR series will be managed with Procurement Tool and must be submitted in accordance with the other instructions provided by ENGINEER Procurement and Transport groups, and during the Kick-Off Meeting or apart.
- All documents relative to Subcontracting Activities D series are not managed in VDBx., e.g. D1001, D1002, etc.

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DOC ITEMS	DESCRIPTION OF THE DOCUMENT ITEMS
B1102	IFAT (Integrated Factory Acceptance Test) Report
B1105	Test and Control Report
B1204	Welders Qualification Certificates
B1206	NDT Operators Certificates
B1207	NDT Record Certificates for Location of Sketches of Radiographs and others NDT
B1209	Hydraulic and Others Shop Tests Records
B1210	Material Certificates
B1211	Heat Treatment Records Certificates
B1219	Declaration of Conformity according to Regulation
B1223	Ex Certificates
B1224	PED Certificates
B1225	Torqueing Records
B1226	PMI, Hardness Reports
B2000	Dispatch Dossier
B2000A	Index of Dispatch Dossier
C1003	Sub- Vendor's and VENDORS' List
C1004	CONSULTANT's Procurement Status
C1005	Unpriced Copy of Sub-Orders
C1006	Project Organization Chart
C1015	CONSULTANT Execution Plan
TR001	Documentation Package for Transport Services RFQ
TR002	Documentation Package for Transport Services Booking
TR003	Documentation Package for Transport Services Execution

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8.6.2. Document Template / Title Block

Vendor shall report the following data in the title block:

- Purchase Order (PO) number
- Material Requisition number (SR Number)
- CONSULTANT Document Number
- VENDOR Reference (Number, Revision, Date)
- Document Title
- Equipment Tag number (s)
- Doc Item (s)
- Submission Status
- Review Code

The said “title block” shall be incorporated in a legible manner in the document, whatever the document size.

All the documents must be developed and shared in the template provided by the CONSULTANT.

8.6.3. Vendor Document Numbering

All technical documents produced by VENDORS and submitted to CONSULTANT and OWNER shall have a CONSULTANT document number: which is constituted by:

SR number – Doc Item – Sequential Number.

Example: **077154C-1807-SR-4261-001-A1003-0001**

- **SR number:** as defined in the MR (here 077154C-1807-SR-4261-001).
- **Doc Item** (1 letter and 4 digits): A1003 stands for Calculation Note.
- **Sequential number** (4 digits): defined by the VENDOR.



Note:

Documents with several sheets (e.g. isometric sketches, diagrams, drawings, data sheets, etc), shall be compiled as sets i.e. as a multi sheet single document with a single document number.

Each set shall include a table of content and the above-mentioned identification data. Document number shall appear on each page of the document

8.6.4. Revision System:

The revision number will indicate the number of times a document has been submitted by the VENDOR to CONSULTANT.

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Revision shall be made whenever an update of a document is issued into a formal review, approval or distribution process.

All document revisions subsequent to the first issue shall be identified and contain a brief description of all changes made, highlighting the revised parts of the document. Only the last highlights shall be visible in each revision.

All document revisions subsequent to the first issue shall be identified with a vertical line down the left-hand side.

- A two-digit sequence number shall indicate the Revision: NN (00, 01, 02 etc.)
The first revision of a document always starts by 00.
- The skipping of CONSULTANT's revision sequence number is not acceptable.

The revision sequence number is ascending regardless of a VENDOR document status code. The Status code is described as below.

STATUS	DESCRIPTION
IFI	Issued for Information
IFR	Issued for Review
IFA	Issued for Approval
AFU	Approved for Use
CEF	Certified Final
ASB	As Built
CAN	Cancelled
SUP	Superseded

8.6.5. Revision Document Status:



All documents shall contain a brief description of the revision purpose which indicates how the document contents shall be interpreted.

8.6.5.1. Cancelled and Superseded Documents:

If a document is to be **SUPERSEDED by another document**:

- The original document shall be re-issued by the VENDOR at its next revision iteration, referencing the reason why it was superseded and where applicable, and the document that it is being superseded by.

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- The document shall have word « SUPERSEDED by xxx... » written in the title of the PDF document and of the document card.
- The revision document status must be « SUP »
- The replacement document may have a reference to the document it has superseded, it shall be issued in first revision, and the “revision purpose” will start from the beginning.

For CANCELLED document:

- The original document shall be re-issued at its next revision iteration, referencing the reason why it was cancelled and where applicable.
- The document shall have word ‘CANCELLED’ written in the title of the PDF document and of the document card.
- The revision document status must be « CAN »

As the documents numbering shall be unique, the CONSULTANT and VENDOR document references cancelled must not be used for any other/new document.

8.6.6. Attachment Management:

8.6.6.1. Numbering of the attachments:

- Attachments must be numbered with a letter: A, B, C... (except I and O)
- If there are too many attachments: AA, AB, AC...
- If there are linked attachments: A1, A2, A3...

8.6.6.2. Format of the attachments:

All the attachments must be integrated in the main consolidated PDF file, in PDF, one after the other.

If an attachment is not part of the main document in PDF or not in PDF, document will be rejected.

8.6.7. Electronic File Name:

8.6.7.1. PDF Files:

All PDF files transmitted by VDBX shall be named with the following syntax:



“CONSULTANT DOC NUMBER_REVISION NUMBER-R.PDF”.

“_” is an underscore.

R indicates that the file is received from the VENDOR.

The file name shall not contain any diacritical marks, in order to prevent technical issues in EDMS system.

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8.6.7.2. Native Files:

This section is to be applied if a native file is required.

The native files shall be added in the PDF and must follow the rules below:

“CONSULTANT DOC NUMBER _REVISION NUMBER-R”. Extension of the software used to produce the document”.

If there are more than one native files, all the files must be gathered in a zip file. Zip file must be named as below:

“CONSULTANT DOC NUMBER _REVISION NUMBER-R”.ZIP

9. REVIEW OF VENDOR DOCUMENTATION:

9.1. General

Documents “for review” (IFR) and “for information” (IFI) shall be received by CONSULTANT by the dates specified in the Part II of the SR.

All documents must be submitted by VENDOR by due dates and finally stamped in Code 3 (i.e. Reviewed without comments) by CONSULTANT before the date of equipment and/or material delivery.

IOCL comments will be compiled with CONSULTANT comments.

It is only when a document is stamped with a Code 3, that it is considered as final.



9.2. Comments Review Codes:

9.2.1. CONSULTANT Comments Management:

CONSULTANT comments will be electronic annotations to the document using the red-lining facilities within Acrobat Adobe software. Sticky notes functionality is not authorized.

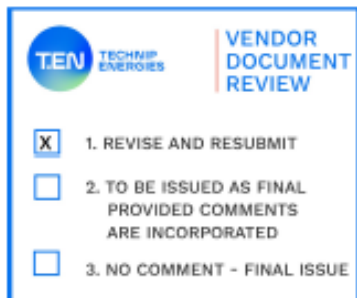
A CONSULTANT focal point will send consolidated comments to VENDOR by allocating a review Code 1, 2 or 3.

CONSULTANT and IOCL comments on VENDOR's documents shall in no way relieve VENDOR from liability, especially concerning the design of the material/equipment or facilities.

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9.2.1.1. **CONSULTANT Review Codes:**

- **Code 1 - Revise and resubmit**



The form is titled 'VENDOR DOCUMENT REVIEW' and includes the T.EN TECHNIP ENERGIES logo. It contains three options with checkboxes:

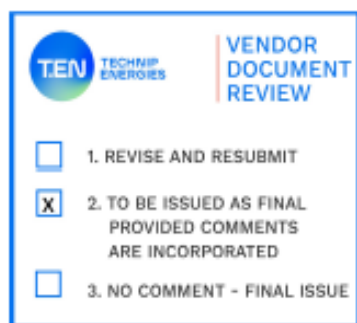
- 1. REVISE AND RESUBMIT
- 2. TO BE ISSUED AS FINAL PROVIDED COMMENTS ARE INCORPORATED
- 3. NO COMMENT - FINAL ISSUE

Is used when a document is not acceptable in its submitted version and the VENDOR is required to make significant modifications and / or to provide data that is not yet included in the document, and to re-submit it for review.

If the documents indicate non-compliance with contractual requirements which are stipulated in the Scope of Work and its associated specifications / codes, nonconformity shall be indicated by the Requisition Leader. Documents in code 1 with nonconformity shall be submitted again as soon as possible.

Code 1 may also apply to documents which, for reasons not relating to nonconformities, have to be submitted again before being accepted as released for construction (e.g. VENDOR did not have the requisite input data: “Hold” point is identified, or Key Interface Data is missing or erroneous).



- **Code 2 - To be re-issued providing that comments are incorporated**



The form is titled 'VENDOR DOCUMENT REVIEW' and includes the T.EN TECHNIP ENERGIES logo. It contains three options with checkboxes:

- 1. REVISE AND RESUBMIT
- 2. TO BE ISSUED AS FINAL PROVIDED COMMENTS ARE INCORPORATED
- 3. NO COMMENT - FINAL ISSUE

Is used for usual Contracting comments. The documents reviewed/commented shall be transmitted to the VENDOR with an electronic notification/transmittal letter indicating the deadline for returning the documents. The Inspection and Quality Control disciplines are authorized to carry-on out shop acceptance on the basis of drawings and documents annotated with code 2, provided that comments

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are implemented before inspection.

- **Code 3 - No Comments**



T.EN TECHNIP ENERGIES | **VENDOR DOCUMENT REVIEW**

1. REVISE AND RESUBMIT

2. TO BE ISSUED AS FINAL PROVIDED COMMENTS ARE INCORPORATED

3. NO COMMENT - FINAL ISSUE

Is used for certified documents finally reviewed without comments by CONSULTANT or documents not submitted to CONSULTANT for review (eg document issued for information).

APPROVAL shall in no way be construed as relieving VENDOR of any of his obligations, responsibilities or liabilities under the Purchase Order or in accordance with APPLICABLE LAWS

9.3. Return of Comments to VENDOR:



CONSULTANT comments from VDBx platform will be returned electronically by e-mail in a PDF file along with a transmittal reference. All e-mails will contain a single commented document to prevent delivery failures. One e-mail will be sent for one document.

Comments from the VDBx platform will be accessible for a maximum duration of 30 days, as these will be deleted automatically after this time.

It is VENDOR responsibility to save these comments before automatic deletion. It shall be noted that VDBx system will only delete PDF attachments and not status of documents.

VENDOR will receive reminders in case there is any delay in submitting document containing Key Interface Data and/or resubmitting documents stamped in Code 1.

Each next revision of a VENDOR document shall be submitted after the receipt of comments. No updated revision will be accepted if previous one has not been commented by CONSULTANT or returned without comment.

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9.4. Documents Follow-up:

VENDOR is responsible for consulting in VDBx the CONSULTANT Document/ by Status and Info Requirement/ by Due Week to follow up documents/ IRs status and perform necessary actions.

10. DOCUMENT CODES AND FORECAST LIST:

10.1. Document Codes/Items:

The documents items specify the type of information to be delivered by VENDOR in term of content. The documents items list are available in Annex 1 of this instruction.

During the ITB process (Invitation to Bid), the VENDOR shall review the documents items sent by CONSULTANT. Following review and discussion, VENDOR shall sign the agreed documents items. After Purchase Order, CONSULTANT will issue the SR part II as agreed with selected VENDOR.

10.2. Forecast List:

10.2.1. Production of the Forecast List:

The Forecast List is the list of the documents defined in SR part II and agreed by the VENDOR. It is managed in VDB.

Submission of document references not available on the Forecast List is not allowed.



The Forecast List includes the documents list containing all required information and specifies at which date VENDOR will send the corresponding information to CONSULTANT (in accordance with SR part II).

VENDOR shall submit a Forecast List of documents, containing all required information requested in the SR part II within one week after the Purchase Order placement or formal notification to proceed. After validation by the Requisition Leader, the VENDOR shall fill out the list in Excel format and e-mail it to CONSULTANT Document Control Mailbox.

Requisition Leader will check the list for matching documents titles and issue dates with CONSULTANT documents items and required schedule dates defined and SR part II, before and during Kick-Off Meeting.

10.2.2. Integration of the Forecast List into CONSULTANT EDMS:

After approval of the Forecast List during Kick-Off Meeting, CONSULTANT Document Control will import the list of the documents into VDB; the information on forecast documents will become available on VDBX: document references, titles, equipment tags (where applicable) and issue due dates.

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User ID and password to access VDBX will then be sent by e-mail to VENDOR by the Document Control – after the Forecast List import.

The VENDOR Forecast List shall include:

Document titles
 Project Document References
 CONSULTANT Document References (if any)
 Forecast dates

Refer to Forecast List Template in Annex 2



10.2.3. Update of the Forecast List:

The VENDOR shall keep the Forecast List up to date, and re-issue it as required to reflect changes that have occurred in document title or reference.

All changes applied to the Forecast List shall be highlighted with each new Revision of the Forecast List.

Deletion of document shall be justified in the column “remark”.



Forecast List is not corresponding to documents item A0001 – List of VENDOR’s Documents and Drawings. Forecast List is a tool used for setting of VDB and VDBx. It shall not be mixed with A0001- List of VENDOR’s Documents and Drawings, which is a formal deliverable.

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11. ANNEX 1 – Document Items



Document Code	Document Title	Document Description
A0001:	List of SUPPLIER's Documents and Drawings	<p>List of all documents and drawings, which the SUPPLIER plans to provide, to satisfy the SR part II requirements.</p> <p>At the first issue, this list shall indicate, as a minimum:</p> <ul style="list-style-type: none"> • SUPPLIER full document/drawing title including equipment tag number • SUPPLIER document/drawing reference, • Other reference (based on contractual requirement), • ENGINEER' document code(s), • Scheduled and Planned issue dates. • Purpose of issuance (e.g. for review, for information ...). <p>This document shall be available at the kick-off meeting for review (provided under MS Excel format)</p>
A0101:	Process Description	<p>This document describes the principle of operation of the unit and the main steps of operational sequences corresponding to the process flow diagram.</p> <p>It also describes the process theory and the involved process variables and shall confirm process guarantees.</p>
A0102:	Process and Utility Flow Diagrams with Heat and Material Balance	<p>Scheme including the following information, as a minimum:</p> <ol style="list-style-type: none"> 1. Main equipment (all the itemized ones), 2. Process lines between equipment and main utility interfaces, 3. All control loops and main instruments, 4. For each stream, indication of: <ul style="list-style-type: none"> • Temperature • Pressure • Composition • Specific gravity • Operating density • Heat content • Flow rate (relevant to each phase) 5. Design conditions of main equipment.

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Document Code	Document Title	Document Description
A0103 (*)	Piping & Instrument Diagrams	<p>This document item includes:</p> <ul style="list-style-type: none"> Piping and instrumentation diagram (showing all piping and instrumentation provided by the SUPPLIER), Auxiliary systems of package equipment i.e. lube oil system, seal system, burner piping, <p>The following information shall be specified in the PID's, as a minimum, and following agreed ranges between ENGINEER and SUPPLIER during kick-off meeting:</p> <ol style="list-style-type: none"> All itemized equipment, (*) Item number and service description of each equipment with relevant design condition (based on contractual requirement) All process and utilities lines, with indication of: <ul style="list-style-type: none"> Diameter (*) Rating (*) Material (*) Service (*) Line number (if applicable) Piping class (piping class specification to be supplied if different from the contractual one. See A2102) (*) Piping class break / change (*) External finishing (such as insulation, personal protection, tracing...), and insulation break location Qualification of battery limit: <ul style="list-style-type: none"> A number (or a letter) shall identify all connection points between SUPPLIER and ENGINEER and shall match with ENGINEER Tie-in point references. Connection used only for operation and SUPPLIER / subENGINEER connection points must be clearly identified with different terminology. (*) These points shall be specified in the list of customer connection (refer to A0111) and shall be used on all documents where such information has to be stated (e.g.: general arrangement, piping isometrics, etc...) In-line loose item (such as relief valves, silencers...) shall be shown with associated Tie-in point references and limit of supply indication, (*) All valves and fittings on lines (including block valves, check valves, strainers,), connections on equipment and vessels, All instruments with detailed control loops: <ul style="list-style-type: none"> All instruments, including analyzers shall be tagged with ENGINEER's numbering system, (*) Local instruments or instruments on local panel,

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> Sequences and interlock shall be stated (with brief description e.g.: comp. start / stop, permissive to start, etc.) (*), References to logic diagram and a list of inputs/ outputs to local or central control system shall be made. (*) <p>7. Control valves (*),</p> <p>8. Safety valves (*) (with set point and inlet/outlet size),</p> <p>9. Particular data or notes relevant to equipment/instruments installation, such as:</p> <ul style="list-style-type: none"> Max or mini length of piping (requirement regarding suction / discharge piping straight length, additional required tap, etc shall be clearly mentioned), Slope/Free-draining requirement for piping and location of high and low points (*) Elevation of equipment (*) Safe location requirement, and identified with a tie-in point number (*) Maximum allowable back pressure, maximum allowable pressure drop, Heater or boiler P&ID's shall contain a detailed drawing for burner instrumentation, For rotating equipment, suction filter or filter element scope of supply shall be clearly mentioned, For pumps, API plan shall be mentioned, Control and monitoring signals for rotating equipment and electrical motors (if applicable), Any requirement regarding piping cleanliness. <p>10. Item number and service description of each equipment with relevant design condition (based on contractual requirement). PIDs shall be compliant to project principle governing symbols (included in PIDs legend sheets) and following project specification for PIDs preparation, if available. (*): Key Interface Data</p>
A0103A (*):	HVAC Schematics And Flow Diagrams	<p>This document item includes:</p> <ul style="list-style-type: none"> the HVAC flow diagrams, the ducting and instrumentation diagrams, the piping and instrumentation diagrams. <p>The following information shall be specified as a minimum:</p> <ol style="list-style-type: none"> all itemized equipment and elements which are part of equipment (*), all ductwork, with indication of:

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • air flow rates (*) • size (*) • circulation way (*) • external finishing (such as insulation, protection) 3. all piping lines, with indication of: <ul style="list-style-type: none"> • diameter (*) • flow rate (*) • material • service (*) • piping class • circulation way • external finishing (such as insulation, protection, tracing...) 4. data on battery limits: <ul style="list-style-type: none"> • Identification of Tie-ins with ENGINEER (*) • characteristics of the utilities (*), 5. all dampers, fittings, etc on ductwork, 6. all valves and fittings on piping lines, 7. all instruments with detailed control loops: <ul style="list-style-type: none"> • all instruments shall be tagged with ENGINEER’s numbering system if any, (*) • sequences and interlock shall be stated (*), • list of inputs/ outputs from / to control system including alarms, safety inputs, etc shall be made. (*) 8. symbols list and abbreviations definition. (*): Key Interface Data
A0103B (*)	Hydraulic Schematics And Flow Diagrams	This document item includes: <ul style="list-style-type: none"> • the Hydraulic flow diagrams, • the associated equipment and accessories. The following information shall be specified as a minimum: <ol style="list-style-type: none"> 1. all itemized equipment and elements which are part of equipment, with size and weight, such as: <ul style="list-style-type: none"> • Pumps, (*) • Dampeners (*) • Accumulators (*) 2. all accessories, with indication of: <ul style="list-style-type: none"> • size (*) • design conditions (*) • external finishing (such as insulation, protection) 3. all hydraulic lines, with indication of: <ul style="list-style-type: none"> • diameter (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • flow rate • material • design conditions • hydraulic component class (with reference to A2103) • external finishing (such as insulation, protection, tracing...) 4. data on battery limits: <ul style="list-style-type: none"> • Identification of Tie-ins with ENGINEER (*), • characteristics of the utilities (*), 5. all valves, safety devices, instruments, fittings, etc on hydraulic lines, (with reference to A2103) 6. all instruments with detailed control loops and logics: <ul style="list-style-type: none"> • all instruments shall be tagged with ENGINEER’s numbering system, if any, • Selector valve assembly shall be detailed (*) • sequences and interlock shall be stated (*), • list of inputs/ outputs from / to PLC including alarms, safety inputs, etc shall be made. (*) 7. Symbols list and abbreviations definition. (*): Key Interface Data
A0104:	Equipment List	List of equipment supplied within a package or unit, including as a minimum: <ul style="list-style-type: none"> • Itemized equipment tag • Parent tag (for sub-item, belongings to another tag; e.g. sealing system of a pump, lube oil system, ...) • Reference to Material Requisition number, PID and Datasheet • Maximum and minimum design and operating parameters (temperature, pressure, duty) • Material • Insulation • Coating type • Weight This document shall follow project template (if available), and to be submitted in MS Excel format, in order to be merged with project overall equipment list.
A0105:	Noise Data Sheet	Detailed Equipment noise data based on contractual requirements. For inline instrument such as control valves, the noise calculation must be integrated into the calculation sheet (A3102)
A0106:	External Painting / Coating Procedure	Document explaining how the external painting/coating system will be executed, including: <ul style="list-style-type: none"> • the identification of the surfaces to be painted, with selected painting system, material of construction, operating and design

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		<p>temperature (min/max), identification of insulation/Passive Fire Protection type, location of item (outdoor, indoor), identification of parts in contact with fluid (especially for submerged items) and water depth (for subsea equipment).</p> <ul style="list-style-type: none"> the detailed surface preparation, the description of painting materials, including paint datasheets, thickness of each layer and name of product the painting application procedure, the heating process, if applicable the repair method, the painted/coated item handling, the pre-qualification procedure (PQT), if applicable the inspection test list with acceptable criteria and frequencies, for each layer the standards to use. <p>The reference of all selected raw materials with technical datasheets shall be included in the painting procedure. This document shall be in accordance with the Painting and coating Specification(s) applicable for the project and joined to the requisition.</p> <p>This procedure is applicable to any coated area, such as equipment, piping, structural steel, E&I, subsea facilities, bulk items, control panels, etc, and to any painted/coated sub-SUPPLIER items.</p> <p>A dedicated procedure shall be developed by SUPPLIER for each type/system of painting/coating on external surfaces, including Passive-Fire Protection, Thermal Spray Aluminum, anti-corrosion resin, where relevant.</p> <p>For the subsea conditions, when the U Value and/or the Cool Down Time (CDT) are required, it includes the insulation material: description of the insulating materials, the required thickness for each items layer and insulation application procedure.</p> <p>A PQT may not be required where the coating applicator can demonstrate through previous experience and relevant test data that the anticorrosion and thermal insulation coating system will meet the requirements of the project specification. Approval of historical data is at ENGINEER’s discretion.</p> <p>Where required, PPT shall be performed before the start of production.</p>
A0107:	Insulation Procedure	<p>Document explaining how the insulation will be executed, including:</p> <ul style="list-style-type: none"> the description of the insulating materials, including product datasheets the required thickness for each item,

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> the description of the jacketing and removable covers (for bolts, valves access, etc), including product datasheets the description of accessories, sealants and vapour barriers the application procedure, the repair method the inspection test list with acceptable criteria the standards to use. When applied to equipment, the design basis and calculation methodology to define quantities to be purchased / supply with provision <p>This document shall be in accordance with the Insulation Specification(s) applicable for the project and joined to the requisition.</p>
A0108 (*)	Weight Data Sheet	<p>A completed ENGINEER’s Form based on contractual requirement, identifying as a minimum:</p> <ul style="list-style-type: none"> Dry / operating / test and lifting weight, for each item subject to separate lifting (*) Position of Center of Gravity for each item subject to separate lifting (*) <p>For instrument material, the weight data shall be mentioned in A3201 (*): Key Interface Data</p>
A0109:	Not used	
A0110:	Vibration Data Sheet	<p>This document shall detail the equipment acceleration and frequency data, as well as the dynamic force generated by the equipment that could be transmit to the baseplate or piping, the stiffness of the fastenings (including stiffness of the Anti Vibrating Mount, if any) and the fastenings points number.</p> <p>It shall describe the dynamic and static analysis of the equipment by the mean of FEM (Finite Element Modelling).</p> <p>This calculation shall include equipment start-up and shut-down. Critical frequencies shall be documented.</p>
A0111 (*)	List of Piping Interface Connections	<p>A tabulation where all piping connection between SUPPLIER and ENGINEER shall be described using the template provided in annex 7.1. (*)</p> <p>This tabulation shall clearly indicate any loose / shipped item connection points (such as valves, strainers, safety valves, coolers, air coolers, lube oil consoles, Hydraulic Power Units, etc). (*)</p> <p>Acceptable dimensional tolerance (in each axis, and angular) shall be indicated and shall be in line with construction Yard requirements. (*): Key Interface Data</p>

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Document Code	Document Title	Document Description
A0112:	Not used	
A0113:	Pipe Coating Procedure	<p>Document explaining how the external painting/coating system will be executed, including:</p> <ul style="list-style-type: none"> the identification of the surfaces to be coated, with selected painting system, material of construction, operating and design temperature (min/max), identification of insulation/Passive Fire Protection type, location of item (outdoor, indoor), identification of parts in contact with fluid (especially for submerged items) and water depth (for subsea equipment). the detailed surface preparation, the description of painting materials, including paint datasheets, thickness of each layer and name of product the painting application procedure, the heating process, if applicable the repair method, the painted/coated item handling, the pre-qualification procedure (PQT), if applicable the Pre-Production Test (PPT), if required the inspection test list with acceptable criteria and frequencies, for each layer the standards to use. <p>The reference of all selected raw materials with technical datasheets shall be included in the painting procedure. This document shall be in accordance with the Painting and coating Specification(s) applicable for the project and joined to the requisition.</p> <p>This procedure is applicable to factory coated pipes for subsea and underground use, with specific coating and process, not covered by A0106.</p> <p>For the subsea conditions, when the U Value and/or the Cool Down Time (CDT) are required, it includes the insulation material: description of the insulating materials, the required thickness for each items layer and insulation application procedure.</p> <p>A PQT may not be required where the coating applicator can demonstrate through previous experience and relevant test data that the anticorrosion and thermal insulation coating system will meet the requirements of the project specification. Approval of historical data is at ENGINEER’s discretion.</p> <p>Where required, PPT shall be performed before the start of production.</p>

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Document Code	Document Title	Document Description
A0114:	Internal Coating/Lining Procedure	<p>Document explaining how the internal coating/ lining will be executed, including:</p> <ul style="list-style-type: none"> the identification of the surfaces to be coated/ lined, with operating temperature (min/max) the detailed surface preparation, the description of coating/lining materials, including product datasheets the application procedure, the heating process, if applicable, the repair method, the inspection test list with acceptable criteria and test frequencies, the pre-qualification procedure (PQT) or Pre-production test procedure (PPT), if applicable the standards to use. <p>This document shall be in accordance with the Coating/ Lining Specification(s) applicable for the project and joined to the requisition.</p> <p>For the subsea conditions, when the U Value and/or the Cool Down Time (CDT) are required, it includes the insulation material: description of the insulating materials, the required thickness for each items layer and insulation application procedure.</p> <p>A PQT may not be required where the coating applicator can demonstrate through previous experience and relevant test data that the anticorrosion and thermal insulation coating system will meet the requirements of the project specification. Approval of historical data is at ENGINEER’s discretion.</p> <p>Where required, PPT shall be performed before the start of production.</p>
A0115:	Metallization Procedure	<p>Document explaining how the metallization will be executed, including:</p> <ul style="list-style-type: none"> the identification of the surfaces to be metalized, with operating temperature (min/max) the detailed surface preparation, the description of materials, including product datasheets the application procedure, the repair method, the inspection test list with acceptable criteria and test frequencies, the standards to use. <p>This document shall be in accordance with the Specification</p>

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Document Code	Document Title	Document Description
		applicable for the project and joined to the requisition.
A0116:	Subsea Painting Specification	Refer to A0106
A0117:	Subsea Pipe Coating Specification	Refer to A0106 for external coating, A0113 for pipe coating and A0114 for internal coating
A0118:	Subsea Insulation Specification	Refer to A0107
A0120:	Design Basis	Document gathering all input data, assumptions, functional requirements and applicable references which will be used for the design. It shall also highlight any missing data needed by SUPPLIER to carry out the detailed design.
A0121:	Design Report	<p>Document demonstrating the validity of the design with respect to requirements. It shall include as a minimum:</p> <ul style="list-style-type: none"> • all references, including Codes and Standards • input data • assumptions • methodology • load cases • sketches • detailed calculations • results, and conclusion on acceptance • output data needed for interfaces • Protection against adverse weather (such as winterization, sand storms or tropicalization). <p>All requirements shall be addressed, including but not limited to:</p> <ul style="list-style-type: none"> • Suitability with site conditions • material selection • corrosion protection • mechanical resistance • thermal performance.
A0122:	Training Program	<p>The training program describe all activities covered during the training relative to all project phases by group of activities in each discipline. For its preparation, it is necessary to define:</p> <ul style="list-style-type: none"> • The main objectives, • Participants to the training • Pre-requisites to participate to the training • The skill capacities obtained, • The duration of each main activity.
A0123:	Material Selection	Document describing the rationale of material selection and corrosion

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Document Code	Document Title	Document Description
	Report	allowance thickness, and detailed corrosion rate calculation, if applicable. This document shall consider: <ul style="list-style-type: none"> • normal operation • start-up • testing / cleaning-in-place operations / transient conditions • impurities that can have a short-term effect on selected material.
A0124:	Material Selection Diagram	Document to indicate in a Process Flow Diagram (or equivalent) the selected material for equipment and piping, and shows mitigation methods at material breaks with different materials.
A0125:	Process Data Freezing	This information is not a document, but the validation that all process Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution, leading to physical modifications after the starting of construction activities. SUPPLIER to submit a front page in VDB when process Key Interface Data are validated.
A0126:	Tag Register	List of item tags representing the functions of the materials and/or equipment provided in the equipment. The Tag Register includes as typical minimum requirements: <ul style="list-style-type: none"> • Tag number • Tag description • Parent tag • Tag class or Tag type • Process unit • System and Sub-system • Reference drawing. Based on the contractual requirements, SUPPLIER shall provide a register filled as per the template provided in the Information Management specifications, if available. The Tag Register may be merged with the Equipment Register into one consolidated register depending on the contractual requirements.

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A0127:	Equipment Register	<p>List of the tagged materials and/or equipment provided in the equipment. The Equipment Register includes as typical minimum requirements:</p> <ul style="list-style-type: none"> • Tag number • Equipment description • Equipment class or Equipment Type • SUPPLIER name • Manufacturer name • Manufacturer model part number • Manufacturing serial number • Manufacturing country • Weight of the Equipment. <p>Based on the contractual requirements, SUPPLIER shall provide a register filled as per the template provided in the Information Management specifications, if available. The Equipment Register may be merged with the Tag Register into one consolidated register depending on the contractual requirements.</p>
A0128:	Document to Asset Register	<p>List of the cross-references between the SUPPLIER documentation and the Asset against which the Equipment is being supplied. The Document to Asset Register includes the following typical requirement, as a minimum:</p> <ul style="list-style-type: none"> • SUPPLIER document/drawing reference (as per A0001) • Plant code • Area code • Process unit • Tag number. <p>Based on the contractual requirements, SUPPLIER shall provide a register filled as per the templates provided in the Information Management specifications, if available.</p>
A0201 (*):	Plot Plan and Elevation	<p>Document showing:</p> <ul style="list-style-type: none"> • Definition of outline dimension (out-of-steel dimension) of the Equipment, Module or Plant, with indication of a reference at equipment key point (such as support, machine axis). (*) • For multi-level Equipment, Module or Plant, elevation of each level to be indicated and isometric view shall be provided. (*) • Definition of the position of the itemized equipment composing the Equipment, Module or Plant, ladders, walkways and service structures provided by SUPPLIER or to be provided by ENGINEER. (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Primary structural steel shall be indicated, with correspondence with site elevation (foundation, deck level to be clearly shown). (*) • Identification of the battery limits areas of the Equipment, Module or Plant (with reference to the connection point), (*) • Identification of all the escape routes and main access ways. (*) • Identification of all the required access, maintenance spaces or/and drop areas around the Equipment, Module or Plant, including area for temporary scaffolding. (*) • Dimension of the parts to be removed/extracted from the equipment (such as bundle, internals). (*) (*): Key Interface Data
A0301:	Chemical, Catalyst, Resin Specification and Consumption	A list detailing the daily and annual consumption of chemicals and catalysts plus the amounts required for initial fill. For analyser purpose, list of gas cylinder, reagent, calibration product, to be done.
A0401:	SUPPLIER Engineering Data-Book	This document shall be in accordance with the relevant specification(s) applicable for the project and joined to the requisition. This document shall also cover the operation and maintenance (routine, planned and exceptional) aspects of the delivered goods. This data-book is composed of engineering documents and shall be submitted in electronic format and in paper copy, as requested in the specification.
A0401A:	Index of SUPPLIER Engineering Data-Book	Summary of SUPPLIER Engineering Data-Book, following project template and format. This document shall contain the front page of SUPPLIER Engineering Data-Book and all sections and sub-sections of SUPPLIER Engineering Data-Book, with reference of the documents inserted in each section (with project document reference).
A0402:	Final Documentation Electronic Files	Native files of the documentation, as per the list specified in the requisition documentation. Native file corresponding to the latest revision submitted in VDB shall be provided. Data shall be unprotected and without passwords. The format and acceptable software and version shall be in accordance with the relevant specification(s) applicable for the project and joined to the requisition.
A0403:	Not used	
A1001:	Equipment Data-Sheet	A completed data-sheet based on contractual format and requirement, including as a minimum:

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		<ul style="list-style-type: none"> • Equipment tag • Design code • Manufacturer and model number • Main dimensions • Characteristics of the fluid handled by the equipment (inlet conditions) • Performance data • Utility consumption • Site data (e.g. Ex zone, seismic or motion conditions, wind condition) • Maximum, normal and minimum design and operating parameters (temperature, pressure, flow...) • Material, with grade, for each sub-item • Electrical data (e.g. voltage, frequency, power, Ingress and Ex Protections,), for main electrical items • Piping connection details, with type (flanged or studded), size, facing, rating, identification number, acceptable nozzle loads (forces and moment) • Instrumentation attached to the equipment (such as temperature, level, vibration, speed, pressure transmitters/gauges) for control and safeguard, and Input/Output signals type • Description of all accessories, couplings, bearings, lube oil unit, Hydraulic power Unit, • Insulation type • Coating type • Weight • Noise limit • Extent of testing, with acceptance criteria, during fabrication and mechanical/performance testing • And more generally all data needed for the design, fabrication, testing, installation, operation and maintenance of the equipment <p>This document shall be in accordance with project template, depending on the nature of supplied equipment (if any).</p>
A1002:	Performance Curves	<p>Predicted performance data showing specified, design conditions and correction factors, if any. Operating point(s) shall be identified in the curve.</p> <p>For F&G gas detectors, correction factor to be integrated into A3106.</p>

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Document Code	Document Title	Document Description
A1003:	Calculation Notes	Document including the calculation of the equipment or the bulk material performed in accordance with the code contractually selected and in the language qualified for the project. Both input data and calculation codes shall be clearly indicated. Calculation note for Cathodic protection shall be provided, if any. Calculation notes for instrumentation to be integrated into A3102.
A1004:	Anti Surge Calculation Sheet (with Anti Surge Valve Sizing)	Report including input data, calculation note and SUPPLIER's conclusion.
A1005:	Performance Curves of Auxiliaries Equipment	Predicted performance data showing specified, design conditions and correction factors, if any. Operating point(s) shall be identified in the curve.
A1006:	Auxiliaries Data Sheets	A completed ENGINEER or SUPPLIER form based on contractual requirements. Refer to A1001 for minimum required information
A1007:	Lateral Critical Speed Analysis	Report including description of method used, input data, graphic display and SUPPLIER's conclusion.
A1008:	Not used	
A1009:	Torsional Critical Speed Analysis	A calculation note for torsional analysis of complete rotor. The model shall cover the complete shaft line including driven machine, coupling, speed reducer, gear-mesh, and driver. Interferences between torsional natural frequencies of complete shaft line shall be compared, for all operating rotation speed range, with all natural frequencies of different elements, in a Campbell diagram. Separation margins shall be established and acceptability shall be discussed in the frame of applicable standard.
A1010:	Blades Campbell and Goodman Diagrams	Report including description of method used, input data, graphic display and SUPPLIER's conclusion.
A1011:	Crosshead Load Reversal Diagrams Including Effect of Valve Failure	Report including description of method used, input data, graphic display and SUPPLIER's conclusion.
A1012:	Thermal Rating for Heat Exchangers	Calculations to show the basis of thermal sizing of heat exchangers, including checks for Flow Induced Vibrations
A1013:	System Mechanical and Acoustical Pulsation Study	Report including description of method used, input data, graphic display and SUPPLIER's conclusion.
A1014 (*):	Utility Balance	A table showing, for all the different operating conditions of the equipment, including start-up / shut-down: <ul style="list-style-type: none"> • list of utilities (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • flowrate (*) • required conditions (pressure, temperature) (*) • requested quality of utility fluid (service water, Nitrogen, Air instrument...) and contaminants to be avoided (*) • Continuous or transient need (indicate frequency and duration) (*) (*): Key Interface Data
A1015:	Completed Lubricant Charts	A table showing as a minimum: <ul style="list-style-type: none"> • lubricating point, • quantity of lubricant for initial fill • quantity of lubricant for refilling/topping-up (with frequency) • required characteristics of oil and grease (such as viscosity, cleanliness, pour point, flash point, acid number, oxidation characteristic ...) • recommended brand and type (attention shall be paid by SUPPLIER on the lubricant brand standardization requirements, if applicable to the project) • maintenance requirements (i.e. frequency of replacement). • Expected lifetime of lubricants
A1016:	CFD Analysis Reports	A report on CFD (Computational Fluid Dynamic) analysis. For example on liquid seal or vessel subject to motions and acceleration (offshore).
A1017:	Pressure Drop Calculation Note	A calculation notes, for different operating conditions, of pressure drop across equipment or critical item (such as liquid seal)
A1101:	Cross Sectional and Assembly Drawings (with Part List)	Drawing identifying all components of the equipment and the relevant description along with qualification of main materials shall be listed on a dedicated table.
A1102:	Drawings of Auxiliaries and Itemized Equipment Supplied Loose	Drawing to include the information required are specified in doc code A2001 and A2006, as far as applicable. Document shall indicate clearly the Tie-in point references and allowable loads and moment at each tie-in point. The procedure for installation of the loose items shall be described in the A5010 document.

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Document Code	Document Title	Document Description
A1103:	Pressure Vessel Fabrication Drawings	<p>Drawing including the following information, as a minimum:</p> <ul style="list-style-type: none"> • Operating/design/testing conditions, • Design codes, • Maximum allowable working pressure, • Non destructive test, heat treatment, • Material list (ASTM or ASTM equivalence) with reference (part list) to each numbered position, • Dimensions and thickness • Nozzles orientation, • Details of welding/nozzles/flanges, external supports / bolting / insulation, supports/lifting lugs/ reinforcing pads, • Loads (empty, operation, hydrotest), • Allowable loads on nozzle, • Nameplate, • Painting/insulation specification. <p>This documentation is also required for control/on-off valve air tank capacities when applicable.</p>
A1104:	Tank Roof, Shell, Bottom Fabrication Drawing	Drawing showing internal details concerning pressure vessel, exchanger or tank. Welding details of roof, shell, bottom, head and shall appear in this drawing, including nozzle location
A1105:	Piping, Insulation, Ladder and Platform Support Drawing	Drawing showing external details concerning pressure vessel, exchanger, tank or structure, including information on material, dimensions, fixing system and weight.
A1106:	Mechanical Seal or Packing Drawings (with Material List)	Drawing identifying all components of the mechanical and the relevant description along with qualification of main materials shall be listed on a dedicated table. Operating and design data shall be stated.

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Document Code	Document Title	Document Description
A1107:	Plate arrangement drawings (with material list)	<p>Also valid for "kettle" type heat exchangers. Not applicable to storage tanks and air-cooled heat exchangers.</p> <p>a. <u>Plate arrangement drawing</u> These drawings A4 size or sketch shall only indicate:</p> <ul style="list-style-type: none"> • General outline equipment (shells, heads, supports, skirt, lugs, saddles, stiffener rings...) • Position of circular welds seams in accordance with plate size • Head shape (and plate arrangement in case of composed head) • Shape of reduction cone (straight flange, Knuckle radius, etc.) • Minimum plate thickness after forming • Material specification <p>Note: Review of this document enables order for main materials to be finalized.</p> <p>b. <u>Material lists:</u> This document shall be presented in schedule form. It shall be established from the nozzles list shown on the general arrangement drawing; it shall include:</p> <ul style="list-style-type: none"> • Identification (or item), quantity and diameter of nozzles, • Type, rating and material of flanges, • Schedule or thickness of nozzle necks, • Diameter, thickness and reinforcement material, • Material, thickness, rating of blind flanges (if any), • Diameter, quantity, length, thread type, material of stud bolts and nuts, • Definition, rating, material of couplings, • Definition, rating and material of couplings and half coupling.
A1108:	Developed Plate Layout Drawings	<p>This drawing shall show the plate arrangement in a plane view, position of weld seams and outline of:</p> <ul style="list-style-type: none"> • Nozzles, • Manways with davits, • Connections, • Structural and piping gussets, • Lifting lugs or trunnions, • All other parts welded to shell. <p>This drawing should allow clearance between the above items to be checked. It shall preferably be prepared on a ENGINEER Form or standard immediately after reception of the nozzle orientations which will permit location of weld seams, gussets, etc...</p>
A1109:	Detailed Drawings	<p>Detail drawings to indicate method of construction, plus all features which are omitted from general arrangement drawing for clarity. For Pressure Vessels, these drawings shall refer to the relevant</p>

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Document Code	Document Title	Document Description
		<p>general arrangement drawing and show:</p> <ul style="list-style-type: none"> • Construction details: <ul style="list-style-type: none"> - Bundle details (baffle arrangement, tube sheets, impingement baffles, etc.), - Pass partition arrangement, - Tube lay-out (number, diameter, gauge, pitch of tubes, etc.), - Dimensional section drawings showing: (shell, flanges, tube sheets, etc.), - Tube to tube sheet attachment detail, - Dimension, material and type of gaskets. • Details of all accessories, internal and external attachments (gussets, etc.) <ul style="list-style-type: none"> - Weld bevel geometry in accordance with welding procedure - Weight (full of water and empty) - Plug details (1) • Louvers and their driving system (1) • All other drawings required for assembly • Material types, thickness, including: gaskets and bolts • Weight and dimension of removable internals (demister pads, internal distributors, bundles, trays, etc.) • Part list of the various elements • Weld bevel geometry in accordance with approved welding procedure • All information required on manufacturer name plate <p>Remark (1): For air cooled heat exchangers only For sacrificial anodes, this drawing shall indicate all the details. For Subsea equipment, these drawings detail the whole or parts of the equipment and show at least:</p> <ul style="list-style-type: none"> • Title block • Drawing of the part • Item tags • Material list and/or component list • General Notes • Functional / interface dimensions • location of Center of Gravity • Overall dimensions of the assembly between brackets • Welding symbols • Location of materials • Total weight in air

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Document Code	Document Title	Document Description
A1110:	Trays & Internal Support Drawing	Detailed drawings showing trays and supports dimensions and all details to install the trays in the vessel.
A1111:	Trays & Internal Construction Drawing	Detailed drawings showing trays and all internal dimensions and all details to assembly and install trays & internals in the vessel.
A1112:	Nameplate Drawing	Drawing showing details of manufacturer’s nameplate.
A1113:	Heat Exchanger Construction Drawing	Drawing including the following information, as a minimum: <ul style="list-style-type: none"> • Operating/design/testing conditions, • Design codes, • Maximum allowable working pressure, • Non destructive test, heat treatment, • Material list (ASTM or ASTM equivalence) with reference (part list) to each numbered position, • Dimensions and thicknesses • Nozzles orientation, • Details of welding/nozzles/flanges, • External supports/bolting/insulation, • Supports/lifting lugs/reinforcing pads, • Loads (empty, operation, hydro test), • Allowable loads on nozzle, • Nameplate, • Painting/insulation specification.
A1114:	Liquid Seal General Arrangement Drawing	A general arrangement drawing, showing at minimum: <ul style="list-style-type: none"> • all dimensions, location, table of allowable stress of piping connections, • loads, dimensions and location of anchor bolts, • lifting lugs.
A1115:	Shop Drawings	Detailed drawing issued by SUPPLIER to be used at shop level for fabrication and control.
A1116:	Mechanical Seal Barrier Fluid List	A table showing list, quantity, required characteristics with recommended SUPPLIER reference
A1117:	Coupling Drawings (with Material List)	Drawing identifying all components of the coupling and the relevant bill of material with alignment tolerances. Maximum allowable speed and torque shall be specified on the drawing.
A1201:	Not used	
A1202:	Torqueing and Tightening Specification	Document to include the torqueing/tensioning value method and calculation/test, considering the selected bolt assemblies, to avoid over or under-torqueing. Document shall contain a table showing flange bolting tightening torque for each bolt size/type, and instructions to worker if necessary. This document shall cover all bolted assemblies (structural, piping

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Document Code	Document Title	Document Description
		flange, internal bolting of bulk item or equipment).
A1301:	Flare Radiation Isoleths	A diagram showing elevation and top scaled views of flare, for all operating conditions, including start-up and emergency cases, showing iso-value radiation lines, taking into account environmental conditions such like wind and sun. The recommended values of iso-lines to be shown are acceptable limits for continuous and maximum flaring cases.
A1302:	Flare Noise Map	A tabulation or a diagram showing top scaled view of flare at different operating conditions, including start-up and emergency cases, showing iso-lines of noise levels.
A1303:	Casing Temperature Calculation Note	A calculation note, considering different operating conditions, showing values of casing temperature in different areas of equipment.
A1304:	Pressure Part Calculation Note	Document including the calculation of the equipment performed in accordance with the code contractually selected, following project requirements and in the language qualified for the project. Both input data and calculation codes shall be clearly indicated, as well as SUPPLIER’s conclusion.
A1305:	Burners Capacity Curve	Diagram showing, for different specified fuel composition, the capacity of burner function of flowrate. Operating point(s) to be indicated in the drawing.
A1306:	Not used	
A1307:	Technical Documentation According to Applicable Regulation	As endorsed by Project local laws (including but not limited to PED 97/23/CE, ATEX 94/4/CE, Machinery Directive 2006/42/EC, Electromagnetic Compatibility Directive 89/336/EEC, IECEx requirements, NORSOK requirements, GOST, API)
A1308:	Hazard Analysis According to Applicable Regulation	As endorsed by Project local laws (including but not limited to PED 97/23/CE, ATEX 94/4/CE, Machinery Directive 2006/42/EC, Electromagnetic Compatibility Directive 89/336/EEC, IECEx requirements, NORSOK requirements, GOST, API)
A1309:	Insulating & Refractory Materials Application Procedure	A narrative procedure showing all instructions necessary for application of insulation and refractory including refractory dry out procedure.
A1310:	Not used	
A1311:	Flare Radiation Report	SUPPLIER shall describe all the effect of flare radiation and temperature on equipment, and protection method. In case protection is not possible or not sufficient (only for start-up and emergency flaring), this shall be justified, and replacement procedure after flaring event shall be described, with spare list.

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Document Code	Document Title	Document Description
		If not specified, flare radiation shall be considered with normal/continuous with equipment in operation and start-up /emergency condition, with equipment in stand-by, except for critical items for safety that shall stay in operation even under emergency flaring.
A1312:	FMECA Report	<p>Report detailing the results of Failure Mode, Effects and Criticality Analysis (FMECA) study performed on the equipment, or part of the equipment:</p> <p>This report shall state clearly:</p> <ul style="list-style-type: none"> • Scope of applicability • The most critical part of the equipment • Actions taken, and their reply • Conclusion
A1313:	RAM Report	<p>Report detailing the results of Reliability, Availability and Maintainability (RAM) study performed on the equipment or process unit:</p> <p>This report shall state clearly:</p> <ul style="list-style-type: none"> • Scope of applicability • Description of the predicted production performance, in the project environment context • Identification of critical contributors • Description of alternate designs to increase equipment/unit availability, efficiency or maintainability, presented in a cost vs benefit approach • Conclusion compared to target equipment availability

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Document Code	Document Title	Document Description
A2001 (*):	General Arrangement Drawings	<p>1/-Equipment or Package</p> <p>General arrangement drawings of all assemblies requiring separate site erection/connection showing:</p> <ul style="list-style-type: none"> • Outline dimensions in the three axis, referring to a particular point (e.g. anchor bolt. position of the center line of the equipment in the three axis), (*) • Position of the different centers of gravity in the three axis, (*) • Position of the different anchor points within the base plate(s) on lines with a limit of supply with ENGINEER, (*) • Location including orientation of all connections that are a connection point between SUPPLIER and ENGINEER, with tie-in point reference(*) • Connection details including size, flange rating, facing, finish, thread details, pipe end details, (*) • Summary of connections (see annex 7.1: list of customer connection), including Nozzle allowable forces/moments and movements anticipated and allowable movements for each connection point between SUPPLIER and ENGINEER (*) • Item number of main or auxiliaries equipment, per ENGINEER’s system, (*) • Nozzle allowable forces & moments, anticipated & allowable movements, (*) • Elevation levels of the different pieces of equipment per ENGINEER’s reference, with site elevation reference (such as deck TOS elevation, foundation TOC elevation) (*) • Relative positions of the different part in relation to the main equipment in the three axes (unless separate drawings are being provided for doc item A0201 data). (*) • Indication of all piping inside and around the package or equipment. Position of the different pieces of equipment for identification of accessibility (for operation and maintenance), (*) • Direction of rotation, • Location of panels, consoles and junction boxes relatives to equipment, with tag numbers, (*) • Instrument, control & safety device locations with tag numbers, (*) • Terminal box locations in the three axis and tag numbers, (*) • E&I cable trays, with identification and position of interface points between SUPPLIER and ENGINEER. (*) • Earthing connection locations and details, (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Lighting fixtures location, if any, (*) • Cathodic protection material location, such as anodes, reference electrodes (*) • Ladders, platforms, stairways, pipe supports, lifting beams, davits and other steelworks provided by SUPPLIER or by ENGINEER to access to SUPPLIER equipment, (*) • Locations of field welds, if any, • Lifting point details, • Details of acoustic or other enclosures. Noise enclosure shall be preferably installed on the package equipment base plate and not directly on the foundation, • Maintenance volumes / Clearances required for maintenance and access for operation, inside and outside the outlines dimensions. This shall include vessels manholes, valves, space to install temporary handling equipment, scaffolding, and accessories to fill/un-fill the equipment. (*) • Specification of the heaviest weight for maintenance and of minimum elevation of the maintenance travelling cranes hook, if any, (*) • Information required in doc code A2006, unless separate drawings are being provided for doc item A2006 data. (*) <p>The drawings shall at least contain two views when the equipment item has one axis of symmetry and three views when the equipment item has one plane of symmetry.</p> <p>Note: for air coolers general arrangement drawings, number of bays and bundles must be indicated.</p> <p>2/-Pressure Vessels</p> <p>The following information are required, as a minimum:</p> <ul style="list-style-type: none"> • Overall and main dimensions, general dimension of structures with location of data points dimensions of bundles, frames, louvers, hoods, electric motors, platforms, ladders, etc., with site elevation reference (such as deck TOS elevation, foundation TOC elevation) (*) • Design code(s), • Design pressure and temperature, hydrostatic test pressure and other tests, heat treatment, corrosion allowance, • Material quality and corresponding specifications, • Elevation and position of nozzles, (*) • List of nozzles and connections (diameter, rating, type of flange and flange face, etc.), (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Schedule of acceptable loads and bending moments on nozzles, (*) • Header box displacement length, (*) • Force required for bundle removal, (*) • Load diagram so as to establish load combinations required for design of foundations, including: <ul style="list-style-type: none"> - Loads (dead weight and weight full of water), (*) - Vertical loads and forces due to wind or motions/acceleration, (*) - Shear loads (normal, extreme, survival and transportation), (*) • Dimensions for the location of foundations including details of anchoring system, (*) • Location and dimensions of inspection doors, (*) • Dimensions for access/maintenance/installation of internals. (*) • Cathodic protection material location, such as anodes, reference electrodes (*) <p>3/-For Subsea equipment, these drawings show the equipment in its environment in order to validate all interfaces and shall contain at least:</p> <ul style="list-style-type: none"> • Title block • Drawing of the part • Item tags • Nomenclature of components • General Notes • Functional / interface dimensions (*) • location of Center of Gravity and Center of Buoyancy (*) • Overall dimensions of the assembly between brackets (*) • Total weight in air and in water (*) <p>(*): Key Interface Data</p>
A2002:	Outline Drawings for off Base Equipment (Oil Console etc.)	Information required in doc code A2001 and A2006, as far as applicable
A2003:	Flushing Auxiliaries Piping Drawings	Detailed drawing with bill of material for all auxiliary system
A2004:	Piping Layouts and Drawings	General Arrangement Drawing for piping in SUPPLIER equipment scope, if not readable in A2001 document

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Document Code	Document Title	Document Description
A2005 (*):	Isometric Sketches	<p>This documents are not to scale, are always one- line diagram type, and the following will be shown as a minimum:</p> <ul style="list-style-type: none"> • Line routing with the position of all fittings/valve, flange, bends, etc, • Flow direction, • Line number, • Piping class, • Pipe and components diameters, • All dimensions required for line construction, • Orifice flange pressure tap orientations, • Orientation of flange holes if not standard, • Construction details, if any, concerning special components to be constructed on site with piping materials, • Item and number of all on-line or on-equipment instruments, • Symbols and references of standard and special auxiliary piping supports, • Field welding to be executed during erection. • To be used for field assembly, the isometrics shall also specify the requirements in terms of: <ul style="list-style-type: none"> - PWHT, - NDE, - Test pressure and medium, - Insulation (with type and thickness), personal protection, with indication of the insulation limit location, where relevant - Painting or Coating, with indication of the coating limit location, where relevant <p>If required in the requisition, the same level information as ENGINEER’s isometrics shall be provided.</p> <p>For each sketch, a list of piping materials to be provided with the following information for the piping component:</p> <ul style="list-style-type: none"> • Type, • material, • diameter, • thickness or schedule, • rating, • Quantity, • Weight of each element, • Total weight. <p>The list can be provided on the same sketch drawing or in a separate document.</p>

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Document Code	Document Title	Document Description
		Information in isometrics sketches is considered as a Key Interface Data by CONTRACTOR for interconnecting lines and process critical lines, subject to ENGINEER review (*) (*): Key Interface Data
A2006 (*):	Foundation Layout and Loading Plan	Drawings shall include as a minimum: <ul style="list-style-type: none"> • Base plate locations, dimensions and details, anchor bolt locations in relation to the edge of the base plate, (*) • Thickness of elements of the base plate to be tightened by anchor bolts or welded at site, • Dimensions material of shims required by the SUPPLIER, • Drawings and details of anchor bolts when supplied by the SUPPLIER. When ENGINEER provides the bolts, material, type and size recommended by SUPPLIER shall be specified, (*) • Slot holes details and axis • Details of welds to be performed at site, if any • Tightening/torquing forces to be applied on anchors bolts • Weights (erection, empty, test, operating), (*) • Indication of rotating speed of the equipment, with speed range (minimum to maximum speed), when applicable, • Location and magnitude of load (static and dynamic) transmitted to foundations, (*) • Wind and earthquake or cargo force loads, (*) • Size and location of foundation cut-outs (if required) for downward facing nozzles, cable penetration and drains, (*) • Special SUPPLIER’s requirements for foundation design, if any, • Type, quality, thickness of grouting required by SUPPLIER, (*) • Indication of noise enclosure position, when applicable. (*) • Loads per foot (e.g. air coolers...) (*) Acceptable dimensional tolerance (in each axis, and angular) shall be indicated and shall be in line with construction Yard requirements. (*): Key Interface Data

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Document Code	Document Title	Document Description
A2007:	Structural Steel Drawing	<ul style="list-style-type: none"> • Steel members shape and dimensions • Steel grades • Structure orientation and location • Weld details (type and size) • Joint details (with details of stiffeners arrangement) and beam priority • Lifting points type (trunnion, lugs, ...) and attachment details • Floor / walls penetrations location and dimensions, if any • Access, ladders, handrails, stairs and accessories details • Anchoring details on foundations (plate size, location, bolts size and type if supplied by SUPPLIER) • Loads on foundations (erection, empty, test, operation) for each column • Reference to Project steelwork specifications and standards, if required by the requisition • Type of finishing on elements (painted / galvanized / fireproofed) • Davits, lifting devices details (beam, pad-eyes...) and capacity loads • Bill of quantities • Erection accessories and instructions, if performed by others
A2008:	Stair, Ladders and Platform Drawing	<p>Drawing shall include as a minimum:</p> <ul style="list-style-type: none"> • General and detailed drawing of stair, ladder and/or platform • Details of selected material (with grade) • Bill of material • Attachment details to adjacent structure/civil works by anchor bolts or welded, • Weld details (type and size) • Handrail / guardrail details • Tightening/torqueing forces to be applied on anchors bolts • Weights (erection, dead weight, operating with live loads), if attached to ENGINEER structure • Location and magnitude of load (static and dynamic) transmitted to foundations, • Wind and earthquake or cargo force loads, • Center of gravity,
A2009:	Steel Stack Drawing	<p>Steel Stack Drawing in SUPPLIER equipment scope, including as a minimum:</p> <ul style="list-style-type: none"> • Steel members shape and dimensions • Steel grades • Structure orientation and location • Weld details (type and size)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> Joint details (with details of stiffeners arrangement) and beam priority Lifting points type (trunnion, lugs, ...) and attachment details Access, ladders, handrails, stairs and accessories details Anchoring details on foundations (plate size, location, bolts size and type if supplied by SUPPLIER) Loads on foundations (erection, empty, test, operation) for each column Reference to Project steelwork specifications and standards, if required by the requisition Type of finishing on elements (painted / galvanized / fireproofed) Davits, lifting devices details (beam, pad-eyes...) and capacity loads Bill of quantities Erection accessories and instructions, if performed by others
A2010:	Template Drawing	A detailed drawing of foundation templates to be used during erection of equipment on construction site.
A2011 (*):	Civil Work Guide Drawings (Base Frame and Cable Holes)	<p>This document shall provide all needed information to ENGINEER to perform civil works detailed design. Drawing shall include as a minimum:</p> <ul style="list-style-type: none"> Any SUPPLIER interfaces with ENGINEER civil works (*) SUPPLIER equipment base plate locations, dimensions and details, anchor bolt locations in relation to the edge of the base plate, (*) Thickness of elements of the base plate to be tightened by anchor bolts, (*) Dimensions and material of shims required by the SUPPLIER, (*) Drawings of anchor bolts when supplied by the SUPPLIER. When ENGINEER provides the bolts, material, type and size recommended by SUPPLIER shall be specified, (*) Tightening/torquing forces to be applied on anchors bolts Weights (erection, empty, test, operating), (*) Indication of rotating speed of the equipment, with speed range (minimum to maximum speed), when applicable, Location and magnitude of load (static and dynamic) transmitted to foundations, (*) Wind and earthquake loads for tall equipment only, e.g. furnaces, (*) Size and location of foundation cut-outs (if required) for downward facing nozzles and drains, and cable penetrations, if any (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Special SUPPLIER’s requirements for foundation design, if any, • Type, quality, thickness of grouting required by SUPPLIER, (*) • Indication of noise enclosure or any out-of-skid accessory position, when applicable (*) <p>Acceptable dimensional tolerance (in each axis, and angular) shall be indicated and shall be in line with construction Yard requirements. (*): Key Interface Data</p>
A2012	Lifting Apparatus Drawing	<p>Drawing of lifting apparatus for transportation / erection on site, with as a minimum:</p> <ul style="list-style-type: none"> • Design code • General dimensions (overall and middle of steel) • Location and details of lifting lugs / trunnion • Details of shackle / hook to be used • Slings, with relative angle with lifting apparatus • Material (with grade) • Welding details, and reference to WPS • Painting details • Reference to relevant calculation note document (A2201) shall appear in the drawing
A2013:	SUPPLIER 3D model	<p>Depending on the project requirement, the 3D model can be deliver under 2 formats:</p> <ol style="list-style-type: none"> 1. 3D model of SUPPLIER equipment, using ENGINEER software, libraries and site format. 2. Simplified model, that can be inserted as an image in ENGINEER model <p>In any case, a front page will be recorded in VDB, at each model submission, in order to record ENGINEER comments and return them officially to the SUPPLIER. 3D model submitted shall match the content of the General Arrangement Drawing document (A2001). Level of details to be indicated and modelling details is described in project specification attached to the Material Requisition.</p>
A2014:	Piping Data Freezing	<p>This information is not a document, but the validation that all piping and installation Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution, leading to physical modifications after the starting of construction activities. SUPPLIER to submit a front page in VDB when piping and installation Key Interface Data are validated.</p>

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Document Code	Document Title	Document Description
A2101:	Line List	<p>This document includes all information necessary to identify the main characteristics of the lines pertaining to the unit such as:</p> <ul style="list-style-type: none"> • Line number (following format and allocated range) • Reference (from, to), • Reference to PID • Service fluid, • Piping class, • Operating and design conditions, • Corrosion allowance, • Material, • Size, • Thickness, • Facing, • Test pressure and medium • Insulation type, and thickness • Heat tracing (Y/N) • Painting system. <p>This document shall follow project template, if any, and to be submitted in MS Excel format, in order to be merged with project overall line list.</p>
A2102:	Piping Classes	<p>Collection of all the information pertaining to the selection criteria for the piping components (pipes, flanges, valves and fittings), used for construction of lines.</p> <p>Each piping class may be related to one or more services, according to the type of fluids and the operating and design conditions. Each piping component is briefly described and a corresponding identification code specified.</p> <p>The following data shall be qualified for each class:</p> <ul style="list-style-type: none"> • Design code • Minimum and maximum service conditions, • Construction material, • Pipe, valves, flanges, gaskets, stud/bolts, fittings, joint materials, with detailed material grade • List of all identification codes, with detailed description (including reference to ANSI, API, ASTM, DIN std, etc.) of the piping components, etc, • Type and description of valves, joints, • Flanges rating/facing, • Usable diameters and piping schedule.

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Document Code	Document Title	Document Description
A2103:	Hydraulic Component Description	<p>Collection of all the information pertaining to the selection criteria for the hydraulic components (pipes, tubing, flexibles, flanges, valves for control, isolation or safety and fittings), used for construction of hydraulic or lubrication network.</p> <p>The following data shall be qualified, as a minimum, and shall cover all item used in the hydraulic network:</p> <ul style="list-style-type: none"> • Design code • Minimum and maximum service conditions, • Construction material, • Pipe, tubing, flexibles, valves, flanges, gaskets, stud/bolts, fittings, joint materials, with detailed material grade • List of all identification codes, with detailed description (including reference to ANSI, API, ASTM, DIN std, etc.) of the components, etc, • Type and description of valves, joints, flexibles • Flanges rating/facing, • Fitting bolting type • Usable diameters and thickness.
A2201:	Structural Steel Calculation Note	<p>Calculation of the structural steel elements. Such calculations shall be developed according to the code and specifications defined on the material requisition.</p> <p>As a minimum, lifting points shall be calculated, considering max weight, sling out-of-plane, shift of Center of Gravity and relevant safety factor from applicable code.</p> <p>For offshore/subsea installed primary structure, fatigue analysis shall be performed by SUPPLIER.</p>
A2202:	Piping Stress Calculation Note	<p>Report of the piping stress analysis, containing as a minimum:</p> <ul style="list-style-type: none"> • Thermal effect (dilatation, contraction) • Wind loads, including Vortex Induced Vibration • Motion/acceleration loads, for offshore and subsea projects <p>For each calculation, SUPPLIER to provide a conclusion.</p>
A2203:	Stack Calculation Note	<p>Required if this information is not shown on doc item A2201.</p> <p>This document shall include the structural and fluid dynamic calculation of stack according to project codes and specifications.</p>
A2204:	Piping Thickness Calculation Note	<p>Piping Thickness Calculation Note, relevant to SUPPLIER Piping Class, shall justify the thickness/schedule of selected piping item for service design pressure and temperature, and project design code.</p> <p>The corrosion allowance shall not be considered for this calculation.</p>
A2301 (*):	Piping Interconnecting Drawing at Battery	<p>This drawing is an isometric drawing of interconnection piping between 2 skid supplied by SUPPLIER, following minimum requirement as per A2005. (*)</p>

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Document Code	Document Title	Document Description
	Limits (Including Nozzle Loads)	This drawing shows the position of all nozzles at battery limits, completed with a table showing the list of said connection with qualification of size/rating/facing/service/allowable forces and moment. (*) Interconnecting piping shall be identified (in drawing and on pipe itself) for easy identification during reinstallation at site. (*) (*): Key Interface Data
A2302:	Not used	
A2303:	Outlet Manifold Drawing	General arrangement drawing of outlet manifold showing: <ul style="list-style-type: none"> • Dimensions, • Location, • Allowable stress on piping connections, • Weight on support.
A2304:	Decoking Lines Layout	A layout drawing showing decoking lines and location of connections with furnace lines with minimum requirement as described in A2301
A2305:	Burner Piping Layout	A layout drawing showing burner piping and details of area close to the burner with minimum requirement as described in A2301
A2401:	Civil Works and Foundation Drawing (with Material List)	This document shows as a minimum: <ul style="list-style-type: none"> • Formwork dimensions • Location and sizes of reinforcement bars • Anchor bolts • Tightening/torqueing forces to be applied on anchors bolts • Steel insert type and location • Bill of quantities.
A2402:	Civil Works and Foundation Calculation Note	<ul style="list-style-type: none"> • Basic data and reference documents used (Project specifications, code) • Computer software references • Elementary loads • Loading and geometric sketch • Loads combinations • Stability checks • Summary results of computer outputs • Computer outputs • Reinforcement sketches • Bill of quantities • Reinforcing ratio • Anchoring details on foundations • Number, diameter, type and location of piles required, if any
A2403:	Not used	

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Document Code	Document Title	Document Description
A2404:	Civil Works / Structural Data Freezing	<p>This information is not a document, but the validation that all civil works /structural and weight Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution, leading to physical modifications after the starting of construction activities.</p> <p>SUPPLIER to submit a front page in VDB when civil works / Structural and weight Key Interface Data are validated.</p>
A2501:	Hydraulic Profile of Basins and Pits	<p>This document shall show the profiles with the elevations of the basins pits and elevation of the pipes (Inlet/Outlet), and internal components, if relevant.</p>
A2601:	Dimensional Data for Piping (DDP)	<p>This document shall contain the dimensional Data to be loaded in the 3D model tool. The table template to be filled/checked by SUPPLIER is attached to the Material Requisition.</p>
A3001 (*):	Instrument's and I/O Lists	<p>List of all supplied instrument including, as a minimum:</p> <ul style="list-style-type: none"> • Tag number, (*) • Instrument Description, • Location, • Service, • Reference to PID, • Reference to data-sheet number, • Manufacturer, • Line number, • Line size, • Reference to Hook-up, • Reference to Loop Wiring Diagram, (*) • Unit, • Range (Process engineering values and corresponding instrument input/output signal values) (*) • Set points of alarm and trip signals (*) • System from / System to (DCS, ESD, FGS, UCP, Vibration Monitoring System, Anti Surge, BMS, etc...) (*) • System I/O type (AI, AO, DI, DO, etc...) (*) • Power Source, (*) • Hazardous area protection mode, • Junction box tag, (*) • Special notes. <p>SUPPLIER shall provide a table filled as per ENGINEER form, based on contractual requirements.</p> <p>(*): Key Interface Data</p>

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Document Code	Document Title	Document Description
A3002:	List of Instrument Cables	<p>List of all instrument and system cables linked to the equipment with the following information, as a minimum:</p> <ul style="list-style-type: none"> • Cable Tag (Numbering to follow format and range allocated by ENGINEER) • Cable type reference (Definition to follow format provided by ENGINEER): <ul style="list-style-type: none"> - Quantity of pairs or cores, - Diameter of pairs or cores - Shielded yes/not, type (overall / individual), - Armored yes/not, type, - IS Yes/No - Fire resistant, Yes/No - Flame retardant, Yes/No - Type of insulation - Color of outer shield, • Supplied by SUPPLIER or by ENGINEER, • Connected From / To, • Routing / Length • Applicable Standard.
A3003:	List of junction boxes, control boxes, cabinets and panels	<p>This document shall clearly identify the various types of JB’s, cabinets and Panels, with tag, following ENGINEER format and allocated range, as a minimum:</p> <ul style="list-style-type: none"> • Number and type of signals (Analog, digitals, Optical fiber, Serial link, ...) • RTD’s and Thermocouples • Vibration monitoring • Intrinsic safety signals • Emergency and control signals
A3004:	Not Used	
A3005:	Not Used	
A3101:	Instrument Data Sheets	<p>SUPPLIER specific information’s will be included in this document, and shall include as a minimum:</p> <ul style="list-style-type: none"> • Instrument tag • Service • Line / Vessel where instrument is installed • Ex area classification and protection • Design condition (min/max) • Measuring and calibrated range • Secondary signals (if any) • Power source and details • Cv (for control valves)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Torqueing values (for actuated valves) • Hook-up details • Manufacturer • Model Number <p>For instruments inside equipment, a completed ENGINEER’s form based on contractual requirement, mainly in compliance with codes prescription.</p>
A3102:	Instrument Calculation Sheets (Valves, Actuators, Safety Devices, Flow Measuring Devices, Thermowells)	SUPPLIER shall provide the calculation performed according to the contractual codes (ISA, ASME, AGA, ANSI....) Valid also for stress vibration calculation (thermowell or probe). The noise calculation of the instrument shall be included in this document
A3103:	Not used	
A3104:	Calculation Sheets of Communication Network and Controllers Load	These documents shall generally be supplied by the system SUPPLIER. They shall be issued in as built status and shall include system screen views showing load ratio and idle time.
A3105:	Calculation Sheets for Intrinsically Safe Loops	<p>The SUPPLIER shall provide these calculations when he supplies field instruments and technical room Equipment. (The multi-pair cables characteristics shall be given to the SUPPLIER by ENGINEER). When the SUPPLIER only supplies field instruments up to local JB’s, SUPPLIER shall provide all information RLC) for each element he supplies, such as:</p> <ul style="list-style-type: none"> • Relays / Barriers model / manufacturer and corresponding Eex-I certificate, • Cable length, • Cable characteristics: <ul style="list-style-type: none"> - DC lineic resistant of conductor at 20°C Ω/km, - Self inductance mH/km, - Capacitance between conductors nF/km.
A3106:	Instrument Calibration/Setting Data Sheets, Calibration Curves, Calibration Procedure	These documents (Sheets and procedure) shall be either the Instrument manufacturer calibration sheets, showing the actual calibration results (Expected value versus actual value) or the SUPPLIER forms if he performs the calibration himself.
A3107:	Not used	

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Document Code	Document Title	Document Description
A3201 (*)	Instrumentation Outline Dimensional Drawing (with Weight Indication) and Cross Sectional Assembly Drawings (Including Electrical Connections)	<p>This document concerns Outline Dimensions of instrumentation and Telecommunication devices.</p> <p>This document shall show, as a minimum:</p> <ul style="list-style-type: none"> • Base plate locations, dimensions and details, anchor bolt locations in relation to the edge of the base plate, (*) • Thickness of elements of the base plate to be tightened by anchor bolts, (*) • Weights (including static & dynamic loads), (*) • Connection points for earthing, (*) • Dismounting/maintenance volume to be kept clear around the instrument, (*) • Special SUPPLIER requirements for foundation design, if any. (*) <p>Drawing provided for each tagged instrument, including the following information as applicable:</p> <ul style="list-style-type: none"> • Manufacturer, • Tag number, • Overall dimensions, (*) • Weight, (*) • Process connection size(s) and ratings, (*) • Inlet and outlet configuration, (*) • Face-to-face dimensions, (*) • Electrical connection size(s), (*) • Instrument mounting details, (*) • Instrument accessories (positioner, hand wheel, air set, etc.). (*) • Schematic connections between the instrument and the accessories (*) • Electrical and air consumption, if not included into A3301 (*) • This document shall show also the terminal block details including wiring and cable connections. (*) <p>SUPPLIER can split these information in several documents/drawings. Example for control valves:</p> <ul style="list-style-type: none"> • one document for boundary dimensions and connections • one document for the internal assembly cross section • one document showing the accessories and their connections <p>Note: The information for this document item are considered Key Interface Data for instrument bulk requisitions and for items supplied loose in equipment requisitions.</p> <p>(*): Key Interface Data</p>
A3202:	Not used	

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Document Code	Document Title	Document Description
A3203:	Not used	
A3204 (*):	Arrangement Drawings for Operator Consoles and Desks, System Cabinets, Control Boxes, Cabinet and Panels	<p>It is the collection of all drawings and schemes relevant to consoles, cabinets and panels.</p> <p>Drawings required as follow:</p> <ul style="list-style-type: none"> • Front of panel layout clearly showing: <ul style="list-style-type: none"> - Overall size, (*) - Layout and weight, with a table of instruments showing duty/label engraving model number, (*) • Back of panel arrangement clearly showing same data as front panel, • Construction drawing showing: <ul style="list-style-type: none"> - Main dimensions, (*) - Hinging/opening of doors, (*) - Door Restraints, (*) - Method of locking, - Plinths, stiffeners, (*) - Hold down details (fully dimensioned), (*) - Anti-vibration methods, (*) - Fixing holes details, (*) - Materials, - Panel finish procedure and colors. • Mimic / annunciator drawing where applicable, • Internal layout of panel showing: <ul style="list-style-type: none"> - Lighting, - Ventilation, - Cable entry and terminal strip locations identified with relevant tag (*) - Wiring trays (*) - Segregation of voltage level, IS and non-IS equipment - Hydraulic, pneumatic layouts (where applicable) - Grounding points. (*) <p>(*): Key Interface Data</p>
A3205:	Not used	
A3206:	Not used	
A3207 (*):	Corrosion Monitoring Outline Dimensional Drawing and Cross-Sectional Assembly Drawing	<p>This document concerns Outline Dimensions for corrosion monitoring and cathodic protection devices.</p> <p>This document shall show, as a minimum:</p> <ul style="list-style-type: none"> • Overall dimensions (*) • Fixation details to adjacent structure, piping or equipment • Tag number • Manufacturer

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> • Weight (*) • Dismounting/maintenance volume to be kept clear around the instrument (*) • Qualification of main materials shall be listed in a dedicated table (*) (*): Key Interface Data
A3301 (*)	Electrical Power Consumption for Instruments, Instrument Air Consumption, Heat Dissipation Data Sheets	This document shall clearly identify: <ul style="list-style-type: none"> • All the utility consumptions (such as instrument air) of the concerned equipment, (*) • Electrical consumption of instruments and details (voltage, AC/DC, ...). (*) • Heat dissipation datasheet shall be provided for panels and cabinets, in order to size/justify the HVAC system. (*) Information may be included as well in A1014 or/and A4001. (*): Key Interface Data
A3302:	Electrical Power Supply for Instruments Distribution Diagram	Schematic diagram - one line diagram with component data for the electrical power to instruments.
A3303:	Interconnection Block Diagrams	This document is an overall view of the equipment or system in terms of: <ul style="list-style-type: none"> • Type and quantity of instruments, • Junction boxes, (as per project signals segregation rules: Analog, Digital, RTD's, Thermocouples, Intrinsic Safety, Emergency, Control, etc...) • Local panels, • Multi-pair cables, • Cabinets and their peripherals (HMIs, printers, data logger...), • Equipment Power supply, • Communication links (with type), • Pneumatic and / or hydraulic connections, • Equipment location (field, shelter, technical rooms), • Battery limits. It is a schematic block diagram showing control signal inter-connections between each discrete item of equipment and the various control panels, cabinets and junction boxes. Cable tag numbers, cable types, Junction boxes and cabinets and panels tag numbers shall be identified on this drawing.
A3304:	Not used	
A3305:	Instrumentation Earthing Diagram	It shall describe instrument, junction boxes and control panels earthing principles and details.

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Document Code	Document Title	Document Description
A3401:	Instrumentation and Control Equipment Manufacturer Documentation	Hardware Design Specification including system architecture diagram
A3402:	Not used	
A3403 (*):	Junction Boxes, Cabinets and Panels Wiring Diagrams	<p>These drawings shall define the detailed connection arrangement of a Junction Box, a Terminal block in a cabinet or panel. Each junction box shall be represented on one sheet with:</p> <ul style="list-style-type: none"> • All incoming single cables from Instruments terminated in terminals 1 to 20 including spares, drain wires, armor earth connection and tags (*) • The multicore cable connected on the other side of the terminals showing the same details. (*) • Cable gland details (material and size). (*) <p>(*): Key Interface Data</p>
A3404:	Instruments, Junction Boxes, Control Boxes, Cabinets and Panel Location Drawings	<p>General arrangement drawing showing the relative position of these items on the equipment. This drawing shall show, as a minimum:</p> <ul style="list-style-type: none"> • Routing of all instrument air distribution, pneumatic tubing from air manifold to instrument/valve • Routing of signal and power supply cables and the identification of the interface point between SUPPLIER and ENGINEER • The location of all instrument junction boxes • The location of all instrument, including fire detection devices, loudspeakers, horns and annunciators. <p>On small equipment, these information can be shown on A2001. As a minimum, location of interfaces between SUPPLIER and ENGINEER shall appear in A2001 document</p>
A3405:	Not used	
A3406:	Instrument Hook-up Drawings	<p>Collection of the hook-up drawings for each instrument, containing as a minimum:</p> <ul style="list-style-type: none"> • Instrument tag • Reference to project typical hook-up • Attachment details with piping or vessel • Tapping orientation • List of the components to be installed and relevant material and size, such as: <ul style="list-style-type: none"> - Isolation valve - Diaphragm - Vent/drain/drip ring - Monoflange/manifold block

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> - Capillary - Bolting and gaskets - Sunshades - Heat tracing - Seal pot - Tubing and fittings • Sloping of tubing • Instrument air manifold details • Actuated valves accessories, such as: <ul style="list-style-type: none"> - Filter - Relief valves - Solenoid - Pressure regulator - Positionner / Limit switch <p>This drawing shall be compliant to project specifications and typical, attached to the requisition, and follow project format..</p>
A3407:	Loop Wiring Diagrams	<p>Diagram showing all details of wiring details, on a loop by loop basis, with termination and inter-connections from primary element to final.</p> <p>It shall include, as a minimum:</p> <ul style="list-style-type: none"> • Numbering of: <ul style="list-style-type: none"> - Primary element, - Individual cables, - Junction boxes, - Multi-pair cables, - Cable cores - Terminals, - I/O cards, - Panels, • Color Coding of wires, • Earthing details, • And locations (field, technical rooms)
A3408:	System Cards I/O Assignment	This document showing on a card-by-card basis the Inputs/Outputs connected to the card terminals.
A3409:	Sampling System Diagram	Hook-up diagram showing the detailed connection arrangement of an analyzer sampling take-off point including material component list.
A3410:	Instrumentation Hardware Data Freezing	This information is not a document, but the validation that all Instrumentation hardware Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution,

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Document Code	Document Title	Document Description
		<p>leading to physical modifications after the starting of construction activities.</p> <p>SUPPLIER to submit a front page in VDB when Instrumentation Hardware Key Interface Data are validated.</p>
A3501 (*):	Control and Safety Systems Description, Operating Principles, Functional Design Specification	<p>1. <u>For P3 Package (When SUPPLIER is providing a complete control panel)</u></p> <p>This document shall cover hardware and software functional aspects. SUPPLIER shall describe hardware control and safety systems equipment characteristics in terms of, but not limited to:</p> <ul style="list-style-type: none"> • Power supply distribution, (*) • Ventilation, • CPU’s, • Cycle time, • I/O cards (galvanic isolation per channel, per 2 channels, IS barriers...) (*) • Communication devices, <p>SUPPLIER shall detail following functionalities:</p> <ul style="list-style-type: none"> • Redundancy, • Time synchronization, • Time stamping, • First fault, communication protocol, • Data storage capacity. <p>SUPPLIER shall describe the system, outlining the function of each logic circuit with relevant inputs actions.</p> <p>This narrative shall describe:</p> <ul style="list-style-type: none"> • Normal start/stop, • Emergency stop, • Local/remote control modes, • Duty/standby modes, • Override and tests modes, • And all the main possible default and start-up modes: i.e.: Power failure, line breakage, • Communication failure, etc... • Each safety automatic action (i.e. trip) with initiating event(s) and final elements, inside or outside SUPPLIER system. (*) • Each alarm shall be described with most likely actions to be performed by operator when alarms happen. <p>Safety aspects shall be clearly segregated from control aspects.</p> <p>2. <u>For P1 and P2 Package (When SUPPLIER is providing instruments connected (or not) to JB, then connected by ENGINEER to a centralized control system)</u></p>

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Document Code	Document Title	Document Description
		<p>SUPPLIER shall describe the system, outlining the function of each logic circuit with relevant inputs actions, in order for ENGINEER to set-up and test the control and safety system.</p> <p>This narrative shall describe:</p> <ul style="list-style-type: none"> • Each control loop: simple (such as temperature transmitter acting on a flow control valve of steam) or complex loops (with multiple initiators/final elements, and/or a calculation, and/or conditional actions) (*) • Local/remote control modes, (*) • Duty/standby modes, including automatic change-over (*) • Soft interlocks (*) • Normal starting and stopping sequences, including, as a minimum: <ul style="list-style-type: none"> - Pre-requisites to initiate the sequence (*) - Over-ride of trips during the sequence, if any (*) - Each step, with condition to validate the step and initiate the next one (*) - Action in case of error during the sequence (cripple mode) and safe state to reach, if relevant,(*) • Emergency stop sequence, (*) • Each safety automatic action (i.e. trip) with initiating event(s) and final elements, (*) • Each alarm shall be described with most likely actions to be performed by operator when alarms happen, • Override and tests modes, (*) • And all the main possible default and start-up modes: i.e.: Power failure, line breakage, (*) • Communication failure, (*) <p>Safety aspects shall be clearly segregated from control aspects. (*): Key Interface Data</p>
A3502:	Not used	
A3503:	Software Specification, Configuration Documentation and Manuals	Program listing, including schemes and / or charts extracted from PLC or controllers (software source files)
A3504:	Not used	
A3505 (*):	Control and Logic Diagrams (Interlock and Safety), Sequence Diagrams,	<p>As per project requirements, this document shall be executed in one or several of the following forms:</p> <ul style="list-style-type: none"> • Logigram (OR and AND gates), (*) • Cause & Effect matrix, (*)

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Document Code	Document Title	Document Description
	Cause and Effect Charts	<ul style="list-style-type: none"> • Grafcet, (*) • Ladder diagram, (*) • Control loops (*) Safety aspects shall be clearly segregated from control aspects. (*): Key Interface Data
A3506:	HMI Graphic Displays (Color Hard Copy), Reports Printout	Custom displays (color hard copy and reports printout)
A3507 (*):	Software Database Exchange Table	For P3 equipment, SUPPLIER shall provide a table filled as per ENGINEER form with list and details of software signals exchanged through communication links. (*) Information about the Fieldbus if required when relevant. (*): Key Interface Data
A3508:	System Architecture Diagram	Overall block diagram showing all control and communication equipment: <ul style="list-style-type: none"> • Control and safety networks, • Serial interfaces, • Communication devices, • PLC, Controllers, • Power supply modules, • I/O boards, • HMIs, • Printers, • Etc...
A3509:	Instrumentation Software Data Freezing	This information is not a document, but the validation that all Instrumentation software Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution, leading to physical modifications after the starting of construction activities. SUPPLIER to submit a front page in VDB when Instrumentation Software Key Interface Data are validated.
A3601:	Instrument and Control Special Cables Definition	Dimension, weight, physical and electrical data of special instrument cables
A3602:	Instrument Cables Drum Schedule	Refer to A3601
A3701:	Noise coverage study	Loudspeaker layout resulting from computations based on supplied noise map, plot plan and specifications. The document shall include 3 bodies as a minimum:

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Document Code	Document Title	Document Description
		1. Methodology and Computation description, 2. Detailed layout, 3. Tagged Loudspeaker list with tapping table, as per required breakdown structure (per unit, module, level, loop ...).
A3702:	SIL Data	SUPPLIER shall provide following information: <ul style="list-style-type: none"> • Calculation of PFD (Probability of Failure on Demand) for SIL (Safety Integrity Level) approval • SIL certificates from instrument manufacturer.
A4001 (*):	Electrical Consumers List Power Supply Requirements (Normal-Emergency-UPS)	This document shall identify any electrical equipment to be fed with its main characteristics: <ul style="list-style-type: none"> • type (*) • operating factor • voltage (*) • rated power (*) • mechanical & electrical absorbed power • type of feeder (DOL, DOLR, VSD, SFS, FDR) • Consumer basic data: <ul style="list-style-type: none"> - brake power (power required by driven machine) - ID/IN Locked rotor current (LRC) to Full load current (FLA) ratio (*) - Load factor , efficiency at load, power factor at load. (*) - Rated current (*) • Consumer power: <ul style="list-style-type: none"> - Active, reactive and apparent power (*) - Operating mode (continuous, intermittent, duty/stand-by) (*) - Duty Factor (ratio of running time of the load) (*) • synchronous speed • power supply requirements (or load classification): <ul style="list-style-type: none"> - Normal (*) - emergency source, (*) - UPS (*) This document shall follow project template, if any, and to be submitted in MS Excel format, in order to be merged with project overall electrical consumer list. (*): Key Interface Data
A4002:	Electrical Cables List	This document shall identify each electrical cable with, as a minimum: <ul style="list-style-type: none"> • its “from” & “to” connection location • rated voltage • Nominal voltage (U₀/U)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> insulation voltage cable specification, with information as per cable datasheet: <ul style="list-style-type: none"> insulation Shield Screen armor and type of armor outer sheath applicable code number of conductors & cross-section Length.
A4003:	Electrical Bill of Materials Supplied as Loose	Bill of Quantities is the supplied quantities of electrical equipment. As a convention, the supplied quantities are considered neat.
A4101 (*):	Data Sheets (Switchgears, Cables, Transformers, etc)	<p>This document shall contain, as a minimum:</p> <ul style="list-style-type: none"> Type Tag (*) design code and standards (*) design condition environmental condition Ex rating (*) Dimensions (Height, Width, Length) (*) Weight Cooling system Input Voltage and frequency, including auxiliary/control (*) Number of phases (*) Power (rated, max, operating) (*) rated short time withstand current (Ik) (*) rated peak withstand current (Ip) (*) rated current (In) (*) Short circuit voltage Ucc (%) (*) neutral configuration system (*) Output Voltage (max and rated, for transformers) (*) Rated voltage ratio (for transformers) (*) Ingress protection (enclosure degree of protection) (*) Connections (*) Cable entry (*) Manufacturer Painting system Noise level

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Document Code	Document Title	Document Description
		A completed ENGINEER or SUPPLIER Form (when ENGINEER form not available) based on contractual requirements. (*): Key Interface Data
A4102 (*)	Electric Motor Data Sheets	<p>This document shall contain, as a minimum:</p> <ul style="list-style-type: none"> • Type (*) • Tag (*) • design code and standard (*) • design and service condition (S1 / S2) • environmental condition • Ex rating for motor and terminal box (gas group, temperature class, zone) (*) • Voltage and frequency (*) • Number of phases, number of poles (*) • Power (rated, max, operating) (*) • Ingress protection of the frame and terminal box (*) • Starting method (*) • Manufacturer and model • Painting system • Representative motor performance curve • Driven machine data <ul style="list-style-type: none"> - Type - Max Shaft power - Driven machine inertia - Brake torque curve / required starting brake torque • Efficiency and power factor at 2/4, 3/4 and 4/4 of load (*) • Locked rotor power factor • Starting current ratio • Rated current / No load current / locked rotor current • Ist/In (*) • Mounting type (Im) (*) • Terminal box (type, position) (*) • Enclosure cooling method (*) • Motor weight (*) • Noise level • Heat dissipation <p>A completed ENGINEER's or SUPPLIER's Form (when ENGINEER's form is not available) based on contractual requirements. (*): Key Interface Data</p>
A4103:	Weights/Centre of	Refer to A4201

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Document Code	Document Title	Document Description
	Gravity Data Sheet	
A4104:	Torque Versus Speed / Current / Power Factor Curves	A curve showing the Torque Versus Speed / Current / Power Factor Curves of the motor.
A4105:	Protective Relay Coordination Study	<p>This study shall fulfill the following goals for the defined scope of work:</p> <ul style="list-style-type: none"> Develop & fix protection and coordination principles (when not already defined). Produce curves showing protection and selectivity are ensured. Check protection function for each type of application (transformer feeder, generator incomer, ..) Study and check the neutral earthing system, Define the protective current and voltage transformers. <p>The aim of this study is to produce programming and settings of corresponding protection relays. This document shall ensure that any electrical faults will be cleared by the protection closest to the fault and in a time delay compatible with the protection of the people and the equipment.</p>
A4106:	Photometric Curves	A drawing to indicate the intensity of light in the facility and its geometrical distribution, for normal/escape/emergency lighting.
A4107:	Loading Performance Curves (Site Conditions)	Loading Performance Curves (Site Conditions) except for LV motors.
A4108:	One Line Diagrams (with Component Data)	This document shall identify each electrical equipment & device (bus-bar, switchgear, circuit breaker, contactor, fuse, protection relay, CT & VT, consumer, transformer, earthing impedance, VSD, capacitor bank, HV or MV motor associated with VSD and transformer, etc.) with its electrical characteristics (voltage & current rating, transformer ratio, short circuit voltage (Ucc %), rated power, neutral connection method, ..), designation (e.g. bus bar 2000A-3p-4w-25kA, 1s) and tag number.
A4109:	Electrical Logic Diagrams	This document shall describe in a grafcet format or equivalent (logigram, etc.) the corresponding function of cable logic and control (electrical)
A4110:	Schematic Diagrams	This document shall show in detail and with necessary self explanatory cross-references all power, control & measurement circuitry and component (including CT's & VT's, relays and contacts, terminal blocks) participating to a given equipment operation.
A4111:	Electrical Calculation	To be used in case when calculation notes are SUPPLIER responsibility

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Document Code	Document Title	Document Description
	Notes	and are not fully detailed.
A4112:	Not used	
A4201 (*):	Electrical Equipment Outline Dimensional Drawings (with Static and Dynamic Loads Indication)	<p>This document shall show:</p> <ul style="list-style-type: none"> • Base plate locations, dimensions and details, anchor bolt locations in relation to the edge of the base plate, (*) • Size of the screw, bearing area, lifting brackets location. • Thickness and size of elements of the base plate to be tightened by anchor bolts. (*) • Weights and center of gravity (including static & dynamic loads). (*) • Connection points for earthing (*) • Special SUPPLIER’s requirements for foundation design, if any. (*) • detail of the top and bottom openings for cable entries (if cable gland, MCT..), (*) • Access to the equipments, with minimum clearance around the electrical equipment for all side (*) • Cut out/ opening for external connections <p>(*): Key Interface Data</p>
A4202:	Corrosion monitoring and Cathodic Protection Layout and Typical Details	<p>This document shall show the localization of each cathodic protection on a general layout (including cable routings), together with its designation (tag) and typical installation details. Refer to A3207 for mounting and wiring details</p>
A4203:	Electrical Tracing Layout and Typical Details	<p>This document shall show location of each piece of electrical tracing equipment (including JB, thermostats and cable routings) together with its designation and typical installation details.</p>
A4204:	Front View and Typical Section Drawings	<p>This document shall show front view and most representative typical section of outline equipment (including main materials) with corresponding tags and dimensions. Minimum room height, and minimum clearance in every direction shall appear in the drawing.</p>
A4205:	Electrical Equipment Name Plate	<p>This document shall show the identification nameplates as per project requirements.</p>
A4206 (*):	Electrical Terminal Box Detail Drawing with Termination Details	<p>This document shall show details of:</p> <ul style="list-style-type: none"> • Equipment terminal box dimensions (*) • Terminations including dimensions and number & type of cable entries. (*) • Cable gland size (*) • Material • Terminal box short circuit withstand current/time (*) • Ingress protection / Protection degree (*)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> Painting system, or finishing details Accessories (anticondensation heater, ...) Drain plug location Compartment location (*) Type of threads (NPT, ...) (*) Gland plate size (*) <p>Spare termination and gland shall be clearly identified in the drawing. (*): Key Interface Data</p>
A4207:	Electric Motor Drawings	<p>This document shall show, as a minimum:</p> <ul style="list-style-type: none"> Outline dimensions of electrical motor Accessories including details, Position of lifting points Weight and center of gravity Position of the inlet and outlet point (for oil, water, ...)
A4208:	Rotor Drawing for Torsional Analysis	<p>This shall be an interface document when rotating equipment is concerned to help torsional analysis development by SUPPLIER of mechanical equipment</p>
A4209:	Electrical Terminal Block Diagrams	<p>This document shall show the function of all terminal block details including constitution and content of corresponding wiring and/or cable connections.</p> <p>Spare termination and gland shall be clearly identified in the drawing. Termination details are covered by A4206.</p>
A4210:	Electrical Consumers Installation Drawings	<p>These documents shall show arrangement of electrical consumers (including cable routing) together with their designation and typical installation details.</p>
A4211:	Electrical Wiring Drawings (Internal and/or Inter-panel)	<p>This document shall show in a condensed format in order to give comprehensive & functional overview of a given equipment:</p> <ul style="list-style-type: none"> All representative power Control & measurement circuitry and components (including tagging & cross-section of inter-panel cables, tagging of exchanged I/O).
A4212:	Electrical multi-cable transit layout and details	<p>This document shall show the location of each MCT, MCT details (frame dimension and the position of each MCT inserts (with spare). This document shall be performed in relation with cable cross section drawings and also electrical equipment layout.</p>
A4213:	Earthing/Lightning Drawings	<p>These documents shall show arrangement & routing of earthing/lightning networks together with typical installation details, details (dimensions, type, ...) of earthing and lightning protection materials and accessories used.</p> <p>This shall contains earthing/lightening details for equipment,</p>

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Document Code	Document Title	Document Description
		structure, piping and E&I).
A4214:	Lighting and small power Drawings	<p>These documents shall cover lighting and small power location layout, and shall show as a minimum:</p> <ul style="list-style-type: none"> • Arrangement of lighting fixtures (including cable routing) together with their designation/tag and type, • main junction boxes • convenience socket • lighting panels • Typical installation details • type of lighting fixture (fluorescent, HPS, with battery backup) • type of mounting (suspended, supported,..), with reference to project standard, if any • Supplying lighting circuit, incl cable tray • Battery details, if required • Nameplate details • load analysis summary per lighting panel • material take off summary <p>Lighting circuit booklets showing distribution of lighting fixtures towards lighting circuits. This drawing shall cover (with clear segregation/identification) the normal, emergency and escape lighting network and associated fixtures.</p>
A4215:	Cable Cross Section Drawings	<p>This document shall identify all electrical cables and main data (rated voltage, insulation voltage, cable specification, number of conductors & cross-section) routing through a given cross section. This drawings shall represent and identify clearly the cable ladder/trays for each level of voltage (HV, LV, control cables,..). This document shall show, the cable ladder tagging and in a table the filling of each ladder with cables tagging & cross section.</p>
A4216:	Bulletins and Catalogues	These documents are manufacturer standard documentation/leaflet of equipment in the scope of work
A4217:	Electrical Cables Description with Terminal Identification	This document shall show all connection and interconnection cables (including tag & cross-section) between given equipment including terminal identification.
A4218:	Transformer/Bus Duct Flange Drawing	This document shall detail the connection interface between transformer/switchgear and bus duct flange including dimensional data.
A4219:	Not used	
A4220:	Not used	

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Document Code	Document Title	Document Description
A4221:	Bus Duct Arrangement Drawing with Supporting Details	This document shall show bus ducts installation with dimensions and weights. Supporting devices of bus ducts shall be identified with the corresponding installation details. This document shall contains at least an isometric view.
A4222:	Not used	
A4223:	Battery Sizing Calculation Note	This document shall describe criteria for battery selection and shall demonstrate correctness of battery sizing towards contractual requirements.
A4224:	Installation Drawing of Battery Racks	This document shall detail installation of battery racks including, as a minimum: <ul style="list-style-type: none"> inter-cells connections, layout battery wiring diagram dimensions, Footprint for racktype weights. Load per insulator,
A4225:	Not used	
A4226:	Not used	
A4227:	Electrical Cable Tray Routing	General arrangement drawing showing the routing of electrical cable trays inside the equipment and the interfaces point with ENGINEER. This drawing shall show, as a minimum: <ul style="list-style-type: none"> Routing of control, power supply and lighting/small power cables and the identification of the interface point between SUPPLIER and ENGINEER (with position, elevation of the tie-ins) Identification of cable tray (tag) The location of all electrical junction boxes The location of all electrical item, such as motors, lighting devices, cubicles, transformers, heat tracing panels. <p>This document shall also include cable routing cross section plan (if any) for better understanding and also to check cable installation (bending radius,..). Depending on contract requirement, cables for control and for power shall be segregated in different cable trays. On small equipment, these information can be shown on A2001.</p>
A4228:	Electrical Cable Schedule	For large, multi-skid or multi-level equipment, where routing of cable from interface point to consumer is not obvious, a cable schedule to be provided, describing the cables at each tray section. The filling rate of the cable tray section shall appear, considering the maximum amount of cable layer, as per contractual requirement. This document is to allow ENGINEER to perform Electrical cable pulling inside SUPPLIER equipment after delivery.

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Document Code	Document Title	Document Description
A4301:	Aircraft Warning System	<p>This document shall describe all data specific to aircraft warning system including, as a minimum:</p> <ul style="list-style-type: none"> • type • manufacturer and model • general layout with control board, JB, lights, cable designation and cross section • voltage • color • fixed/blinking light • control panel • control board block diagram, with front and internal view and cables entries table, • termination details • Ingress protection / degree of protection • Ex rating • weight • dimensions • Material • Painting/coating • fixing details • Nameplate
A4302:	Not used	
A4303:	Table of Data Exchange	<p>This document shall list the various data with type of data to be exchanged between SUPPLIER scope and external system including communication procedure (when applicable).</p> <p>This document shall give all the interface signals (by bus, hardwired) and also a serial data exchange table.</p> <p>This document shall give sufficient details for interfacing SUPPLIER equipment with a third party system (modbus mapping list, IEC 61850, signal,..) (refer also to A4317).</p>
A4304:	Data for Harmonic Analysis	SUPPLIER shall provide current harmonic spectrum data and all relevant information in order to perform a harmonic analysis. This document shall detail all necessary data to conduct a harmonic analysis including harmonic current and phase angle per harmonic rank for equipment generating harmonics.
A4305:	Heat Dissipation and Power Supply Consumption	SUPPLIER shall provide in this document power supply consumption of each equipment (if not already indicated in A4001 consumer list) and a total heat output value per equipment cubicle
A4306:	Data for Stability Study	This document shall detail all necessary data to conduct a stability study including modelling data and transfer schemes for dynamic behavior of all rotating equipment.

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Document Code	Document Title	Document Description
A4307:	Not used	
A4308:	Not used	
A4309:	Not used	
A4310:	Not used	
A4311:	Not used	
A4312:	System Block Diagram	This document will be an overview of the system architecture showing various communication networks and various hardware equipment
A4313:	Functional Analysis	SUPPLIER shall describe all functions covered by system with relevant inputs and actions.
A4314:	I/O List and I/O Cards Assignment List	This document shall list all I/O per type of I/O and shall show on a card by card basis the Inputs/Outputs connected to the card terminals.
A4315:	General MMI Definition	This document shall detail the Man Machine Interface of the system
A4316:	Detailed Views & Mimic Diagrams	This document shall list and describe the various views & mimic diagrams provided by the system
A4317:	System Data Table	This document shall be dedicated specifically to serial link I/O and shall identify their corresponding addressing & mapping.
A4318:	System Description, Installation, Operation & Maintenance	In addition to description of electrical system, its installation, operation & maintenance, this narrative shall also describe all the main possible system fault modes: i.e. Power failure, line breakage, communication failure, etc...
A4319:	Reliability Study	This document shall give reliability figures for the hardware equipment implemented in the given system
A4320:	List of System Hardware Components	This document shall consist in an exhaustive listing of the electrical material for given equipment.
A4321:	Electrical Data Freezing	This information is not a document, but the validation that all Electrical Key Interfaces Data, containing in other documents are complete and frozen. Every change to these data after freezing will have a direct impact on ENGINEER project execution, leading to physical modifications after the starting of construction activities. SUPPLIER to submit a front page in VDB when electrical Key Interface Data are validated.
A5001:	Special Precautions for Handling Prior and During Erection/Installation	This document shall cover for all item lifted separately, including loose parts: <ul style="list-style-type: none"> • Special precautions for handling and erection/installation • Procedure for handling consumable materials at site • Rigging + lifting procedure • Lifting beam/frame arrangement and orientation, if any, and slings and hook point location

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Document Code	Document Title	Document Description
A5002:	Recommendations for Storage and Preservation Prior and After Erection/Installation	<p>This document shall include as a minimum:</p> <ul style="list-style-type: none"> SUPPLIER recommendations for a further two years storage at site under site conditions, specifying, among others: required storage facilities and procedures for maintenance and restoring of protective products and provisions. Frequency and nature of site inspections shall be specified. Special precautions for storage and routine inspection/activities, considering construction site conditions. SUPPLIER instructions and inspection/maintenance procedures after erection/installation up to pre-commissioning, considering only temporary utilities and electrical power. SUPPLIER shall describe the need for utilities (type and quantity) and power in the procedure. SUPPLIER instruction for preservation, after commissioning and before plant start-up, considering utilities are available at this time. All activity that shall be carried out to maintain the warranty of the Goods. <p>This document shall describe all the actions for in accordance with project specifications, attached to the requisition.</p>
A5003:	Not used	
A5004:	Not used	
A5005:	Site Quality Control Plan (QCP)	Site testing procedures and acceptance criteria, including works not in scope of SUPPLIER, such as: foundation, tolerances, piping alignments...
A5006:	List of Consumables for Erection/Installation, Commissioning and Start-up	<p>List of consumables supplied for site welds, List of consumables supplied for execution of PQR and welder’s qualifications, List of raw materials (e.g. pipes, plates) supplied for execution at site of PQR and welder’s qualifications. List of consumables necessary for the performance of the erection/installation, commissioning and Start-up, in particular for handling, transportation, warehousing, prefabrication, erection, testing.</p>
A5007:	List of Spare Parts for Erection/Installation, Commissioning and Start-up	<p>List of spare parts for erection/installation, commissioning and start-up, including gaskets and bolts. SUPPLIER shall complete the form (Excel template or dedicated database/tool depending on the contractual requirements, if any) for the items for which Spares data is required.</p>
A5008:	List of Special Tools and Means for	List of special tools supplied by SUPPLIER for erection/installation and assembly,

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Document Code	Document Title	Document Description
	Erection/Installation and Assembly	Recommended erection/installation/assembly tools/means to be made available by construction ENGINEER.
A5009:	Not used	
A5010:	Procedure for Erection and Installation of the Equipment	<p>Description of erection and installation works to be executed on construction site with reference to engineering drawings.</p> <p>This procedure shall contain as a minimum:</p> <ul style="list-style-type: none"> • Description of the equipment, with a list of equipment or pieces to be installed/erected at site, with indication of dimensions, center of gravity and weights • Bill of materials supplied as loose, to be erected, with weights, for piping, steel structures, instruments, electrical. For each component, SUPPLIER shall indicate the reference drawing/document number and lifting procedure • Description of precautions to be taken (HSE risks) • Overall sequence of erection and installation, using series of sketches • Detailed sequence & methodology of erection for specific items identified as critical, including as a minimum: <ul style="list-style-type: none"> - Assembly, with tolerances/acceptance criteria - Leveling, with tolerances/acceptance criteria - Welding / NDE - Alignment of rotating parts, with tolerances/acceptance criteria • Sequence and details of cable pulling activity (for the part done by ENGINEER inside SUPPLIER equipment) • Exhaustive reference and consistency to Tag register. • Main findings summary of constructability reviews (if applicable). First issue of this document shall be issued before the constructability review meeting. • List and description of tools needed • Detailed schedule of activities: <ul style="list-style-type: none"> - Proposed detailed erection schedule including assumptions taken into account, - Recommended SUPPLIER supervision at site with qualification and duration, - SUPPLIER representative job ticket description <p>This shall cover each loose parts to be installed.</p>
A5011:	Not used	
A5012:	Not used	

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Document Code	Document Title	Document Description
A5013:	Welding Procedure Specification for Field Welds	See B1304 for requirements
A5014:	Procedure of Preparation of Equipment for Commissioning	<p>Requirements for site tests, checks, examinations, inspections, and pre-commissioning operations Pre-commissioning operations shall state in a non-ambiguous way:</p> <ul style="list-style-type: none"> • Equipment cleaning and flushing, • Piping cleaning and flushing, • Pressure testing, • Leak testing, • Water circulation, • Chemical cleaning (where and procedure), • Requirements for sentinel hole drilling if any, • Steam blowing (where and procedure), • Air blow (where and procedure), • Safety valve setting, • Oil flushing for machinery, • Procedures for preparation of equipment for commissioning (including calibration of instruments), • Electrical and instrument equipment test, • Cold running test for compressors, • Cold running test for machinery, • All such other typical items that SUPPLIER considers necessary for pre-commissioning, • Quality Control Forms
A5015:	Installation, Start-up and Commissioning Manuals	<p>Requirements for site tests, checks, examinations, inspections, commissioning operations. Commissioning operations shall state in a non-ambiguous way:</p> <ul style="list-style-type: none"> • Leak testing, • Water circulation, • Dry-out procedures for stack, furnaces, refractory, • Cool down procedure for cryogenic tanks, • Safety valve setting, • Oil flushing for machinery, • Fuel system blow-out, • Electrical equipment test, • Catalyst, adsorbent, resin loading and unloading procedure, • Hot running test for compressors, • Hot running test for machinery, • Hot bolting and hot alignment procedures for compressors and machinery,

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> All such other typical items that SUPPLIER considers necessary for commissioning, Process performance validation, when possible Quality Control Forms
A5016:	Maintenance procedure	<p>A data-sheet or a narrative document, describing all preventive and corrective maintenance required for the equipment, including the nature of maintenance (instrumentation, lubrication, mechanical), actions (surveillance, shaft rotation, data collection, cleaning, replacing damaged element...) and frequency (daily, weekly, monthly, yearly, unplanned).</p> <p>The needed tools and steps to dismantle/replace and put back the equipment into service shall be described.</p>
A5017:	Trouble Shooting Check List and Diagrams	<p>This document shall indicate what the typical problems of the equipment are, and their solution(s) and operation action to be done, based on SUPPLIER experience and know-how.</p> <p>This document shall not explain the normal equipment control operation, but what happen in case of failure in control, process upset or unexpected event, such as lost of utility, contamination of inlet fluid or internal leakage (i.e. lube oil), spare part or consumable/catalyst to be replaced.</p>
A5018:	Not used	
A5019:	Procedure for Test-run	<p>This document shall describe the procedure to be applied to perform the test run and process performance validation in field. As a minimum, the following indications shall be given:</p> <ul style="list-style-type: none"> Sequence of operation for preparation to test run, Conditions relevant to up-stream and downstream systems to start the test run, Minimum warning-up time, Duration of continuous and stable operation of the unit before starting the test run, Parameters to keep under control with acceptable figures and tolerances, with check list Duration of test run, Type of analysis to be carried out on incoming product with criteria of acceptability and frequency of check/sampling, Indication of points for checking/sampling of incoming and outgoing products, Process parameters subject to performance guarantees, Frequency of measurements,

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> System for measurements (on line instruments/special instruments/laboratory tests/laboratory testing equipment/laboratory testing procedure or codes), Requested accuracy of instruments, Reference parameters and acceptability tolerances.
A5020:	List of Special Tools for Maintenance	The list shall indicate those tools necessary for removing equipment from transport at site, plus those necessary for installation and maintenance equipment. Against each entry, a brief description shall be given and where necessary for clarify, a drawing shall be provided. Standard tools needed for maintenance of SUPPLIER equipment shall also be described, even if not supplied by SUPPLIER.
A5021:	Not used	
A5022:	Not used	
A5023:	Constructability Study	Document explaining how the equipment will be built in SUPPLIER workshop and demonstrating the feasibility of the construction. It shall be detailed enough to allow planning and costs estimation. It includes at least: <ul style="list-style-type: none"> sketches showing the construction sequence description of means which will be used to carry out the construction (machines, tools, lifting facilities, fabrication stands and/or aids, etc) expected difficulties linked to the construction and proposed mitigation
A5024:	Technical Deviations Requests List	List of approved technical deviations, alterations or exceptions from specifications. No submittal required in VDB except if specific request is made by requisition engineer. Note: issuance of individual Deviation Requests before PO and during project execution shall follow the adequate Project Procedure.
A5025:	Operating Instructions according to Local Regulation	As endorsed by Project local laws (including but not limited to PED 97/23/CE, ATEX 94/4/CE, Machinery Directive 2006/42/EC, Electromagnetic Compatibility Directive 89/336/EEC, IEC requirements, NORSOK requirements, GOST, API)
A5026:	List of spare parts for Two years operation	List of spare parts for Two years for operation (planned maintenance and consumables) and to ensure the reliable operation in case of

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		equipment failure. SUPPLIER shall complete the form, (MS Excel template or dedicated database/tool depending on the contractual requirements, if any) for the items for which Spares data is required. The list shall cover and segregate operation spares from insurance spares.
A5027:	Operating procedure	This document shall provide guidance to the operator for a good and reliable operation the equipment, including all safety aspects. It shall describe, as a minimum: <ul style="list-style-type: none"> • Cold start-up procedure (from preservation state) • Start-up after equipment trip or shut-down • Check-list of routine and periodic activity to be performed during equipment operation • Shut-down procedure • Procedure for long stop and adequate preservation It shall describe the transient conditions, i.e. change of equipment from duty to stand-by, and vice-versa, addition of a membrane bank in operation, batch operation, cleaning in place, periodic activities (desaturation, regeneration), refilling of consumables/catalysts. Field and remote activities (from control room) shall be described. Maintenance activities shall be described if not described in A5016 document.
A6001:	HSE Plan	The HSE Plan shall describe the Health, Safety, and Environment Management System (HSE MS), and the related responsibilities, with respect to the work scope. It shall state the policy, strategy, and methodology to be used in the management of HSE Management System. This HSE plan shall satisfy all requirements described in project specifications.
A6002:	Human Factor Engineering (HFE) Checklist	This checklist shall be filled using ENGINEER template. Purpose of this checklist is to validate that all aspects of operator accessibility and maintenance during operation, planned and unplanned maintenance are well covered in equipment design and are following project requirement.
A6003:	Escape Route Drawing	This document shall show escape route, restricted safety access route positioning etc..., if not included in A2001
A6004:	Vent list to safe location	This document shall describe the following information for each vent to safe location (local or remote), in order for ENGINEER to calculate the exclusion volume around safe location exhausts: <ul style="list-style-type: none"> • Vent Line • Reference to PID

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> Flow (maximum, normal, start-up) Composition of the fluid: <ul style="list-style-type: none"> Hydrocarbon content (and nature of the hydrocarbon compound) Oxygen content Toxic product content Dust/ Particle content Temperature Release orientation (vertical/horizontal) Dimension of the piping/exhaust point at vent location
B SERIE - QCS AND SOME FABRICATION DOCUMENTS (INSPECTION)		
B1001:	Job Quality Assurance Plan	<p>A document which sets out the specific quality practices, resources and sequence of activities for the described scope of work. It shall:</p> <ul style="list-style-type: none"> Identify all technical and quality requirements and how they will be satisfied, Identify all quality activities relevant to the work as well as the associated procedures to control these activities, Include all inspection and test plans, Define all interfaces between Client, ENGINEER, SUPPLIER, sub-SUPPLIERS, and third parties such as certifying authorities, Identify the quality system requirements to be placed on ENGINEER, SUPPLIER and sub-SUPPLIERS thereof, Make reference to applicable procedures and manuals, give organization details and identify the quality related responsibilities of named holders of key positions.
B1002:	Fabrication Quality Control Plan	<p>A document which sets out the planned sequence of checks/controls/tests applicable to the item at various steps of fabrication.</p> <p>For each planned control, SUPPLIER shall set out the relevant applicable procedure/work instruction/code or standard, the acceptance criteria or reference values, associated Quality Control Records to be issued by SUPPLIER and the extend of attendance by SUPPLIER, ENGINEER, Client and/or 3rd Party Agency, according to the requirement of the Inspection and Test Plan (ITP) attached to the material requisition.</p> <p>This document is applicable for SUPPLIER fabrication activity and any sub-contracted fabrication activity.</p>
B1002A:	Painting Quality Control Plan	<p>A document which sets out the planned sequence of checks/controls/tests applicable to the item at various steps of</p>

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		<p>painting/coating activities.</p> <p>For each planned control, SUPPLIER shall set out the relevant applicable procedure/work instruction/code or standard, the acceptance criteria or reference values, associated Quality Control Records to be issued by SUPPLIER and the extend of attendance by SUPPLIER, ENGINEER, Client and/or 3rd Party Agency, according to the requirement of the Inspection and Test Plan (ITP) and painting/coating specifications attached to the material requisition. This document is applicable for SUPPLIER painting/coating activity and any sub-contracted painting/coating activity.</p>
B1003:	Index of SUPPLIER Manufacturing Data Book	<p>Summary of SUPPLIER Manufacturing Data-Book, following project template and format.</p> <p>This document shall contains the front page of SUPPLIER Manufacturing Data-Book and all sections and sub-sections of SUPPLIER Manufacturing Data-Book, with reference of the documents inserted in each section (with project document reference) covering the content of VMDB (B1004).</p> <p>For complex equipment with equipment composed with part provided by different sub-suppliers, the sub-sections shall be split between different sub-supplier activities.</p>
B1004:	SUPPLIER Manufacturing Data Book	<p>This document shall be in accordance with the relevant specification(s) applicable for the project and joined to the requisition.</p> <p>This data-book is composed of applicable manufacturing and test records, reviewed or witnessed by Inspector, such as, but not limited to:</p> <ul style="list-style-type: none"> • Certificate of compliance • Release notes • Approved Technical deviations • Material certificates • Testing procedures, with ENGINEER stamp in code 3 • Repair procedures, with ENGINEER stamp in code 3 • Operator/inspection qualification • Weld records • Non-Destructive Tests records • Pressure tests records • Load tests records • Painting records • QCP with steps signed during fabrication • Test reports

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		<ul style="list-style-type: none"> • Calibration certificates • Weight certificates • Ex compliance certificates • Non-compliance Reports, in closed status • Supplier punch-list, with the status at delivery time • Installation procedures <p>The document shall be submitted in electronic format and in paper copy, as requested in the specification.</p>
B1101:	Not used	
B1102:	IFAT (Integrated Factory Acceptance Test) Report	<p>The IFAT shall demonstrate the correct integration and operation of the system (intelligent equipment, PLC, PC ...) supplied by the SUPPLIER with the Control System to which it is interfaced (supplied by others) for P2 equipment, or the correct operation of the control system provided by SUPPLIER (for P3 equipment).</p> <p>The test shall not be limited to the validation of the interface and the exchange table but shall also cover all data display, all operator commands and all sequences implemented in the control system.</p> <p>The test shall also cover the following aspects:</p> <ul style="list-style-type: none"> • Safety and control aspects, including soft interlocking and over-riding of trips • Alarm generation and reset, and impacts on sequences, if any • Restoration of the link after failure to ensure that no spurious actions are generated when the link is restored • Redundancy of the link if implemented • Any specific requirement that has been specified. <p>Document reviewed and signed by Inspector during logic and control testing and included in SUPPLIER Manufacturing Data-Book (B1004). No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1103:	Testing and Control Procedures	<p>Procedures for workshop testing shall include the following:</p> <ul style="list-style-type: none"> • Safety aspect/instruction to be observed during the test • Purpose of the test, • Written description of test set-up, • Definition of all equipment to be used for testing, • Description of the method of testing, readings to be taken and instruments to be used, • Acceptance criteria for the test, • Full description of the method of calculating the results and their accuracy. <p>These procedures may include test and control related to fabrication, dimensional and quantity.</p>

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Document Code	Document Title	Document Description
B1104:	Factory Acceptance Tests Procedure (FAT)	<p>This procedure includes functional tests of complete system (hardware and software), and interfaces checked carried out in the SUPPLIER factory to demonstrate the equipment suitability to fulfill the duty specified.</p> <p>The procedure is developed by SUPPLIER based on requirements specified in job specifications, attached to the requisition.</p>
B1105:	Test and Control Report	<p>These reports are the quality records of test and control performed according to following procedures:</p> <ul style="list-style-type: none"> • B1103 • B1104 • B1201 • B1202 • B2003 <p>These reports are reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004).</p> <p>No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1106:	Site Acceptance Tests Procedure (SAT)	<p>Procedures required proving on site pre-commissioning, commissioning complete or run-test prior handover.</p> <p>Procedure shall contain as a minimum:</p> <ul style="list-style-type: none"> • Cover safety aspect/instruction to be observed during the test, and pre-requisite to ensure safe operation during the SAT • Define order of sequential tests • Utility needs for the tests • Temporary devices to be installed • Description of the method of testing, readings to be taken, operator follow-up during the test and instruments to be used, • Provide acceptance criteria of the test, and check-sheet/record form • Full description of the method of calculating the results and their accuracy.
B1107:	Hydraulic, pneumatic and leak test procedure	<p>Procedures for workshop testing shall include the following:</p> <ul style="list-style-type: none"> • Safety requirements to be observed during the tests • Verification required prior to the tests, with check list and acceptance criteria • Hydrotest procedure, including as a minimum <ul style="list-style-type: none"> - test pressure - holding time - acceptance criteria - water quality to be used

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INSTRUCTIONS TO VENDOR ON DOCUMENTS REQUIREMENT	Project No. 077154C001	Documente No. 077154C-000-PP-272	Rev. No. A	Page 87 of 95



Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> - drainage and drying procedure after the test • Pneumatic test • Leak test (including vacuum holding test when operating pressure is below atmospheric pressure)
B1108:	Hardness and PMI procedure	<p>Procedures for workshop testing shall include the following:</p> <ul style="list-style-type: none"> • Positive Material Identification procedure, including as a minimum <ul style="list-style-type: none"> - measurement methodology - acceptance criteria - template for PMI report - Hardness testing, including as a minimum <ul style="list-style-type: none"> - measurement methodology and localisation - acceptance criteria - template for hardness report <p>procedure for any other test to be done during the fabrication, as requested by contract or code/standard, with acceptance criteria</p>
B1201:	PWHT Procedure	<p>Detailed SUPPLIER’s procedure to perform Post-Weld Heat Treatment (PWHT) including:</p> <ul style="list-style-type: none"> • Drawing number, diameters, thickness, materials, • Heat soak and cooling parameters, temperature ranges, type of heat source, e.g. Furnaces or electric resistance heaters, temperature control procedures, • Number & spacing of thermocouples, type of thermocouple & cable, method of attachment & Removal, • Protection of machined surfaces, • Indication of NDT (PT and/or MT) upon removal of thermocouples, • Equipment calibration, • Furnace dimensions and control volume • Production tests where appropriate
B1202:	NDT Procedure	<p>SUPPLIER shall provide detailed technique sheets for Non-Destructive Tests (NDT) with procedure and cross reference with Weld Map NDT test can be, depending on contract requirements:</p> <ul style="list-style-type: none"> - Penetrant test (PT) - Visual Test (VT) - Magnetic Test (MT) - Eddy Current Test (ET) - Radiographic Test (RT)

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> - Ultrasonic Test (UT) - Phased Array (PA) - Time of Fly Diffraction (TOCD) <p>When extent of NDT is not specified in the welding map of the welding book (i.e. bulk, piping components, equipment), frequency of each type of NDT to be stated in the NDT procedure.</p> <p>Acceptance criteria and reference to the applicable code/standard to be clearly stated in the procedure.</p> <p>Digital RT procedure shall be issued as a stand-alone document</p>
B1203:	Material Specification for Main Sub-orders	<p>Technical specifications issued by SUPPLIER to their raw material, including welding consumables, equipment or service (such as fabrication, inspection) sub Suppliers to describe technically the procurement of main raw materials (head, plate, forging...), equipment or service.</p> <p>These specifications must clearly identify project requirements applicable to the supply.</p> <p>Material specification are mandatory in the case that ordered material are not strictly standard market grade without any additional requirement.</p>
B1204:	Welders Qualification Certificates	<p>Document reviewed and signed by Inspector according to WPS/PQR (B1304) in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004).</p> <p>No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1205:	Not used	
B1206:	NDT Operators Certificates	<p>Document reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004).</p> <p>No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1207:	NDT Record Certificates for Location of Sketches of Radiographs and others NDT	<p>Document reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004).</p> <p>No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1208:	Not used	
B1209:	Hydraulic and Others Shop Tests Records	<p>Document reviewed and signed by Inspector in SUPPLIER workshop according to hydraulic test procedure (B1107) and included in SUPPLIER Manufacturing Data-Book (B1004).</p> <p>No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1210:	Material Certificates	Certificate types are as follows:

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> ISO/EN 10204 Material Test Certificate (i.e. Type 2.1, 2.2, 3.1 or 3.2), NACE Certificate of conformance, Material Traceability Records. <p>Document reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004). No submittal required in VDB except if specific request is made by requisition engineer.</p>
B1211:	Heat Treatment Records Certificates	Document reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004). No submittal required in VDB except if specific request is made by requisition engineer.
B1212:	Not used	
B1213:	Not used	
B1214:	Not used	
B1215:	Not used	
B1216:	Not used	
B1217:	Not used	
B1218:	Not used	
B1219:	Declaration of Conformity according to Regulation	As endorsed by Project local laws (including but not limited to PED 2014/68/UE, ATEX 94/4/CE, Machinery Directive 2006/42/EC, Electromagnetic Compatibility Directive 89/336/EEC, IEC requirements, NORSOK requirements, GOST, API)
B1220:	Operating Instructions according to Regulation	As endorsed by Project local laws (including but not limited to PED 2014/68/UE, ATEX 94/4/CE, Machinery Directive 2006/42/EC, Electromagnetic Compatibility Directive 89/336/EEC, IEC requirements, NORSOK requirements, GOST, API)
B1221:	Material Safety Data Sheet	Document issued by SUPPLIER in connection with any hazardous product included in the manufactured goods, describing: <ul style="list-style-type: none"> Product identification and composition Handling ,storage as well as HSE measures such as physical ,chemical ,toxicological ,ecological properties Transportation information as per UN regulations and Classes Any other regulatory Information of project final location and construction site countries. <p>The Material Safety data-Sheet (MSDS) shall be in project language, and construction site language, if different.</p>
B1222:	Not used	
B1223:	Ex Certificates	As per European Directive ATEX, IEC regulation, or equivalent, as applicable to the project. Including the information to provide for the calculation of intrinsic

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Document Code	Document Title	Document Description
		safety loops.
B1224:	PED Certificates	Declaration of conformity to PED (Refer to Pressure Equipment Directive)
B1225:	Torqueing Records	Document showing the torque or tension applied on bolts during assembly in SUPPLIER workshop. The document shall identify the piping flange, equipment bolts or structural joints where torqueing values have been applied. Document reviewed and signed by Inspector, in accordance with Torqueing and Tightening Specification (A1202) in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004). No submittal required in VDB except if specific request is made by requisition engineer.
B1226:	PMI, hardness reports	Report showing the application of B1108 procedure during manufacturing Document reviewed and signed by Inspector in SUPPLIER workshop and included in SUPPLIER Manufacturing Data-Book (B1004). No submittal required in VDB except if specific request is made by requisition engineer.
B1230:	Not used	
B1301:	Not used	
B1302:	Not used	
B1303:	Not used	
B1304:	Welding Book (Welding Map, Welding Procedure Specification, Procedure Qualification Report)	<ol style="list-style-type: none"> Welding map Document showing on an equipment schematic sketch the position of all different typologies of welds to be performed. A table shall indicate, for each weld position, the applicable Welding Procedure Specification, the Procedure Qualification Record, then extent relevant to: <ul style="list-style-type: none"> Non destructive examination, Impact test, Coupons, Post weld heat treatment. Welding procedure specification SUPPLIER shall provide all shop and repair welding procedure specification (WPS) together with cross Referenced Weld Maps in accordance with the ENGINEER’s requirements. WPS shall be cross referenced to the applicable weld procedure qualification record (PQR). WPS shall be written on the ASME form or format required by fabrication code, unless ENGINEER agreement.

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Document Code	Document Title	Document Description
		<p>3. Procedure qualification report This procedure shall describe the parameters used in qualification of weld procedure specifications (WPS) together with mechanical testing and result in accordance with the ENGINEER’s requirements. PQR test records are to be cross referenced to the WPS and, when applicable, stamped by the third party inspection authority. PQR shall be written on the ASME form or format required by fabrication code, unless ENGINEER agreement.</p> <p>The complete supporting PQR package (including non-destructive and destructive test reports) shall be available for ENGINEER review and included in this document upon request.</p>
B2000:	Dispatch Dossier	<p>This document shall be in accordance with the relevant specification(s) applicable for the project and joined to the requisition.</p> <p>This data-book is composed of shipping documents and shall be submitted in electronic format and in paper copy, as requested in the specification.</p>
B2000A:	Index of Dispatch Dossier	<p>Summary of Dispatch Dossier, following project template and format. This document shall contains the front page of the Dispatch Dossier and all sections and sub-sections of dispatch dossier, with reference of the documents inserted in each section (with project document reference).</p>
B2003:	Manufacturing Procedures	<p>Any additional procedures linked with manufacturing but not covered by B1103, B1104, B1201 and B1202.</p>
C SERIE - QCS DOCUMENTS		
C1001:	Engineering, Procurement, Manufacturing, Testing and Traffic Schedule	<p>This schedule (level 2), containing all main activities, covers all project phases by group of activities in each discipline. For its preparation, it is necessary to define:</p> <ul style="list-style-type: none"> • The main milestones necessary to reach the contractual objectives, • The main interfaces between the groups of tasks in each discipline, • The duration of each main step of the engineering, the procurement, the manufacturing, the testing and traffic, • The identified critical path. <p>The schedule shall cover all fabrication steps for subcontracted activities, and the interfaces between different subENGINEER activities, if relevant</p>
C1002:	Progress Report	<p>Weekly and/or monthly progress report (as per purchase order attachment) for all material, including piping & gaskets.</p>

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Document Code	Document Title	Document Description
C1003:	Sub-SUPPLIER's and Suppliers' List	List of sub-suppliers in charge of supplying raw materials or parts (including coating or painting) to be incorporated into the SUPPLY, the SUPPLIER shall provide ENGINEER with the list of its subENGINEERs and/or sub-suppliers, with an indication of the places of execution.
C1004:	SUPPLIER's Procurement Status	included in C1002
C1005:	Unpriced Copy of Sub-Orders	As soon as sub-orders are placed as defined by C1003 with associated acknowledgment.
C1006:	Project Organization Chart	Chart showing the main persons in charge of the PO in SUPPLIER organization, such as: <ul style="list-style-type: none"> • Project manager • Quality manager • HSE manager • Fabrication manager • Engineering manager • Document control manager • Traffic manager This document shall describe the role, the responsibilities and the tasks assigned to key members of the Project,
C1007:	Not used	
C1008:	Not used	
C1009:	Not used	
C1010:	Not used	
C1011:	Not used	
C1012:	Not used	
C1013:	Not Used	
C1013A:	Not Used	
C1014:	Not used	
C1015:	SUPPLIER Execution Plan	This document describes the strategy for Purchase Order execution; its purpose is to focus on the project objectives and the means to be put in place during each main phase of the Purchase Order (Engineering, Procurement, Test and Fabrication) to achieve them. This document shall be written taking into account project QHSES policies, and shall contain as a minimum: <ul style="list-style-type: none"> • Purchase Order execution objectives • HSE objective and management

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Document Code	Document Title	Document Description
		<ul style="list-style-type: none"> Description of the Scope of Work and strategy of Order execution, in terms of: <ul style="list-style-type: none"> Engineering deliverables Material supply (incl. procurement strategy) Manufacturing Preservation and shipment Quality control and inspection strategy, especially for out-sourced items Third Party validation/classification/certification of the design and the manufacturing SUPPLIER organization chart for Order execution A monthly man hours planning chart for the management of documentation submission in line with the SR part II requirements, including: <ul style="list-style-type: none"> Engineering Third party review Translation requirements if any Document used internally during construction Fabrication Quality and Control Plan document Final Documentation <p>CONSULTANT’s intention is to anticipate that SUPPLIER is properly planning the right resources for documentation management; this is to avoid excessive delays in SUPPLIER documentation close-out.</p> <ul style="list-style-type: none"> Progress measurement and reporting
C1016:	Not used	
C1017:	Not used	
SHIPPING DOCUMENTATION		
TR 001	Shipping Documents for Transport Services ITB	For details reference to be made to Project Documents: 077625-C00-JSM-0000-0602 INT-TP - Packing Marking Shipping Instructions 077625-C00-JSM-0000-0607 INT-TP - Prescriptions for Preparation of Documentation Packages for Transport Services
TR 002	Shipping Documents for Transport Services Booking	For details reference to be made to Project Documents: 077625-C00-JSM-0000-0602 INT-TP - Packing Marking Shipping Instructions 077625-C00-JSM-0000-0607 INT-TP - Prescriptions for Preparation of Documentation Packages for Transport Services
TR 003	Shipping Documents for Transport Services Execution:	For details reference to be made to Project Documents: 077625-C00-JSM-0000-0602 INT-TP - Packing Marking Shipping Instructions 077625-C00-JSM-0000-0607 INT-TP - Prescriptions for Preparation of Documentation Packages for Transport Services

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13. ANNEX 3 – VENDOR DOCUMENT COVER SHEET





077154C-000-PP-0272				
	Vendor Document Cover Sheet			
PROJECT TITLE:				
VENDOR NAME:				
DOCUMENT TITLE:				
VENDOR DOCUMENT NO:				
VENDOR REVISION NO:				
VENDOR DOCUMENT REVIEW FEEDBACK				
Permission to proceed does not constitute acceptance or approval of Design Detail, Calculation, Analysis. Test Methods of Materials developed OR selected by Vendor and does NOT relieve Vendor from FULL compliance with Contractual Obligations				
Discipline:				
Equipment No:				
MR Number:	0 7 7 1 5 4 C - 0 0 0 - M R - A A A A - B B B			
DOCUMENT NO:	MRP No	CATEGORY	Seq No	Rev No
	0 7 7 4 5 4 C - 0 0 0 - S R	A 0 0 0 1	0 0 0 1	0
Page 1 of 1				

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VENDOR FINAL DOCUMENTATION PROCEDURE

			 Written By Rashok 2021.03.23 17:52:07 +05'30'	 Checked by Vidyasagar Dopati 2021.03.24 12:47:46 +05'30'	 Approved By Vidyasagar Dopati 2021.03.24 17:48:08 +05'30'	 Approved By Ganeshji P. Som Sarika 2021.03.25 08:00:02 +05'30'
A	20.03.2021	ISSUED FOR IMPLEMENTATION	KA	RS	VSD	PSSG
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. **INTRODUCTION:**



INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 9th April 2018 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for BDEP preparation for Open Art units, FEED & DFR preparation, Detailed Engineering, Procurement & Expediting services, Tendering & Award of LSTK contracts, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for capacity expansion (From 13.7 to 18 MMTPA) of Gujarat Refinery in Vadodara, Gujarat, India.

However, after completion of PMC-1 services covering Detailed Feasibility Report and + 10% cost estimate, due to the Fuel demand forecasts and to meet the increased demand for petrochemicals, IOCL decided to change the process configuration envisaged under “J18 Capacity expansion Project” and included some additional units and accordingly made its Financial Investment Decision in September 2020. IOCL after the change in the configuration of original J18 has renamed the project to “**Petrochemical and Lube Integration Project “LuPech” (J18)**”.

2. **DEFINITIONS AND ACTONYMS:**

2.1 Wherever used in this procedure, the following words shall have the meaning as given hereunder

OWNER or IOC or IOCL	INDIAN OIL CORPORATION LIMITED
PMC or CONSULTANT	TECHNIP INDIA LIMITED
CONTRACTOR	The bidder selected by the OWNER for performing the scope of works specified in the bid documents.
AUTHORISED REPRESENTATIVE	OWNER’s/CONSULTANT’s representative authorized to act for and on behalf of OWNER/CONSULTANT, as the case may be
VENDOR	Any third party selected by either the OWNER or CONSULTANT for supplying any of the equipment/materials for the Unit specified in the bid documents.
PROJECT	Petrochemical and Lube Integration Project “LuPech” (J18)
UNIT	The totality of the units and facilities comprised in the Scope of work, which forms a distinct operating system

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3. PURPOSE:

The purpose of this document is to specify the format, content and structure of the Vendor Final Documentation, for the Petrochemical and Lube Integration Project “LuPech” (J18)

This concerns the Vendor Data Books (VDB), Manufacturing Data/Record Books (MDRB) and corresponding electronic version on DVD/CD-ROM.



4. REFERENCE DOCUMENTS

SI. No.	Document Title	Document Reference
1	IOCL Tender Document	RHQCC17071
2	IOCL's Fax of Award-1	RHQCC17071/FOA-1/18-19/06
3	IOCL's Contract	KK/RHQCC17071-1/AGT/201802019
4	IOCL's Fax of Award-3	RHQCC17071/FOA-3/18-19/06
5	List of Project procedures	077154C-000-PP-011
6	Project Organization Chart	077154C-000-PP-013
7	Project Coordination procedure	077154C-000-PP-014
8	Project ISMS Plan	077154C-000-PP-016
9	Document Control Identification and numbering procedure	077154C-000-PP-071
10	Document Management and Control procedure	077154C-000-PP-072
11	Vendor Document Management Procedure	077154C-000-PP-271
12	Instructions to Vendor on Documents Requirement	077154C-000-PP-272
13	Electronic Communication Procedure for Vendor Documents	077154C-000-PP-273
13	Vendor Final Documentation Procedure	077154C-000-PP-274
14	LSTK Contractor Document Management and Control Procedure	077154C-000-PP-275

5. RESPONSIBILITY

The VENDOR agrees to deliver the VENDOR Final Documentation, MDRB and data as defined in the Purchase Order and/or as required in the SR Scope of Supply part II. VENDOR is responsible for compiling and checking the quality of all the files in accordance with requirements before sending to the CONSULATANT/PMC/OWNER.

All the information delivered on electronic and paper format **shall be readable**.

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6. GENERAL INFORMATION

The final documentation shall be produced and provided to CONSULATANT for acceptance, as soon as possible as per dates specified in the SR and the ORDER.

One Final Documentation dossier per ORDER shall be provided by VENDOR to CONSULATANT and it shall contain sections as mentioned in section 8 of this document.

If additional documentation is required by VENDOR to produce the work specified in this procedure, VENDOR shall inform CONSULATANT in due time.

Any discrepancy between the following procedure and other documents shall be notified to CONSULATANT prior to the submission of any Final Documentation.

Final Documentation documents shall reflect the final status of the documents:

- Latest revision – Issued for Construction/ or As Built with the approval VDB code 3

All documents shall be submitted unprotected.

7. PRESENTATION OF FINAL DOCUMENTATION

VENDOR will furnish reproducible and electronic files of all the documents, certified as “As-Built Issue” / or “As Delivered”.

7.1 AS BUILT DRAWINGS



VENDOR shall furnish six (6) paper copies of technical documents. Software's and Hardware's reproducible for final drawings, CDs shall also be furnished along with above 6 copies for:

1. Final Drawings
2. Preservation Instructions
3. Operation and Maintenance Manuals
4. Test Certificates
5. Spare Parts Catalogues

7.2 AS BUILT REVISIONS

As-built/As Delivered revisions are to be provided for the following type drawings:

1. Plot Plan
2. P & ID's including utility diagrams
3. Electrical one-line diagrams

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4. Cable routing and wiring diagrams
5. Instrument loop and connection diagrams
6. Drawings of items buried or otherwise hidden from view (i.e. vessels, internals, etc.,)
7. All drawings and documents in which some changes are required during construction, pre-commissioning, commissioning.

As built comments may later be marked up by CONSULATANT on a master copy of these drawings, designated for this purpose. These changes, if any, will have to be approved by VENDOR.

8. **ELECTRONIC COPY**

8.1. **DOCUMENT FORMAT**

VENDOR has to provide all the documents in Native and PDF formats with the stamp “Code 3” assigned by CONSULATANT for Final Documentation (except for some files, as vendor document list, index, etc. which require the native format since the 1st issue and during the project).

If a file is oversized, only the coversheet has to be uploaded in Vendor Document Base Xchange Platform (VDBx) and full files are to be provided through One Drive / Shareapps.

8.2. **INDEX FILE**



Electronic Index is an Excel file where there is one document per line, the sections and subsections are indicated, and there are hyperlinks connected to the files (PDF), for each document (See Template in **Appendix 2 for VENDOR Final Documentation** and **Appendix 5 for MDRB**). The mandatory information is:

- ⇒ Chapter
- ⇒ Sub-Chapter
- ⇒ Sub-Sub-Chapter
- ⇒ Project Document Reference
- ⇒ Document Title
- ⇒ Hyperlink to the document

All documents should be listed and included in a chapter.

In case a chapter or sub-chapter is not applicable, VENDOR will indicate a cross in the relevant column of the document concerned.

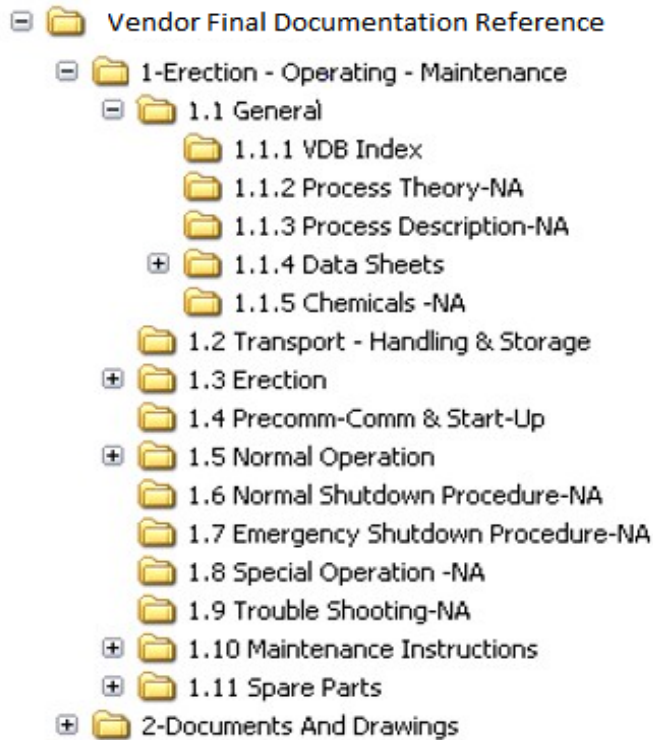
Hyperlinks are to be added only in the Index delivered together with the completed electronic version of the Vendor Final Documentation and MDRB.

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8.3. COMPILATION TREES

Documents are classified by folders and sub-folders, following the organization defined in the index.
Example: VENDOR Final Documentation Compilation Tree (Refer the section 8.3.1 and MDRB
Compilation Tree (Refer the section 8.3.2.

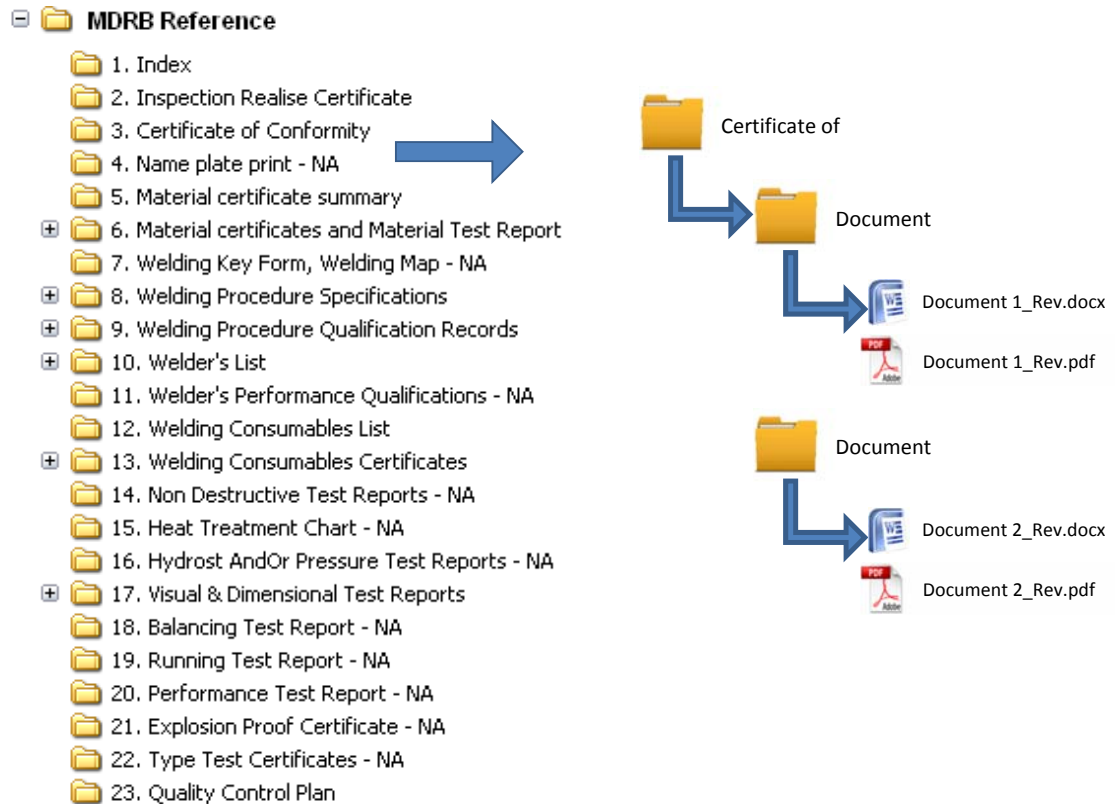
8.3.1 Example of VENDOR Final Documentation compilation tree



Note: In case a Part is not applicable, please delete the not applicable folder or sub-folder:

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8.3.2 Example of MDRB compilation tree



8.4. DESCRIPTION OF CD AND DVD ROMs

VENDOR will provide 1 CD or DVD ROM per Data Book.



For CD and DVD ROMs, the colored stickers defined in **Appendix 12** will be used.

Each CD and DVD ROM will be compiled as per the electronic compilation tree corresponding to the summary of the Data Book.

9. PAPER COPY

The documents which shall be printed are the last ones validated by CONSULATANT with a Code 3. The CONSULATANT stamp must appear on the coversheet. If the stamp is not printed or if it is not a Code 3, the document will be rejected.

Before printing the hard copy of the data books, VENDOR shall send an electronic version to CONSULATANT and get it stamped with a Code 3. After checking, CONSULATANT will inform VENDOR if there are modifications to apply or not. It is only when CONSULATANT communicates to VENDOR that data books do not need any change that VENDOR can print the hard copy of the data books.

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9.1 DOCUMENT SIZE

Documents in original size A4 must be printed in A4, black and white and 2-sided print. Documents in A3, A2, A1 and A0 must be printed in A3 and in black and white. If documents are not legible in A3, they must be printed in their original size, folded correctly and inserted into A4 size Transparent plastic pockets with the title block visible (Separate plastic pocket for each document).

9.2 DESCRIPTION OF BINDERS AND PRESENTATION

The Vendor Final Documentation and MDRB will consist of one or several binders (at least one binder for each data book).

In the case of several binders, VENDOR shall indicate on each binder coversheet and spine “Volume XX of YY”, with XX being the binder number and YY being the total number of binders.

These shall be of a size to readily accommodate A4 size documentation.



VENDOR shall, for all volumes, use:

- ⇒ White PVC binders with rigid covers.
- ⇒ Binders with fixed clear plastic pockets on their outside front and spine into which cover sheets and spine sheets will be inserted.
- ⇒ No specific number of rings binders are required, but 4 rings are recommended.

9.3 BINDER EXTERNAL COVERSHEET (APPENDIX 7)

It will be inserted on the front side and spine of the binder and will include the following information:

1. Project Number
2. Requisition Number
3. Purchase Order Number
4. Doc Item
5. Equipment Name
6. Equipment Tag
7. Vendor’s Name (Address, Telephone, Fax, Email)
8. Project Document Reference
9. Vendor Maintenance Representative
10. Volume Number (XX/YY)

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9.4 BINDER INTERNAL FRONT PAGE (APPENDIX 9)

A front page will contain the following indications:

1. Vendor's Name
2. Project Document Reference
3. Requisition Number
4. Purchase Order Number
5. Equipment Name
6. Equipment Tag
7. Volume Number

9.5 PARTITIONS

In case VENDOR Final Documentation or MDRB have to be split in several volumes, VENDOR will ensure that the Volume is split at the end of a chapter or a sub-chapter.

Each volume shall have solid section with tabs and sub-section dividers (coloured sheet for example).

Each divider will include a tab on which the section/subsection numbers will be permanently marked.

In case a chapter or sub-chapter is not applicable, it is not necessary to insert a page for it.

The tabs/dividers shall strictly comply with the Index.

9.6 INDEX IN HARD COPY



There is an Index in each binder, listing the documents gathered in the binder. It is the first document in the binder before the other documents and the partitions. Index for VDB and MDRB shall follow the structure as described in **Appendix 3 for VENDOR Final Documentation** and **Appendix 6 for MDRB**. The hard copy of the Index is printed from the Electronic file in Excel, without the columns containing the hyperlinks.

9.7 VENDOR FINAL DOCUMENTATION AND MDRB MASTER

The VENDOR Final Documentation and MDRB masters shall be started as soon as possible and ready when the first vendor documents are issued for CONSULATANT review or information.

When a document in electronic version is stamped “Code 3” it will be immediately put in place in the VENDOR Final Documentation and MDRB in paper version.

The VENDOR Final Documentation and MDRB in paper version are to be assembled and maintained throughout the work and can be shown to CONSULATANT inspector or his representative at every inspection, whenever required.

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10. VENDOR FINAL DOCUMENTATION

VENDOR Final Documentation is the compilation at the end of the project of last revision of documents previously submitted to CONSULATANT and stamped in Code 3.

All the documents and manuals specified in the Requisition (SR Part II) that have been submitted to CONSULATANT for prior review and have obtained the “Code 3” from CONSULATANT shall be included in the Final Documentation Dossier.

The VENDOR Final Documentation covering all equipment and bulk materials, shall encompass, in particular, Instructions for installation, operation and maintenance, cross-sectional drawings, lubricating, seal and control oil schemes, drawings of parts showing part numbers, part lists, test performance curves for fans, pumps and compressors, maintenance manual.

11. MANUFACTURER’S DATA RECORD BOOKS

The Manufacturer’s Data Record Book (MDRB) will be prepared as a stand-alone Data Book, independent of the VENDOR Final Documentation.

The MDRB is the complete collection of all certificates, test reports, inspection documents, “Certified Final” Documents and any other document relevant to manufacturing, inspection and testing activities performed.



In general, the MDRB shall be prepared:

- ⇒ Per tagged item of itemized equipment if the PO includes several itemized equipment under the category.
- ⇒ For package units, the MDRB will consist of one book including volumes per each item of itemized equipment and volume(s) for components.
- ⇒ For Bulk Orders (piping and manual valves), Material Certificates will be submitted by VENDOR along with the MCS (Material Certificate Summary) at final inspection, and will be recorded in a dedicated database. This database will be considered as the MDRB for pipes. In other cases, (valves), the MDRB shall be prepared for each lot of delivery in case the delivery is made by lots.

Note that on demand of the CONSULATANT the above splits can be organized differently according to the requisitions and their specificities. In this case, discussions will be organized between the VENDOR and the CONSULATANT.

All parts of the MDRB shall be filled-in during fabrication or production by VENDOR. CONSULATANT Inspector shall check and stamp documents, as they are available after each inspection or testing.

CONSULATANT Inspector shall give final approval of the MDRB content. The CONSULATANT Inspector shall check the MDRB for completeness and correctness.

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VENDOR shall fill-in all the requested information and CONSULATANT Inspector shall sign and stamp the cover sheet. At this point only, the MDRB shall be considered accepted by CONSULATANT.

12. REVIEW / COMMENTS FOR INDEXES OF VENDOR FINAL DOCUMENTATION AND MDRB

The Procedure for review / comments of the Vendor Final Documentation and Manufacturer's Data Record Books (MDRB) is as follows:



- ⇒ VENDOR forwards the VENDOR Final Documentation and MDRB Indexes to CONSULATANT for review and comments.
- ⇒ Indexes are reviewed and approved/ or commented by CONSULATANT. Once the indexes are approved, VENDOR is electronically notified.
- ⇒ Each document listed in the VENDOR Final Documentation Index has to be referred in the Requisition (SR Part II)
- ⇒ VENDOR Final Documentation is the compilation at the end of the project of last revision of documents previously submitted to CONSULATANT and stamped in Code 3.

12.1 INDEX ELECTRONIC SUBMISSIONS

- ⇒ VENDOR uploads on Vendor Document Base Xchange Platform (VDBx) the VENDOR Final Documentation and MDRB Indexes for review and comments (native and pdf files) by CONSULATANT.
- ⇒ CONSULATANT then sends back the comments to the VENDOR.
- ⇒ VENDOR updates the VENDOR Final Documentation/MDRB Index until a “Code 3” (Accepted) is assigned by CONSULATANT.

12.2 MASTER ELECTRONIC COPY SUBMISSION

- ⇒ Once Electronic Indexes are approved (Code 3), VENDOR issues corresponding VENDOR Final Documentation and MDRB Electronic Master Copy (zipped compilation tree) to CONSULATANT for review and comments through One Drive / Shareapps, and uploads each front page on Vendor Document Base Xchange Platform (VDBx). VENDOR Final Documentation and MDRB “for review” (IFR) and files sent through One Drive / Shareapps shall be received by CONSULATANT within the dates specified in Part II of the SR.
- ⇒ CONSULATANT then sends back comments, if any, on Electronic Master Copy to the VENDOR.
- ⇒ VENDOR updates the Final Documentation /MDRB Electronic Master Copy until a “Code 3” (Accepted) is assigned by CONSULATANT

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⇒ Once the versions of the VENDOR Final Documentation and MDRB Electronic Master Copy have reached Code 3, VENDOR send one (1) CD/DVD-ROM to CONSULATANT

CD-ROM with electronic copy must be sent to the CONSULATANT address:

**Document Controller – IOCL Lupech Project
TECHNIP India Limited
Technip Centre
19, Velachery Main Road, Guindy
Chennai – 600 032, Tamil Nadu
India.**

12.3 MASTER HARD COPY SUBMISSION OF ORIGINALS (CERTIFICATES OF STATUTORY AUTHORITIES)

On Final Approval of the electronic copy of MDRB, the Certificates of Statutory authorities like IBR, PESO, etc. in ORIGINALS shall be compiled separately and arranged in file and this file shall be sent to the IOCL by COURIER with acknowledgement, superscribing “ORIGINAL STATUTORY CERTIFICATES



**Document Controller – IOCL Lupech Project
INDIAN OIL COPRATION LIMITED
IOCL Football Ground,
Opp. To Admin Building,
Koyali, P.O. Jawaharanagar, Karachiya,
Vadodara, PIN - 391 320,
Gujarat, INDIA.**

Note: The copy of the above certificates shall be maintained in MDRB in its relevant position as approved in electronic copy.

12.4 MASTER HARD COPY SUBMISSION of VDB (Vendor Data Book) + Manufacturing Data Record Book (MDRB)

⇒ On Final Approval of the electronic copy of VENDOR Final Documentation (VDB) + Manufacturing Data Record book (MDRB), VENDOR shall prepare and dispatch Six (6) hard copies + One (1) electronic copy of VENDOR Final Documentation + Manufacturing Data Record book (MDRB) BY COURIER addressed to IOCL:

**Document Controller – IOCL Lupech Project
INDIAN OIL COPRATION LIMITED
IOCL Football Ground,
Opp. To Admin Building,
Koyali, P.O. Jawaharanagar, Karachiya,
Vadodara, PIN - 391 320,
Gujarat, INDIA.**

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One (1) electronic copy of VENDOR Final Documentation + Manufacturing Data Record book (MDRB) BY COURIER addressed to IOCL

If a subsequent updating is necessary, it will be at VENDOR care to revise the Vendor Final Documentation (VDB) and MDRB Indexes and to send the updated one together with the revised drawings.

Electronic copy and Hard copy should be strictly identical.

13. DISTRIBUTION AND FINAL DISPATCH

REQUIREMENT	VENDOR Final Documentation		MANUFACTURER DATA RECORD BOOK (MDRB)	
	PAPER COPY	ELECTRONIC COPY (Pen drive)	PAPER COPY	ELECTRONIC COPY (Pen drive)
IOCL	6	1 pen drive	6	1 pen drive
CONSULTANT	0	1 pen drive	0	1 pen drive
TOTAL COPIES FROM VENDOR	6	2 (minimum)	6	2 (minimum)

14. ATTACHMENTS

APPENDIX 1: CONTENT OF VENDOR FINAL DOCUMENTATION

APPENDIX 2: VENDOR FINAL DOCUMENTATION INDEX TEMPLATE FOR ELECTRONIC VERSION

APPENDIX 3: VENDOR FINAL DOCUMENTATION INDEX TEMPLATE FOR PAPER VERSION

APPENDIX 4: CONTENT OF MDRB

APPENDIX 5: MDRB INDEX TEMPLATE FOR ELECTRONIC VERSION

APPENDIX 6: MDRB INDEX TEMPLATE FOR PAPER VERSION

APPENDIX 7: BINDER FRONT COVER SHEET FOR VENDOR FINAL DOCUMENTATION



APPENDIX 8: BINDER FRONT COVER SHEET FOR MANUFACTURER DATA RECORD BOOK (MDRB)

APPENDIX 9: BINDER INTERNAL FRONT PAGE FOR VENDOR FINAL DOCUMENTATION

APPENDIX 10: BINDER INTERNAL FRONT PAGE FOR MANUFACTURER DATA RECORD BOOK (MDRB)

APPENDIX 11: SPINE COVER PAGE FOR VENDOR FINAL DOCUMENTATION and MANUFACTURER DATA RECORD BOOK (MDRB)

APPENDIX 12: CD & DVD STICKERS FOR VENDOR FINAL DOCUMENTATION and MANUFACTURER DATA RECORD BOOK (MDRB)



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APPENDIX 1: CONTENT OF VENDOR FINAL DOCUMENTATION



When a document is not applicable in a sub-section without a sub-section number*, it is not necessary to indicate “Not Applicable”: only the applicable document should be indicated.

CHAPTER	TITLE
AT THE BEGINNING OF EACH BINDER: THE VENDOR FINAL DOCUMENTATION INDEX	
1. ERECTION, OPERATING AND MAINTENANCE INSTRUCTION MANUAL	
1.1. General	
1.1.1.VDB Index	
1.1.2.Process Theory	
1.1.3.Process Description	
1.1.4.Chemicals, Catalyst Utilities Consumption	
1.1.5.Painting Specification	
1.2. Recommendation for Transportation, Handling and Storage	
1.2.1.Special precautions for handling prior to erection (Including a copy of the transport drawing when applicable)	
1.2.2.Recommendations for storage prior to and during erection	
1.3. Erection	
1.3.1.List of components to be erected/installed on site with major component weights	
1.3.2.Detailed schedule of the erection including hypothesis taken into account	
1.3.3.Procedures for erection and installation of the equipment/materials	
1.3.4.List of connection points detailing location and dimensions (including location of centre of gravity and riggings provisions)	
1.3.5.Details of site assembly and field welds	
1.3.6.List of special tools for site erection and assembly	
1.3.7.Procedures for site assembly, tolerances, levelling and welding	
1.3.8.Welding specifications for field welds	
1.3.9.List of checks and tests to be performed on site and monitoring system requirements	
1.4. Precommissioning, Commissioning and Start-Up Procedure	
Test, flushing, cleaning, drying etc. with relevant acceptance criteria	
1.5. Operating and Maintenance Manuals – including:	
Normal Operating Procedure	
Sequence Flow Chart (valve positioning, controls, etc.)	
Description of Control System	
List of Alarms and Set Points	
Program List (logic and ladder diagram, AND/OR, etc.)	
Normal Shutdown Procedure	
Emergency Shutdown Procedure	
Special Operation (chemical cleanings, catalyst regeneration, etc.),	
Trouble Shooting Maintenance Instructions	
Safety Instructions	
Lubricant table and equivalence	
Safety Instructions	

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CHAPTER	TITLE
	General Maintenance Lubricant table and equivalence Trouble shooting check lists and diagrams
1.6. Spare Parts	
	1.6.1.Consumable for erection, commissioning and start-up
	1.6.2.Spare parts for start-up and 2 years operation
	1.6.3.Capital spare parts
	1.6.4.Sectional drawings with part list numbers
2. DOCUMENTS AND DRAWINGS	
2.1. General	
	2.1.1.Drawing List
	2.1.2.P.&I. and Process Flow Diagram with Material Balance
	2.1.3.Plot Plan
2.2. Main Equipment (Indicate Equipment tags e.g. 30-E-2402, 31-BR-8800 etc...) (if applicable)	<i>Please indicate only the documents concerned*</i>
	2.2.1.Equipment 1 Name + Tag (e.g. 30-E-2402) - including:
	Data Sheet
	Assembly Drawing
	Nameplate Drawing (and in picture)
	Calculation Note
	2.2.2.Equipment 2 Name + Tag (e.g. 31-BR-8800) - including:
	Data Sheet
	Assembly Drawing
	Nameplate Drawing (and in picture)
	Calculation Note
2.3. Pressure Vessels (Indicate Equipment tags e.g. 31-EJ-4000, 32-EJ-4000 etc.) (if applicable)	<i>Please indicate only the documents concerned*</i>
	2.3.1.Pressure Vessel n°1 Name + Tag (e.g. 31-EJ-4000B)
	Data Sheet
	General assembly drawings
	Detailed Drawings
	Nameplate Drawings (and the picture)
	Calculation notes including FEA Calculation.
	2.3.2.Pressure Vessel n°2 Name + Tag (e.g. 32-EJ-4000B)
	Data Sheet
	General assembly drawings
	Detailed Drawings
	Nameplate Drawings (and the picture)
	Calculation notes including FEA Calculation
2.4. Machinery (including Pumps, fans, compressors, etc.) (Indicate Equipment tags) (if applicable)	<i>Please indicate only the documents concerned*</i>



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CHAPTER	TITLE
2.4.1.Pump n°1 Name + Tag (e.g. 31-P-6702)	<ul style="list-style-type: none"> Data Sheet and/or Expected Performance Curves Assembly Drawings Sectional Drawings (with part list) Accessories Drawings of Brochures (Mechanical seals, pulsation dampers, lubricant unit, flushing system, gear reducer, couplings, etc.) Nameplate Drawing (and the picture) Calculation Note
2.4.2.Pump n°2 Name + Tag (e.g. 32-P-6702)	<ul style="list-style-type: none"> Data Sheet and/or Expected Performance Curves Assembly Drawings Sectional Drawings (with part list) Accessories Drawings of Brochures (Mechanical seals, pulsation dampers, lubricant unit, flushing system, gear reducer, couplings, etc.) Nameplate Drawing (and the picture) Calculation Note
2.5. Other Equipment (Indicate Equipment tags...) (if applicable)	<i>Please indicate only the documents concerned*</i>
2.5.1.Other Equipment n°1 Name + Tag	<ul style="list-style-type: none"> Data sheet and/or Performances Curves Assembly/Sectional Drawings Calculation Notes Nameplate Drawings (and the picture)
2.5.2.Other Equipment n°2 Name + Tag	<ul style="list-style-type: none"> Data sheet and/or Performances Curves Assembly/Sectional Drawings Calculation Notes Nameplate Drawings (and the picture)
2.6. Piping and Valves (if applicable) – including:	<i>Please indicate only the documents concerned*</i>
	<ul style="list-style-type: none"> Piping Classes Isometrics Calculation Notes Piping and Piping Supports Layout (Cross Sectional & Assembly Drawings (with Part List)) Piping Support List Valve List Special Item List Valves and Accessories Drawings (Cross Sectional & Assembly Drawings (with Part List)) and Nameplate Drawings Flexible Connectors Isolation Specification
2.7. Instrument and Local Control Panel (if applicable) - including:	<i>Please indicate only the documents concerned*</i>

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CHAPTER	TITLE
	Instrument List
	Instrument Data Sheet and Brochure
	Calibration Sheet and Procedure
	Control Panel Drawing (with internal arrangement and wiring)
	Terminal Strip Connection
	Instrument Cable List
	Instrument Equipment Layout, Cable Routing, Junction box location, Operating principles, Functional design specification
	Calculation Notes (Pressure safety valves, Rupture discs, Control valves and flow orifices)
	Installation Materials (Supports, brackets, accessories...)
	PLC Manual
2.8. Electrical Equipment (if applicable) - including:	
	<i>Please indicate only the documents concerned*</i>
	Electric Motors Drawings, datasheets and starting Torque Curves
	Electrical cable dossier (Cable list, Data sheets, Cross Section – Outline Drawings)
	Power Distribution Panels Drawings (with internal arrangement and wiring)
	Installation Materials (Supports, brackets, accessories...)
	Electrical Consumers list and load balance
	Wiring Diagrams
2.9. Noise Source Data Sheet	
2.10. Refractory and Isolation (if applicable) - including:	
	<i>Please indicate only the documents concerned*</i>
	Drawings
	Datasheets
	Installation Data

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APPENDIX 2: vendor FINAL DOCUMENTATION Index Template for Electronic version

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Vendor Logo

VENDOR FINAL DOCUMENTATION INDEX

CHAPTER	SUB-CHAPTER	SUB-SUB-CHAPTER	PROJECT DOCUMENT REFERENCE	VENDOR DOCUMENT REFERENCE	DOCUMENT TITLE
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.1. Process Theory			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.2. Process Description			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.3. Chemicals, Catalyst Utilities Consumption			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.4. Painting Specifications			
1. ERECTION, O & M INSTRUCTION MANUAL	1.2. Recommendation for Transportation, Handling and Storage	1.2.1. Special precautions for handling prior to erection (including a copy of the transport drawing when available)			
1. ERECTION, O & M INSTRUCTION MANUAL	1.2. Recommendation for Transportation, Handling and Storage	1.2.2. Recommendations for storage prior to and during erection			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.1. List of components to be erected/installed on site			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.2. Detailed schedule of the erection including lift/hoist/taken into account			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.3. Procedures for erection and installation of the equipment/instrutah			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.4. List of construction points detailing location and dimensions			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.5. Details of the assembly and field work			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.6. List of special tools for site erection and assembly			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.7. Procedures for site assembly, welding and venting			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.8. Welding specifications for field work			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.9. List of checks and tests to be performed on site			
1. ERECTION, O & M INSTRUCTION MANUAL	1.4. Precommissioning, Commissioning and Start-Up Procedure	Start, flushing, cleaning, drying etc. with relevant acceptance criteria			
1. ERECTION, O & M INSTRUCTION MANUAL	1.5. Operating and Maintenance Manuals	Handing of equipment: Normal Operating Procedures, Sequence Flow Chart (pilot positioning, control, etc.), Description of Control System, List of Alarms and Set Points, Program List (logic and ladder diagram), ABEVOR, etc.), Normal Shutdown Procedures, Emergency Shutdown Procedures/Partial Operation (Chemical Drawings, catalyst regeneration, etc.), Trouble Shooting Maintenance Instructions, Safety Instructions, Lockout/Tagout and availability			

APPENDIX 3: VENDOR FINAL DOCUMENTATION INDEX Template for Paper version



PETROCHEMICAL AND LUBE INTEGRATION PROJECT “LuPech” (J-18) IOCL GUJARAT REFINERY



Vendor Logo



VENDOR FINAL DOCUMENTATION INDEX

CHAPTER	SUB-CHAPTER	SUB-SUB-CHAPTER	PROJECT DOCUMENT REFERENCE	VENDOR DOCUMENT REFERENCE	DOCUMENT TITLE
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.1. Process Theory			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.2. Process Description			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.3. Chemicals, Catalyst Utilities Consumption			
1. ERECTION, O & M INSTRUCTION MANUAL	1.1. General	1.1.4. Painting Specifications			
1. ERECTION, O & M INSTRUCTION MANUAL	1.2. Recommendation for Transportation, Handling and Storage	1.2.1. Special precautions for handling prior to erection (including a copy of the transport drawing when available)			
1. ERECTION, O & M INSTRUCTION MANUAL	1.2. Recommendation for Transportation, Handling and Storage	1.2.2. Recommendations for storage prior to and during erection			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.1. List of components to be erected/installed on site			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.2. Detailed schedule of the erection including lift/hoist/taken into account			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.3. Procedures for erection and installation of the equipment/instrutah			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.4. List of construction points detailing location and dimensions			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.5. Details of the assembly and field work			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.6. List of special tools for site erection and assembly			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.7. Procedures for site assembly, welding and venting			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.8. Welding specifications for field work			
1. ERECTION, O & M INSTRUCTION MANUAL	1.3. Erection	1.3.9. List of checks and tests to be performed on site			
1. ERECTION, O & M INSTRUCTION MANUAL	1.4. Precommissioning, Commissioning and Start-Up Procedure	Start, flushing, cleaning, drying etc. with relevant acceptance criteria			
1. ERECTION, O & M INSTRUCTION MANUAL	1.5. Operating and Maintenance Manuals	Handing of equipment: Normal Operating Procedures, Sequence Flow Chart (pilot positioning, control, etc.), Description of Control System, List of Alarms and Set Points, Program List (logic and ladder diagram), ABEVOR, etc.), Normal Shutdown Procedures, Emergency Shutdown Procedures/Partial Operation (Chemical Drawings, catalyst regeneration, etc.), Trouble Shooting Maintenance Instructions, Safety Instructions, Lockout/Tagout and availability			

 		PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT “LuPech” (J-18) IOCL GUJARAT REFINERY		
		CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114		Rev. No. A	Page 21 of 32



APPENDIX 4: CONTENT OF MDRB

**CONTENT OF MDRB
 (Manufacturer’s Data Record Book)**

 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 22 of 32

CONTENT OF MANUFACTURER'S DATA RECORD BOOKS (MANUFACTURING INSPECTION DOSSIER) (Guidelines)		EQUIPMENT AND/OR MATERIAL CATEGORIES												
		A	B				C	D	E	F				
			b1	b2	b3	b4				f1	f2	f3	f4	f5
1	MDRB Index	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Inspection release certificate	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Vendor Concession Request (if any)	X	X	X	X	X	X	X	X	X	X	X	X	X
4	Non-Conformance Report (if any)	X	X	X	X	X	X	X	X	X	X	X	X	X
5	Certificate of conformity	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Certification Matrix (in Code 3) with reference of all CU TR, GOST-R, PAC, FSC	X	X	X	X	X	X	X	X	X	X	X	X	X
7	Statutory or Third Party reports and/or certificates	X		X						X				
8	Nameplate print (copy or photography)	X	X	X						X				
9	Material certificate summary	X	X	X	X	X	X	X	X	X	X	X	X	X
10	Material certificates and Material Test Report	X	X	X	X	X	X	X	X	X	X	X	X	X
11	Welding key form, Welding Map	X	X	X		X		X	X	X	X			X
12	Welding procedure specifications	X	X	X		X		X	X	X	X			X
13	Welding Procedure qualification records	X	X	X		X		X	X	X	X			X
14	Welder's list	X	X	X		X		X	X	X	X			X
15	Welder's performance qualifications	X	X	X		X		X	X	X	X			X
16	Welding consumables list	X	X	X		X		X	X	X	X			X
17	Welding consumables certificates	X	X	X		X		X	X	X	X			X
18	Non-destructive test reports (incl. PMI, ferrite, hardness, if any)	X	X	X	X	X	X	X	X	X	X	X	X	X
19	Destructive test reports of Production Test Pieces (if any)	X		X						X				
20	Heat treatment chart	X		X		X				X		X		
21	Hydro and/or Pressure leak test reports	X	X	X	X	X		X	X	X	X	X	X	X
22	Visual & dimensional test reports (including « As-Delivered » Documents)	X	X	X	X	X	X	X	X	X	X	X	X	X
23	Balancing test report		X								X			
24	Mechanical (performance, run) test reports		X		X			X	X		X		X	X
25	Electrical test reports and/or certificates		X		X			X	X		X		X	X
26	Instrumentation test reports and/or certificates							X	X				X	X
27	Explosion Proof certificate				X			X	X				X	
28	Other test reports and/or certificates							X					X	
29	Signed quality Control Plan	X	X	X	X	X	X	X	X	X	X	X	X	X
30	Testing procedures	X	X	X	X	X	X	X	X	X	X	X	X	X
31	GA drawing (as per Final Inspection revision and	X	X	X	X	X	X	X	X	X	X	X	X	X

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 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 23 of 32

CONTENT OF MANUFACTURER'S DATA RECORD BOOKS (MANUFACTURING INSPECTION DOSSIER) (Guidelines)	EQUIPMENT AND/OR MATERIAL CATEGORIES													
	A	B				C	D	E	F					
		b1	b2	b3	b4				f1	f2	f3	f4	f5	
as witnessed in workshop), Equipment filled-in datasheet														

EQUIPMENT AND/OR MATERIAL CATEGORIES

A P.V. & H.E., HEATERS TOWERS, REACTORS, TANKS, etc.

PUMPS, COMPRESSORS, TURBINES, etc.:

b1 Main equipment

B b2 Aux., press. equip.

b3 Auxiliary machinery

b4 Instrumentation

C PIPING, FITTINGS, VALVES, STRUCTURES, etc.

D ELECTRICAL

E INSTRUMENTATION

PACKAGES



f1 P.V.v., H.E., Towers, etc.

f2 Machinery

F f3 Connecting piping

f4 Electrical & Instrum.

f5 Assembled Unit

 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 24 of 32

APPENDIX 5: MDRB INDEX TEMPLATE FOR ELECTRONIC VERSION

PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY





Vendor Logo

MDRB INDEX TEMPLATE FOR ELECTRONIC VERSION

CHAPTER	EQUIPMENT	OWNER DOCUMENT REFERENCE	VENDOR DOCUMENT REFERENCE	DOCUMENT TITLE	HYPERLINK TO DOCUMENT
1-MDRB Index					
2-Inspection release certificate					
3-Vendor Concession Request (if any)					
4-Non-Conformance Report (if any)					
5-Certificate of Conformity					
6-Certification Matrix (in Code 3) with reference of all CU TR, GOST-R, PAC, FSC					
7-Statutory or Third Party reports and/or certificates					
8-Nameplate print (copy or photography)					
9-Material certificate summary					
10-Material certificates and Material Test Report					
11-Welding key form, Welding Map					
12-Welding procedure specifications					
13-Welding Procedure qualification records					
14-Welder's list					
15-Welder's performance qualifications					
16-Welding consumable list					
17-Welding consumables certificates					
18-Non destructive test reports (incl. PMI, ferrite, hardness, if any)					

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 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 25 of 32

APPENDIX 6: MDRB INDEX TEMPLATE FOR PAPER VERSION



PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY





Vendor Logo Vendor Logo



MDRB INDEX TEMPLATE FOR PAPER VERSION

CHAPTER	EQUIPMENT	CONSULTANT DOCUMENT REFERENCE	VENDOR DOCUMENT REFERENCE	DOCUMENT TITLE	HYPERLINK TO DOCUMENT
1- MDRB Index					
2-Inspection release certificate					
3- Vendor Concession Request (if any)					
4-Non-Conformance Report (if any)					
5-Certificate of Conformity					
6-Certification Matrix (in Code 3) with reference of all CU TR, GOST-R, PAC, FSC					
7-Statutory or Third Party reports and/or certificates					
8-Nameplate print (copy or photography)					
9-Material certificate summary					
10-Material certificates and Material Test Report					
11-Welding key form, Welding Map					
12-Welding procedure specifications					
13-Welding Procedure qualification records					
14-Welder's list					
15-Welder's performance qualifications					
16-Welding consumable list					
17-Welding consumables certificates					
18-Non destructive test reports (incl. PMI, ferrite, hardness, if any)					
19-Destructive test reports of production Test Pieces (if any)					
20-Heat Treatment chart					
21-Hydrost. and/or pressure leak test reports					
22-Visual & dimensional test reports (including in Material certificates and Material Test Report)					
23-Balancing test report					
24-Mechanical (performance, run) test reports					
25-Electrical test reports and /or certificates					
26-Instrumentation test reports and/or certificates					
27-Explosion Proof certificate					
28-Other test reports and/or certificates					
29-Signed quality Control Plan					
30-Testing procedures					
31-GA drawing (as per Final inspection revision and as witnessed in workshop), Equipment filled-in datasheet					



 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 26 of 32



APPENDIX 7 BINDER EXTERNAL COVER SHEET FOR VENDOR FINAL DOCUMENTATION

OWNER		EPC	
 	INDIAN OIL CORPORATION LIMITED.	(LOGO) & Vendor Logo	XXXXXXX XXXX, INDIA.
PROJECT NUMBER	:	XXXXXX	
REQUISITION NUMBER	:	077154C-XXX-SR-XXXX-XXXX	
PURCHASE ORDER NUMBER	:	077154C-XXX-PO-XXXX-XXXX-XX-XXX	
DOCUMENT ITEM	:	XXXXXX	
EQUIPMENT NAME	:	AA	
EQUIPMENT TAG	:	BB	
VENDOR's NAME	:		
➤ Address		CC	
➤ Telephone Number		CC	
➤ Fax Number		CC	
➤ E-mail		CC	
CONSULTANT DOCUMENT REF.	:	DD	
VENDOR MAINTENANCE REP.	:		
➤ Address		EE	
➤ Telephone Number		EE	
➤ Fax Number		EE	
➤ E-mail		EE	
VOLUME NUMBER	:	X/X	



 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 27 of 32



APPENDIX 8 BINDER INTERNAL FRONT PAGE FOR VENDOR FINAL DOCUMENTATION

OWNER		EPC	
 	INDIAN OIL CORPORATION LIMITED.	(LOGO) & Vendor Logo	XXXXXXX XXXX, INDIA.
VENDOR's NAME	: AA		
CONSULTANT DOCUMENT REF	: XXXXXXX		
REQUISITION NUMBER	: 077154C-XXX-SR-XXXX-XXXX		
PURCHASE ORDER NO.	: 077154C-XXX-PO-XXXX-XXXX-XX-XXX		
EQUIPMENT NAME	: BB		
EQUIPMENT TAG	: CC		
VOLUME NUMBER	: X/X		



 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 28 of 32



APPENDIX 9 BINDER EXTERNAL COVER SHEET FOR MANUFACTURER DATA RECORD BOOK

OWNER	EPC
  INDIAN OIL CORPORATION LIMITED.	(LOGO) & Vendor Logo XXXXXXX XXXX, INDIA.
PROJECT NUMBER	: XXXXXX
REQUISITION NUMBER	: 077154C-XXX-SR-XXXX-XXXX
PURCHASE ORDER NUMBER	: 077154C-XXX-PO-XXXX-XXXX-XX-XXX
DOCUMENT ITEM	: XXXXX
EQUIPMENT NAME	: AA
EQUIPMENT TAG	: BB
VENDOR's NAME	:
➤ Address	CC
➤ Telephone Number	CC
➤ Fax Number	CC
➤ E-mail	CC
CONSULTANT DOCUMENT REF.	: DD
VENDOR MAINTENANCE REP.	:
➤ Address	EE
➤ Telephone Number	EE
➤ Fax Number	EE
➤ E-mail	EE
VOLUME NUMBER	: X/X





 		PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY	
		CLIENT	INDIAN OIL CORPORATION LIMITED	
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 29 of 32

APPENDIX 10 BINDER INTERNAL COVER SHEET FOR MANUFACTURER DATA RECORD BOOK



OWNER	EPC
  INDIAN OIL CORPORATION LIMITED.	(LOGO) & Vendor Logo XXXXXXXX XXXX, INDIA.
<p>VENDOR's NAME : AA</p> <p>CONSULTANT DOCUMENT REF: XXXXXX</p> <p>REQUISITION NUMBER : 077154C-XXX-SR-XXXX-XXXX</p> <p>PURCHASE ORDER NO. : 077154C-XXX-PO-XXXX-XXXX-XX-XXX</p> <p>EQUIPMENT NAME : BB</p> <p>EQUIPMENT TAG : CC</p> <p>VOLUME NUMBER : X/X</p>	

 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 30 of 32

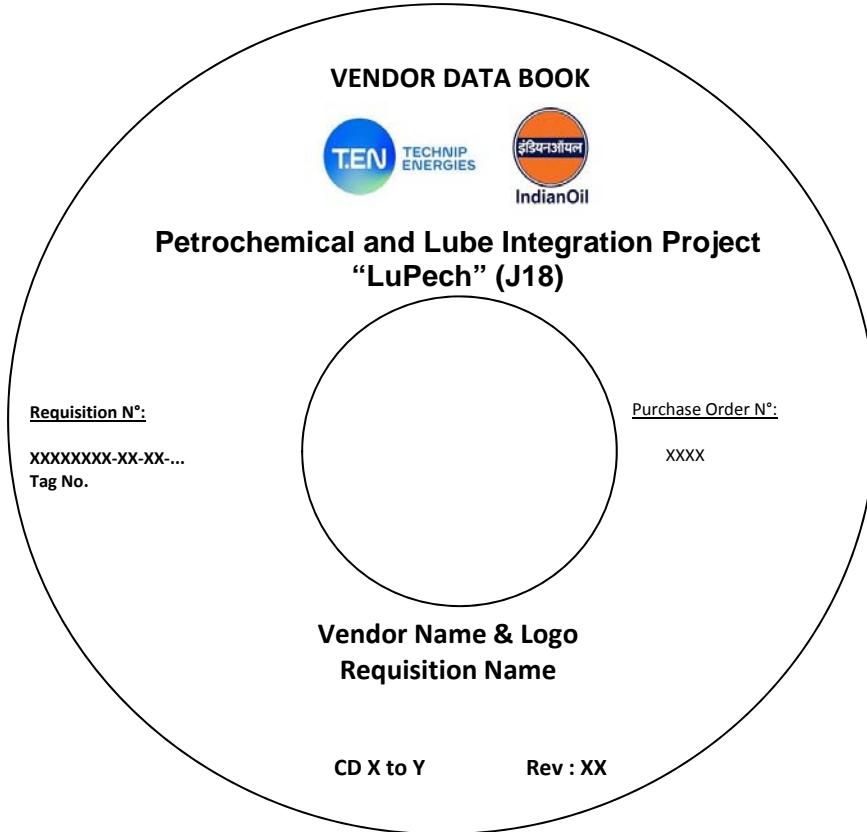
APPENDIX 11: SPINE COVER PAGE FOR VENDOR FINAL DOCUMENTATION AND MANUFACTURER DATA RECORD BOOK (MDRB)

 	 
Vendor logo	Vendor logo
VENDOR FINAL DOCUMENTATION FOR LUPECH (J-18) - IOCL GUJARAT REFINERY PROJECT	MANUFACTURER'S DATA RECORD BOOK FOR LUPECH (J-18) - IOCL GUJARAT REFINERY PROJECT
<u>Project Number</u> XXXXX	<u>Project Number</u> XXXXX
<u>Requisition Number</u> XXXXX	<u>Requisition Number</u> XXXXX
<u>Purchase Order Number</u> XXXXX	<u>Purchase Order Number</u> XXXXX
<u>Document Item</u> XXXXX	<u>Document Item</u> XXXXX
<u>Equipment Name</u> AA	<u>Equipment Name</u> AA
<u>Equipment Tag</u> AA	<u>Equipment Tag</u> AA
<u>Vendor's Name</u> AA	<u>Vendor's Name</u> AA
<u>Consultant Document Ref.:</u> AA	<u>Consultant Document Ref.:</u> AA
VOLUME X of X	VOLUME X of X



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 		PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY	
		CLIENT	INDIAN OIL CORPORATION LIMITED	
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 31 of 32



APPENDIX 12: CD & DVD STICKERS FOR VENDOR FINAL DOCUMENTATION and MANUFACTURER DATA RECORD BOOK (MDRB)





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	CLIENT	INDIAN OIL CORPORATION LIMITED		
VENDOR FINAL DOCUMENTATION PROCEDURE	Project No. 077154C001	Document No. 077154C-000-PP-114	Rev. No. A	Page 32 of 32

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OWNER	EPC
  INDIAN OIL CORPORATION LIMITED.	(LOGO) & Vendor Logo XXXXXXXX XXXX, INDIA.

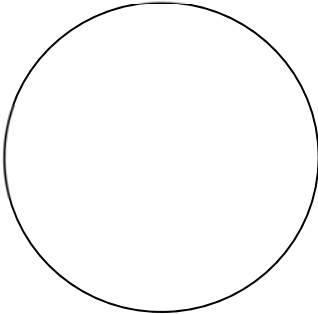
**MANUFACTURER DATA RECORD
BOOK**

**Petrochemical and Lube Integration Project
"LuPech" (J18)**

Requisition N°:
XXXXXXXX-XX-XX-...
Tag No.

Purchase Order N°:
XXXX





**Vendor Name & Logo
Requisition Name**





CD X to Y
Rev : XX

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 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
Packing, Marking and Shipping Specifications	Project No. 077154C001	Document No. 077154C-000-PP-034	Rev. No. A	Page 1 of 54

Packing, Marking and Shipping Specifications

			 Digitally signed by Govindarajan Ramakrishnan Employee, iocl, Govindarajan Govindarajan Date: 2021.02.02 16:08:49 +05'30'	 Digitally signed by Ananth Joseph Employee, iocl, Ananth Joseph Date: 2021.02.02 11:21:02 +05'30'	 Approved By Gopalraj P. Suresh Babbar 2021.02.12 10:42:19 +05'30'	 Approved By Sankar 2021.03.13 21:44:16 +05'30'
A	09.02.2021	Issued for Execution	RG	AJ	PSSG	BSR
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT “LuPech” (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
Packing, Marking and Shipping Specifications	Project No. 077154C001	Document No. 077154C-000-PP-034	Rev. No. A	Page 2 of 54

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5. Preparation for shipment and General packing requirements for conservation.....	7
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 	PROJECT	PMC/ EPCM Services for PETROCHEMICAL AND LUBE INTEGRATION PROJECT "LuPech" (J-18) IOCL GUJARAT REFINERY		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
Packing, Marking and Shipping Specifications	Project No. 077154C001	Document No. 077154C-000-PP-034	Rev. No. A	Page 3 of 54

1. Introduction:

Indian Oil Corporation (IOC), raising the capacity of its Gujarat refinery as well as setting up a petrochemical plant at the unit as part of plans for upscaling Petchem business to protect margins.

The project envisages raising the capacity of the Vadodara refinery in Gujarat from 13.7 MMTPA to 18 MMTPA and building a 500 KTPA polypropylene (PP) plant and a 235 KTPA Lube Oil Base Stock (LOBS) unit.

The project would be a building block for the production of niche chemicals in future with a potential to increase petrochemical and specialty products integration index on incremental crude oil throughput which would enhance the refinery margins.



The Gujarat Refinery project is part of IOC's plans to boost petrochemical capacity by more than 70 per cent over the next decade, from 3.2 million tons a year currently.

2. Reference Documents

Sl. No	Document Title	Document Reference
1	IOCL Tender Document	RHQCC17071
2	IOCL's Contract	KK/RHQCC17071-1/AGT/201802019
3	PMC's Project Execution Plan	077154C-000-PP-012
4	PMC's Procurement Plan	077154C-000-PP-031
5	PMC's Procurement & tendering Procedure	077154C-000-PP-033

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	CLIENT	INDIAN OIL CORPORATION LIMITED		
Packing, Marking and Shipping Specifications	Project No. 077154C001	Document No. 077154C-000-PP-034	Rev. No. A	Page 4 of 54

3. Definitions & Abbreviations

Abbreviation	Definition /Expanded form
IOCL/ CLIENT	Indian Oil Corporation Limited
PMC/ CONSULTANT	Technip India Limited
LICENSOR	Party selected by IOCL for process technology ownership for any UNIT
CONTRACTOR	Party whose services are obtained for performing the works specified as part of LSTK / packages.
EPCM	Engineering, Procurement & Construction Management Services.
LSTK	Lump Sum Turn Key portion of the work to be executed by CONTRACTOR
FEED	Front End Engineering Design
AUTHORISED REPRESENTATIVE	IOCL's/ CONSULTANT's representative authorized to act for and on behalf of them.
PURCHASER	Party purchasing the materials / services for setting up the Plant
SUPPLIER	Any third party supplying the equipment/materials for setting up the Plant
LLI	Long Lead Item – Any equipment / Package / Work order taking 16 months or more completion time from the date of award
PROJECT	Indicates LuPech Project, Gujarat Refinery
SITE	Indicates Gujarat Refinery in Vadodara, Gujarat State, India
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
IMDG	International Maritime Dangerous Goods Code
HLO	Heavy lift or oversized equipment
GC	General Cargo
IMO	International Maritime Organization
ADR	Accord Dangereux Routier
IATA	International Air Transport Association
MSDS	Material Safety Data Sheet

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4. Scope:



The scope of this document is to explain the works / activities to be performed for Packing, Marking and Shipping requirements. The SUPPLIER's own experience and practice shall determine any improvements to ensure safe delivery of the goods. For equipment / materials sourced from SUPPLIER's by CONTRACTORS as part of contract with IOCL/OWNER, CONTRACTORS shall review these minimum requirements and reinforce with any additional requirements based on their experience in past projects.

Deviations from these minimum requirements are not allowed without PURCHASER's prior approval.

- a. The following guidelines are an integral part of the purchase order. SUPPLIER shall be held liable for any consequences arising from non-observance of these instructions, including, but not limited to, dead freight or demurrages or loss or damage of goods, due to poor packing or marking.

In particular, in case of loss or damage, SUPPLIER's liability extends to the total replacement value of goods at site (included, but not limited to, transport, dismantling, repairing/replacing and reassembling of goods and specialist costs). The SUPPLIER will have 7 days' time, upon receiving PURCHASER's request, to take suitable repair measures; after this period the PURCHASER may, without further formalities, proceed to make good the supply, back-charging SUPPLIER for any costs occurred for EPCM / CONTRACTOR for supplies in EPC.

- b. Any specific packing specifications or requirements will be stated in the Purchase Order or attachments. Effective September 2006, all wood packing materials must comply with the ISPM 15 standards which defines regulations related to fumigation.
- c. Observance of these minimum requirements does not constitute a limitation to SUPPLIER's full responsibility for the efficiency of the packing itself.
- d. Goods shall not be packed before the issue of PURCHASER's "Inspection Release Note", authorizing packing/transport or PURCHASER's waiver of inspection.
- e. Inspection of packing and marking may be carried out either by PURCHASER directly or by any appointed third party. At the time of inspection, the lids of the cases shall remain open and a copy of the packing list shall be available in order to allow the content to be checked. The inspection shall in no way relieve SUPPLIER from responsibility for packing/markings execution.
- f. Should the packing and marking at inspection not be found in accordance with these specifications, SUPPLIER shall, if deemed necessary, remake the packing and/or the marking at his own cost.
- g. Should the packing, provided by the SUPPLIER, be found defective or inadequate at shipping port, PURCHASER shall be entitled to carry out possible repairs at SUPPLIER's expense or request SUPPLIER's intervention.

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h. All costs due to split-up and /or late delivery(ies) caused by the SUPPLIER or its Sub-SUPPLIER(s), requiring extra measures from the PURCHASER to maintain/adhere to the construction schedule may be back charged to the SUPPLIER for EPCM / CONTRACTOR for supplies in EPCC.

i. Final destination: IOCL Gujarat Refinery Limited, Vadodara, Gujarat, India.

j. **Shipping General cargo dimensions/ volumes/ weights/ special handling:**

a) The gross weight of a package shall not exceed: 10,000 kg.

b) The dimensions of a package shall not exceed: 11.90 (L) x 2.40 (W) x 2.30 (H) mts

For Information, maximum cargo dimensions (in meters). for inland India Transport:

Single Axle Trucks	Closed	7.3 (L) X 2.10 (W) X 3.05 (H)
	Open	7.3 (L) X 3.65 (W) X 3.05 (H)
Double Axles Trucks	Closed	7.3 (L) X 2.10 (W) X 3.05 (H)
	Open	7.3 (L) X 3.65 (W) X 3.05 (H)
Trailers	Flat	15.2 (L) X 4.25 (W) X 3.05 (H)
	Semi	15.2 (L) X 4.25 (W) X 3.65 (H)
	Low Bed	9.1 (L) X 4.25 (W) X 4.25 (H)

c) The SUPPLIER shall advise the PURCHASER of any package in excess of the weight and/or dimensions given above, Specific needs of shipment for cargo beyond above dimensions shall be stated.

The SUPPLIER shall, if requested, submit transport drawings three plane view of packages indicating all details such as lifting points, center of gravity, actual position of all nozzles and protruding parts, support positions, Special tools any, net gross weights and accurate size and overall dimensions.

d) Goods will not be shipped on deck, unless so decided by the PURCHASER because of size or IMDG or other regulations. For shipments on deck, the SUPPLIER shall make additional and adequate provision for conservation, packing, lashing etc.



e) The SUPPLIER shall advise the PURCHASER of any Special Handling Requirements in respect to shelf life, expiration date, Transport and/or Storage or Handling Precautions.

SUPPLIER shall provide the Transport Drawing with Load distribution / Lifting and Lashing points for Over Dimensional / Exceptional Cargo.

k. **Content of set of shipping documents**

All transport unit packages exceeding any of the following limit of overall dimensions and gross weights, are classified as Heavy lift or oversized equipment (HLO), differently as General Cargo (GC) materials:

- Weight Tons 24.00

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- Length Mt 13.00
- Width Mt 2.50
- Height Mt 2.50

All transport packages containing cargo subjected to IMO/ADR/IATA Regulations, are classified as hazardous/radioactive materials (Dangerous SUPPLY), usually General Cargo (GC).

5. Preparation for shipment and General packing requirements for conservation

- a. Unless otherwise specified, the packing itself shall protect materials/equipment from shocks and weathering, environment and marine agents, preventing any damage and corrosion of its contents and loss during transport. In addition, the packing and marking must withstand the various tough handling operations, from withdrawal up to the delivery point.
- b. In principle, protection of contents and relevant marking must not only be guaranteed for the period of transport, but also for a period of at least one year of outdoor storage under atmospheric conditions at the final destination point. Exceptions shall be examined case by case.
- c. It shall be SUPPLIER's duty and responsibility to supply PURCHASER with the necessary storage instructions during the bidding time, before order. Any damage incurred due to incorrect or missing storage instructions shall be at SUPPLIER's charge.
- d. After final inspection, SUPPLIER shall coat all unpainted machinery components and /or surfaces with suitable corrosion inhibitor, easily removable without polluting the environment. All machined surfaces shall be protected by a wax based corrosion protection compound, which after application, cures to waxy, transparent, firm film. The SUPPLIER shall protect all unpainted goods and surfaces with a suitable corrosion inhibitor (Castrol Rustilo 150, Shell ENSIS Fluid H or equivalent).
- e. For plant piping materials and convection coil pipes and fittings, the SUPPLIER's standard conservation may be applied. Pipes subsequently to be finned shall be delivered without conservation. For Radiant coil- and Reformer tube materials all machined surfaces are to be protected with the SUPPLIER's standard corrosion inhibitor and a cleaning instruction is to be included with the copy of the Packing List inside the package.
- f. For enclosed surfaces such as Vessels, Towers, Exchangers etc. Shell VPI 280 powder or equal is to be used. The SUPPLIER may apply other protection measures, provided that the same objectives are achieved. In the event of any doubt the SUPPLIER shall contact the PURCHASER for final instructions. The number of bags and type of the dehydrating agent shall be identified by type and number on the outside of each package in which they are contained.



For goods under NITROGEN Pressure: SUPPLIER shall have to provide all necessary

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documentation including MSDS.

- g. SUPPLIER shall thoroughly clean and dry all unpainted machinery components, both internally and externally. Dirt, grease, scale, welding spatter and any other foreign matter shall be removed.
- h. Metal gaskets, rings, bolts and nuts shall be greased.
- i. Connections and in general all openings shall be adequately protected and plugged to prevent moisture infiltration. Machined / unmachined pipe ends and threaded openings shall be closed and protected by metal plugs of material equal or superior to that of the equipment itself.
- j. All packed goods must be properly secured inside the packing to prevent movement during transit.
- k. Loose and moving parts within equipment may need to be temporarily secured while in transit; i.e. drawers in cabinets, rotors in drivers, header boxes in air-cooled exchangers. Clear warnings must be indicated on items to remove all securing devices before start-up. Such devices shall not abrade or damage the material.
- l. Highly sensitive parts (manometers, electronic boxes and others), that might interfere with the packing, shall be protected by cushioning material in order to prevent damage by the packing components. Accessories mounted in areas, where there is risk of damage, shall be disassembled and packed separately.
- m. For material with protective coating, SUPPLIER shall indicate the duration of the protection and shall also give instructions for a prolonged period of preservation of the goods.
- n. In principle, polyethylene sheeting (treated against the effects of sunlight and heat) with a suitable thickness (min. 0.2 mm) shall always be provided to protect material from rainwater or splashes. Said sheeting shall be left open at the bottom to allow aeration. Polyethylene sheeting cannot be used for protection against humidity.
- o. For highly sensitive equipment subject to deterioration by moisture, such as control panels, DCS, Electrical instruments, oleo dynamic machinery, pumps, compressors and the like (see packing instructions for each material category), a thermo welded barrier must be used and filled with dehydrating product (approximately Y2 unit x m2 if package) in order to keep the humidity rate lower than the acceptable one for at least one year safeguarding the equipment from oxidation, rust and the like.

De-hydrant product bags shall be hung inside the wrapping and not be placed on the floor. A partial vacuum shall be produced inside the barrier bag in order to avoid moisture penetration. Barrier bag holes corresponding to equipment fixing bolts, shall be sealed using rubber washers. Humidity

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indicators shall be applied to the thermos-welded barrier bag and shall be inspected through a window provided in the packing wall. Shock sensors (2 pcs) shall also be fixed to the packing walls.

- p. Sharp edges, protrusions and the like shall be lined with soft material to avoid tearing the protective wrapping.
- q. The packages shall be executed to reduce volume, without prejudicing the function of the packing itself. In order to allow max usage of box containers and/or trucks, overall package dimensions should, when applicable, be kept within the following figures:
 - Length: 5.8 mt (20' box) or 11.8 mt (40' box) Or entire submultiple
 - Width: 2.2 mt or entire submultiple
 - Height: 2.0 mt or entire or entire submultiple

However, to minimize the need of exceptional transport, packing shall, unless dimensions and weights are binding, observe the following limitations:



- Max length: 12.0 mt – (For Flat Rack Containers – 11.50 mts.)
- Max. Width: 2.5mt
- Max. Height: 2.5 mt
- Max. Weight: 24,000 Kgs

Furthermore, to avoid risk of loss and to meet shipping liner regulations, sea shipment package shall have a minimum volume of 1 Cubic meter or 500 Kgs.

Weights and dimensions allowed for air shipment, unless otherwise agreed upon, shall be:

- Max Length: 1.0mt.
- Max Width: 0.8mt.
- Max Height: 0.7mt.
- Max Weight: 120 Kgs

- r. Plastic or steel boxes shall not be used unless authorized by PURCHASER.
- s. Material pertaining to two or more different material requisition shall not be packed together.
- t. Grouping materials into single package is only allowed for materials of the same category or type: i.e. valves with valves, flanges with flanges, etc.
- u. Materials belonging to the same purchase order, but with different destinations or delivery points, must be packed separately.
- v. Spare parts shall be packed separately from materials belonging to the main order and per type of equipment, unless otherwise agreed with PURCHASER.

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- w. Chemical products shall be packed in respect to their compatibility with other chemicals and MSDS shall be provided in advance to arrange safe transport
- x. All packing material used shall be biologically decomposable. Packing material which endangers or pollutes the environment is prohibited.
- y. Packing for overland transport (truck/wagon) are not required to be seaworthy, nevertheless the packing structures shall be designed so as to enable over stacking, loading/unloading with crane or forklift.
- z. The Packing shall be suitable for Rail Transport as appropriate for the final destination.
- aa. The use of containers does not dispense with seaworthy packing. The materials/equipment shall in any case be packed for long storage.
- bb. Used one-way containers shall have C.S.C.-homologation certified by RINA, LLOYD Register of shipping or any other register, and in case of its expiration date they shall be rectified.
- cc. Bundles and pallets are acceptable but subject to PURCHASER's formal agreement.
- dd. Use of asbestos in any form (granular, powder or plates), is STRICTLY FORBIDDEN

6. Over dimensional cargo(ODC) / Heavy lift items (HLO items)/ Super heavy lift items

Any GOODS over General Cargo dimensions and up to 300 Tons are ODC cargo and Heavy lift items and Cargo weight above 300 Tons are Super Heavy Lift items.

a. Movement of ODC/HLO items by Road



EPC /EPCM Contractor has to perform the route survey for their ODC Shipments before the actual shipping of the ODC's

b. Movement of ODC/HLO/SHL items by multimodal transport

ODC & HL cargo where dimensions requires Multi-modal transportation through Sea and River by Ship, Barge and Trailer due to the various limitations of unit weights and dimensions of the GOODS.

7. Marking – General Requirements

- a. All individual items included in a single packing unit are to be marked separately.
- b. Each package shall be clearly marked in accordance with these requirements.



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- c. Each package mark shall be stenciled with indelible paint on the packing and shall not have any detrimental effect on the parts. Wood/metal plate markings may only be used if authorized by PURCHASER.
- d. Marking shall be applied on three sides (long sides and top).
- e. The colour to be used shall contrast with the package surface (never use yellow or red paint). Black and white paint are recommended.
- f. If the package does not have sufficient space to apply the shipping marks, metal labels of proportionate size shall be fixed to the package, but the main packing marks (Consignee, PURCHASER, Project. No. and Contract No., if any) shall be stenciled on the package, without fail.
- g. The size of the letters (legible at a distance of 8 meters) shall be determined according to package size, whenever applicable, as follows:

<u>Length of package</u>	<u>Size of letters</u>
Under 1000 mm	25 mmx20mm
1000 to 3000 mm	40mmx30mm
3000 to 5000 mm	50mmx40mm
5001 and above	60mmx50mm

- h. The following information shall be indicated:

- Consignee
- Plant Name
- Plant location
- Port/Country of Destination
- Letter of Credit No. (if any)
- Contract No. (if any)
- PURCHASER Project. No.
- PURCHASER P.O. No.
- PURCHASER M.R. No.
- Vendor's Name
- Item No.
- Description of Material
- Type of storage: (See para 3.1 0)
- Package no. of ... (total number of packages)
- Dimension (CM): (L)x(W)x(H)
- Weights (KG): (Gross)/(Net)

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i. Handling symbols (see figure 1)

For the identification of goods subject to special handling, the following international symbols shall be used to ensure proper handling and warehousing:

Symbols	Description	Remarks (Symbols to be shown on)
1	THIS WAY UP	All Top comers
2	FRAGILE HANDLE WITH CARE	All Top comers
3	KEEP DRY	All Top comers
4	KEEP AWAY FROM HEAT	All Top comers
5	USE NO HOOKS	All Top comers
6	CENTRE OF GRAVITY	Two sides of packages over 2000 kgs.
7	SLING HERE	All slinging points
8	HAZARDOUS MARKING	All Top corners

Special remarks: Symbols 15 cm high to be painted in black, On bright surface.

j. Storage Recommendation (see figure 1)

The SUPPLIER's storage recommendations shall be marked on each package and indicated on the packing list.



The symbols for the type of storage are:

- X or A" = storage in heated/ventilated warehouse and with special precautions
- XX or B" = storage in closed warehouse
- XXX or C" = storage in open shed
- XXXX or D" = storage in open air (covered by tarpaulins)

8. Types of Packing

The following types of packing shall be utilized:

- Bags
- Drums
- Reels
- Pallets
- Bundles
- Wooden crates
- Wooden any plywood cases

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a. Bags

5 multiple layer bags, with polyethylene lining shall be employed. Polyethylene lining is not necessary if bags are placed in cases or containers. Maximum weight of each bag shall be 50 Kg (preferably 30 Kg). Bags shall be palletized.

b. Drums (See Figure)

Steel drums shall be employed (plastic drums shall only be used for powders with a maximum weight of 50 Kg per drum).

Maximum capacity of each drum: 220 liters.

Maximum overall diameter: 570 mm.

Maximum overall height: 790 mm.

Drums for "Dangerous Materials" must strictly comply with IMO / ADR / IATA regulations or similar.

c. Reels (see figure 3)

All Reels (Wooden / Steel) Perimeters shall be saved by wooden boards with a minimum width of 300 mm, nailed to the flanges and fastened with S.S. metal strips (minimum thickness 3 mm).

The minimum diameter of the reels shall be twice the minimum bending radius of the cable. Wooden reels shall be sound and be protected by water-repellent paint. Marking shall be executed on metal plates fixed on two sides.

d. Pallets (see figure 4)

Pallets shall be four-way-operating and made of wood in accordance with ISO standards.

Maximum over staking weight on pallet shall be 1.2 tons.



Goods shall be fastened on the pallets unless otherwise agreed, by means of stretch-wrap plastic film and metal or plastic straps.

The maximum height of palletized materials shall be 2150 mm.

Pallets shall be for one-way-use.

e. Bundles (See attachment D)

Goods packed in the same bundle shall be of the same type and have approximately the same length. The fastening sections shall be placed symmetrically with respect to the center of the bundle.

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- i. Bundles up to two tons' weight shall be tied with steel wire ropes, sized for the purpose, duly clamped and tensioned, unless otherwise stated. Wooden elements or neoprene strips shall be inserted between the steel wire ropes and the bundle to partially absorb binding stress. The maximum distance between fastening sections shall be 1500 mm.
- ii. Bundles over two ton's weight shall first be tied with stainless steel strips, spaced at no more than 1500 mm, and then be secured by U-Iron profiles duly welded or bolted. The maximum distance between the U-Iron/bolts shall be 3000 mm. Their max. distance from the ends of the bundle shall be 1000 mm. Each section shall withstand a stress equal to the weight of the entire bundle.

Max bundle weight shall not exceed 5 tons.

The material forming the bundle shall be separated into rows by interposing layers of wood on and below the U-iron beams and between the multiple rows in order to shape the bundle in a prismatic form, thus facilitating correct stacking.

f. Wooden crates (see figure 5)

Materials not needing special protection against rain, sun, environmental agents and the like, may be shipped in crates.

The dimensions and thickness of boards and struts shall comply with the minimum figures provided in TABLE 1.

The bottom and structure of the crate shall support the entire weight without deformation or breaking, when lifted by two slings without spreaders with a minimum angle of 60°.

The bottom shall be suitable for handling by fork-lift (space for forks to be foreseen). Structure packing shall allow over-stacking of packages of same weight. Type of nailing, bolting, reinforcing and fixing of material inside the crate shall be compatible for wooden cases. Boards may be spaced from 100 mm to 150 mm, according to the volume for the crate itself. Contents shall be fixed to prevent movement and consequent damage either to the material or to the package structures.

Marking may be on a separate metal or plywood plates, fixed to the crate. Essential information such as project number, consignee's name, letter of credit number (if required by the consignee), purchase order number, etc., shall be stenciled directly on the crate boards.



g. Wooden and plywood cases (see figure 6)

i. General requirements

The thickness of boards or plywood paneling and the cross-section areas of struts shall comply with the minimum figures given in TABLE 1.

Width of board paneling shall be between 120 mm and 250 mm.

Width of plywood panels shall be minimum 300 mm.

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The wood used shall be sawn spruce, meeting the following quality requirements:

- Dry and seasoned spruce (relative humidity < 20%)
- Groups of knots shall not cover more than 1/3 of board width; individual knots shall be no larger than 50 mm diameter.
- At a visual check, the spruce shall be a light pink. Sawn spruce showing signs of degradation is not acceptable. The solid wood packing must be totally free of barks and live pests.
- The plywood shall be water- and moisture proof, multi-layer type, with phenolic glue.
- Filling material such as straw or any other flammable material is forbidden.
- The goods shall be firmly fixed to the packing floor and walls by means of bolts, spacers, shores, strip steel, steel wire or similar. Ends should be screwed or nailed in a manner where no sharp pieces are exposed.
- High quality wooden cases and/or crates shall be used. These should be constructed of top quality softwood or rigid plywood and be solid and robust for packages to be stacked in SEVERAL LAYERS (minimum 3 layers is requested).
- **USE OF PARTICLES OF FIBRES – OSB (Oriented strand board) IS PROHIBITED**
- UNDER NO CIRCUMSTANCES SHALL FIBREBOARD, CARDBOARD OR CHIPBOARD OR SIMILAR CARTONS BE USED AS OUTSIDE PACKING.

ii. Floor (see figure 7)

The distance between the floor skids shall not be more than 1000 mm. For ventilation and water drainage, the floor boards shall be arranged parallel with a spacing of 5-10 mm, or laid side by side in close contact with each other, but with 4 holes of about 120 mm diameter drilled in 4 free points.

The headers at both ends of the floor skid shall be bolted perpendicularly to the skid, except for weights under 1000 kgs, where nails may be used.

The floor boards shall be nailed to the skid.

The height of floor underskids must not be less than 80 mm, to enable insertion of fork-lift forks.

Floor underskids for cases over 2 tons' weight must be provided with metal edge protections to avoid penetration and breakage by lifting ropes.



iii. Side walls, ends and frames (see figures 8,9, 10 and 11)

Side wall frames shall sustain a superimposed weight equal to or greater than the weight of the contents of the case itself.

Cases over 2 tons' weight must be provided at side junctions with metal L-bar angles, spaced at a maximum distance of 1 meter.

Waterproof lining shall be applied to the walls.

Packing for contents over 1 ton weight shall be provided with additional vertical supporting battens between

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side walls and ends, adequately dimensioned, in order to make the packing suitably sturdy.

iv. Lids (see figure 12)

Lids shall be dimensioned so as to sustain a load of 1000 Kg/m² and be supported by stiffening elements placed along the upper part of the packing.

Polyethylene sheeting shall be arranged underneath the lid so as to overlap the lower side/end framing in order to avoid rain infiltration.

For weights over 2 tons the lid boards shall be protected by metal angles (at least 2 per side) to avoid the boards being removed by the lifting ropes.

v. Stiffening elements

Stiffening elements shall be fixed right below the lid. Their function is to enable the packing case to resist the pressure caused by the lifting ropes and overhead loads. The size of these elements depends on the weight of the case, the width and maximum permissible overhead load.

vi. Loading Distribution

As far as transport drawings issued by SUPPLIER are concerned, SUPPLIER shall control the adequacy of the supports and/or saddles and ensure that load distribution is in compliance with the Owner's / Consultant's nominated Transporter requirements with respect to road and sea transportation, as applicable, and with respect to Local / International Road Regulations, prior to saddle fabrication. In all cases, the maximum load distribution will never exceed 10 tonnes/m². It is the responsibility of the SUPPLIER to provide saddles (in quantity and sizes) requested by the Freight Forwarder or Transport Companies (Road and/or Sea).



In addition to the above, unless otherwise specified, INCOTERMS 2020 to be followed. Specific Guidelines for different categories of Engineering Goods, Dangerous Goods, Radioactive Goods are enclosed as Attachment - A to Attachment - E which also forms part of the guidelines for packing for the project.

9. Summary of packing required for each category of material

This para is applicable unless otherwise agreed.



TYPE OF MATERIAL	BAGS	DRUMS	REELS	CARTONS	PALLETS	BUNDLES	SADDLES	GRATES	CASES
Structural Steel - Panels,beams,columns,gratings						X		X	
Equipment -Towers,Vessels,Heat exchangers,air cooler,boilers							X	X	

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TYPE OF MATERIAL	BAGS	DRUMS	REELS	CARTONS	PALLETS	BUNDLES	SADDLES	GRATES	CASES
- Pumps,Compressors,blowers,fans,mixers									X
- Tower and Vessel internals									X
- Bolting and special small items									X
- Package units							X		X
Piping -Flanges,Fittings 10" and smaller than 10"									X
- Valves 6" and smaller than 6"									X
- C.S Pipes and remianing valves,fittings and flanges						X		X	
-Gaskets and bolts									X
- Welding rods									X
-SS Pipes								X	
Instrumentation -Cable trays and supports								X	
- Control room panels, racks, cabinets and associated instruments									X
- All other items									X
Electrical -Conduits						X			
- Cables			X						
- Electric Motors									X
- Ligthing equipment									X
-Panel boards,racks,cabinets and associated electrical materials								X	X
- Transformers									X
-UPS, Batteries									X
All other materials									X
Refractory lining -Refractory liquid mortar , castables,mixes,ceramic fibres,expanded polystyrene, adhesive paper, coatings , paints , etc..			X						
- Dense fire bricks,steel parts , Insulating fire bricks and blocks		X							



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TYPE OF MATERIAL	BAGS	DRUMS	REELS	CARTONS	PALLETS	BUNDLES	SADDLES	GRATES	CASES
Insulation -Ceramic fiber and Calcium silicate material, metal sheeting		X							
- Mineral wool blankets, supporting rings, fasteners, banding etc.	X								
Painting, thinners, etc									
-All materials		X							
Furnaces / Reformers									
- Steel panels, beams, columns, stacks						X		X	
-Catalyst tubes and radiant coils, convection coils, peepholes, access doors							X	X	
- Springs, bolting and other miscellaneous small items								X	X
; - Sealing mastics									X
Civil									
- Anchor bolts									X
- Reinforcing steel						X		X	
-Cement bricks									X
Chemicals and Catalysts									
- Catalysts, alumina balls, molecular sieves		X		X					

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10. Figures and table

Please refer to the figures and table hereto enclosed.

STORAGE CODES : FIGURES AND TABLE-1



D



A

B

C



	STORAGE IN AIR CONDITIONED PREMISES	STORAGE IN COVERED OR ENCLOSED PREMISES	STORAGE UNDER TARPAULIN	STORAGE OUTDOOR WITHOUT COVERS
STORAGE CODES	D	A	B	C
STRUCTURAL STEEL -Panels, beams, columns, grating -bolting -Material for civil work		X		X X
EQUIPMENT -Towers, vessels, kiln, mills, air coolers, boilers -Pumps, compressors, blowers, fans, mixers, reducers -Tower and vessels internals -Bolting and special small items -Mechanical parts -packing unit		X X X	X X X	
PIPING -Flanges, fittings 10" and smaller than 10" -valves 6" and smaller than 6" -Pipe and remaining valves, fittings and flanges -Gaskets and bolting -Welding rods		X X X X	X	
INSTRUMENTATION. LABORATORY -Cable tray and support			X	

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	STORAGE IN AIR CONDITIONED PREMISES	STORAGE IN COVERED OR ENCLOSED PREMISES	STORAGE UNDER TARPAULIN	STORAGE OUTDOOR WITHOUT COVERS
STORAGE CODES	D	A	B	C
-Control room panels, racks, cabinets and associated instruments -All other items	X X			
ELECTRICAL -Cable reels, conduit and cable trays -Electrical motors designed for outside service -Electrical motors designed for inside service -Supporting steel, stanchions, saddles, etc.... --Lightning equipment -Panel boards, racks cabinets and associated electrical -transformers -U.P.S., batteries -All other materials	X X X X X	X	X X X	
REFRACTORY LINING -Refractory liquid, mortar, castables, mixes, ceramic fibres Expanded polystyrene, paper adhesive coatings, paints... -Dense fire bricks, steel parts, insulating fire bricks and blocks		X	X	
INSULATIONS -Ceramic fibre and calcium silicate material, metal sheeting -Minerals wool blankets, supporting rings, fasteners, Banking,...		X X		
PAINTING, THINNERS, etc. -All material		X		
CIVIL -Anchor bolts -Reinforcing steel -Cement (in bags), bricks		X	X	X

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	STORAGE IN AIR CONDITIONED PREMISES	STORAGE IN COVERED OR ENCLOSED PREMISES	STORAGE UNDER TARPAULIN	STORAGE OUTDOOR WITHOUT COVERS
STORAGE CODES	D	A	B	C
CHEMICAL'S & CATALYST -Catalysts, alumina balls, molecular sieves		X		

MAIN SYMBOLS FOR PACKAGE MARKING



For a complete set of symbols, Ref. ISO 7000/ No. 0621 through 0632.



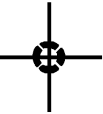
Figure 1

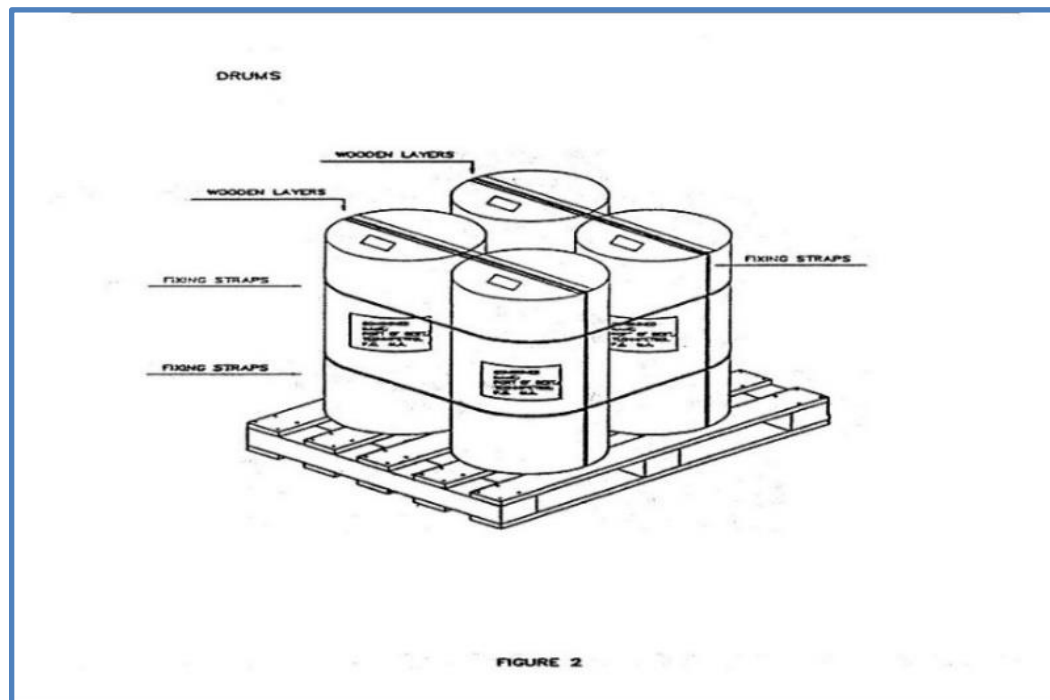
Symbols	Description	Remarks
	<u>FRAGILE</u> , <u>HANDLE WITH CARE</u>	To be shown minimum on one side and on top (preferred on all sides).
	<u>USE NO HOOKS</u>	To be shown minimum on one side and on top (preferred on all sides).
	<u>THIS WAY UP</u>	To be shown at top corner of all sides
	<u>KEEP AWAY FROM</u> <u>HEAT</u>	To be shown minimum on one side and on top (preferred on all sides).

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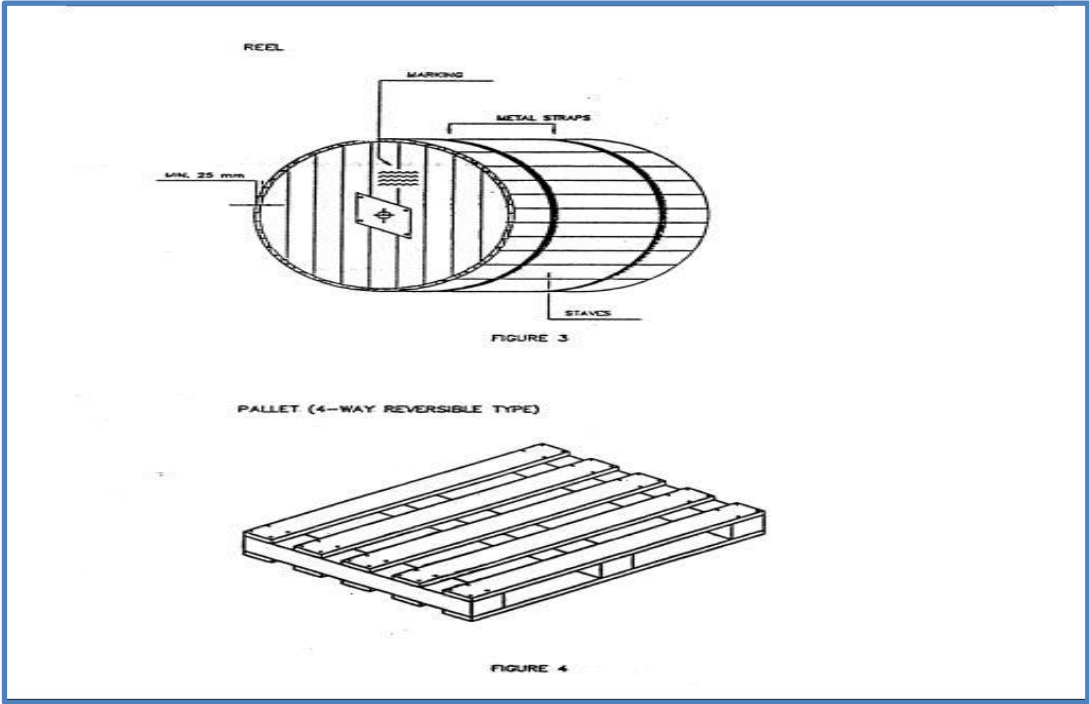
	<u>SLING HERE</u>	To be shown on locations, depending on centre of gravity.
	<u>KEEP DRY</u>	To be shown minimum on one side and on top (preferred on all sides).
	<u>CENTRE OF GRAVITY</u>	To be shown minimum on all packages over 1000 kg. To be shown on all sides.



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TABLE 2

SECTIONS FOR BOARDS, HEADERS AND STRUTS

WEIGHT KGS	FLOOR-SIDES-ROOF MINIMUM THICK MM		SKIDS MINIMUM SECTION	HEADERS MINIMUM SECTION	SIDE WALL MINIMUM FRAME SECTION	MAXIMUM INTERNAL LENGTH
	PLYWOOD	BOARD	MM	MM	MM	MM
300-1500	10	25	90 X 60 or 80 X 80	90 X 60 or 80 X 80	/	4000
1501-3000	10	25	90 X 60 or 80 X 80	90 X 60 or 80 X 80	100 X 30	4000
3001-5000	12	30	90 X 90	90 X 60 or 80 X 80	100 X 35	5000-6000
5001-8000	15	30	100 X 100	100 X 80	100 X 35	6000-7000
8001-12000	15	40	120 X 120	120 X 80 or 100 X 100	100 X 45	7000-8000
12001- 15000	20	40	150 X 150	150 X 80 or 120 X 120	100 X 60	8000-9000

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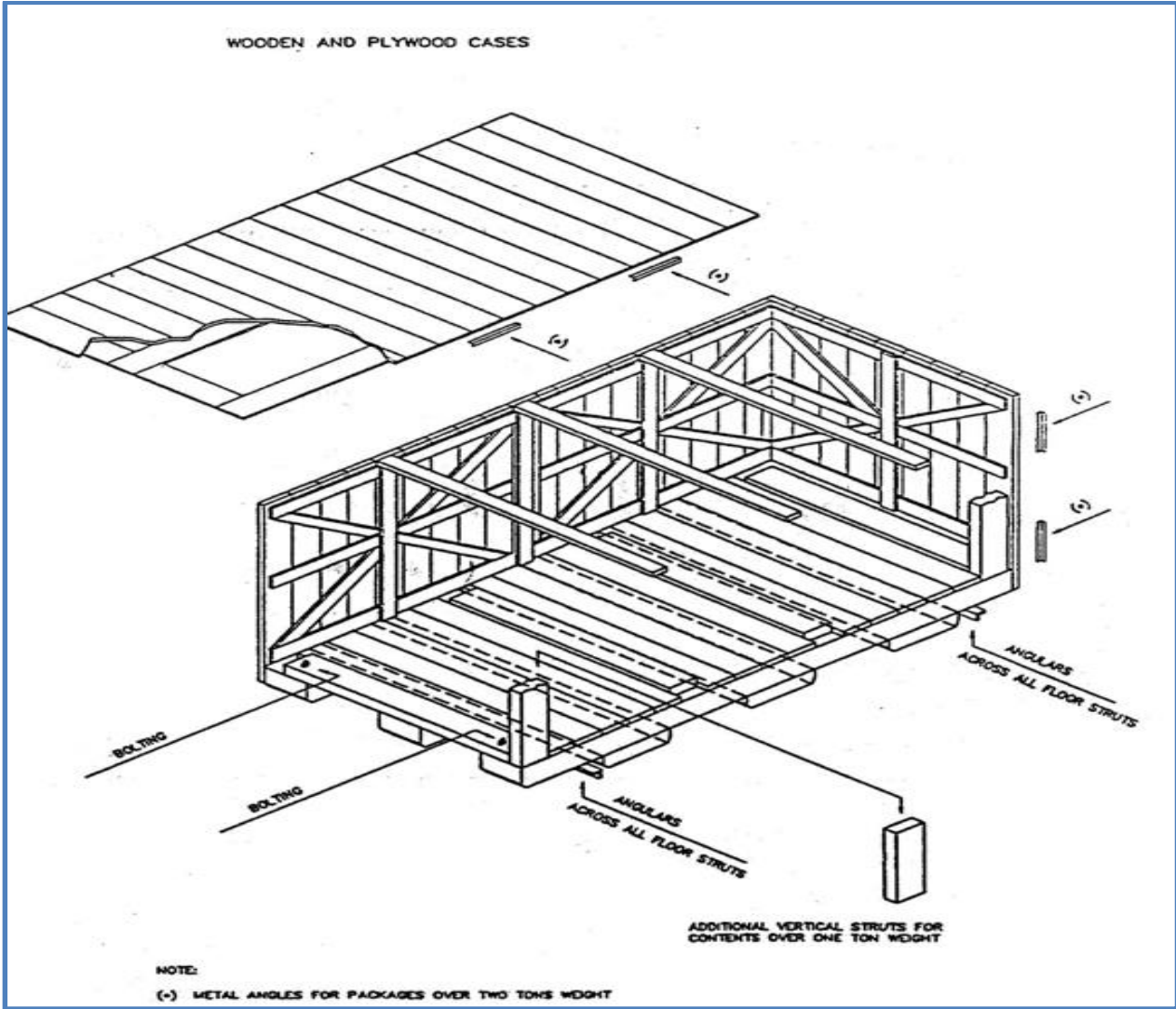


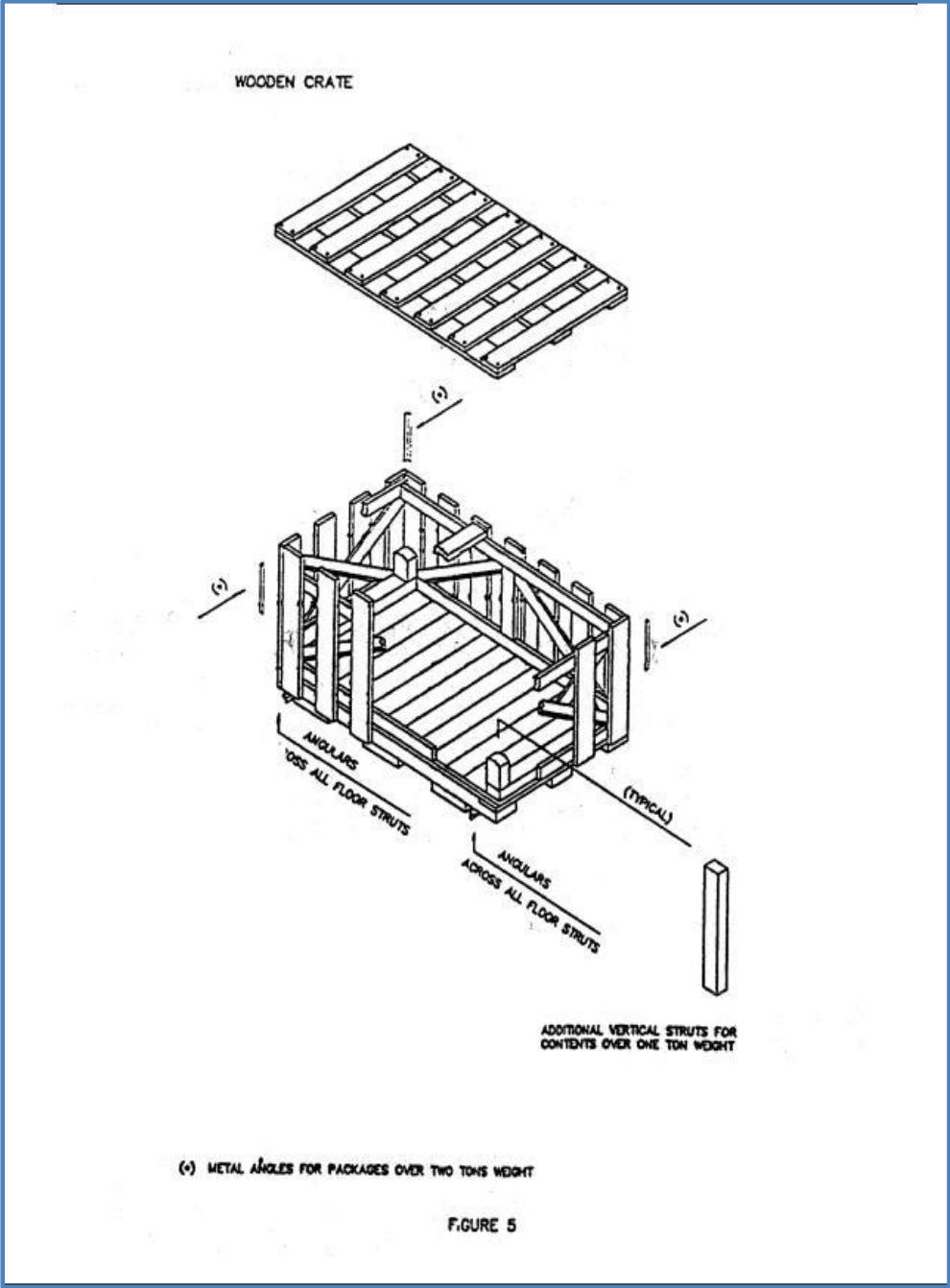


FIGURE 5



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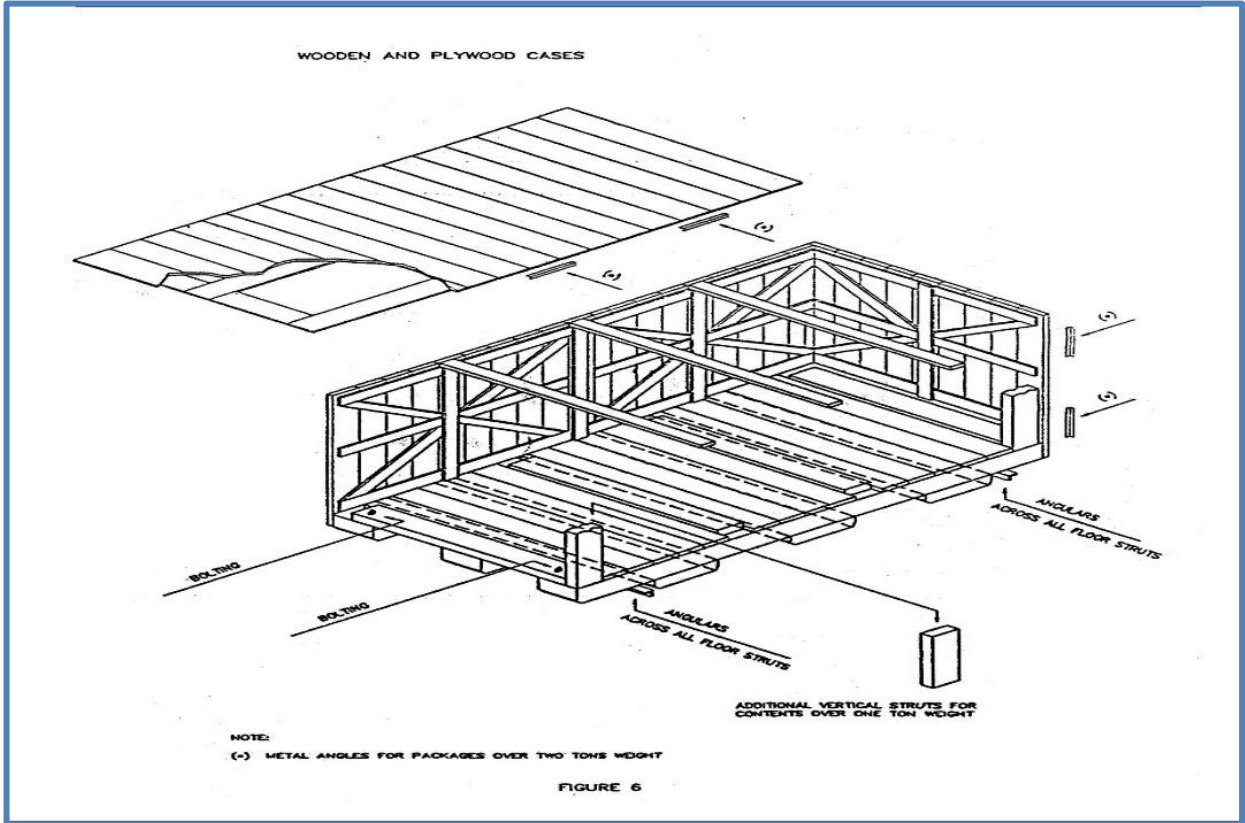
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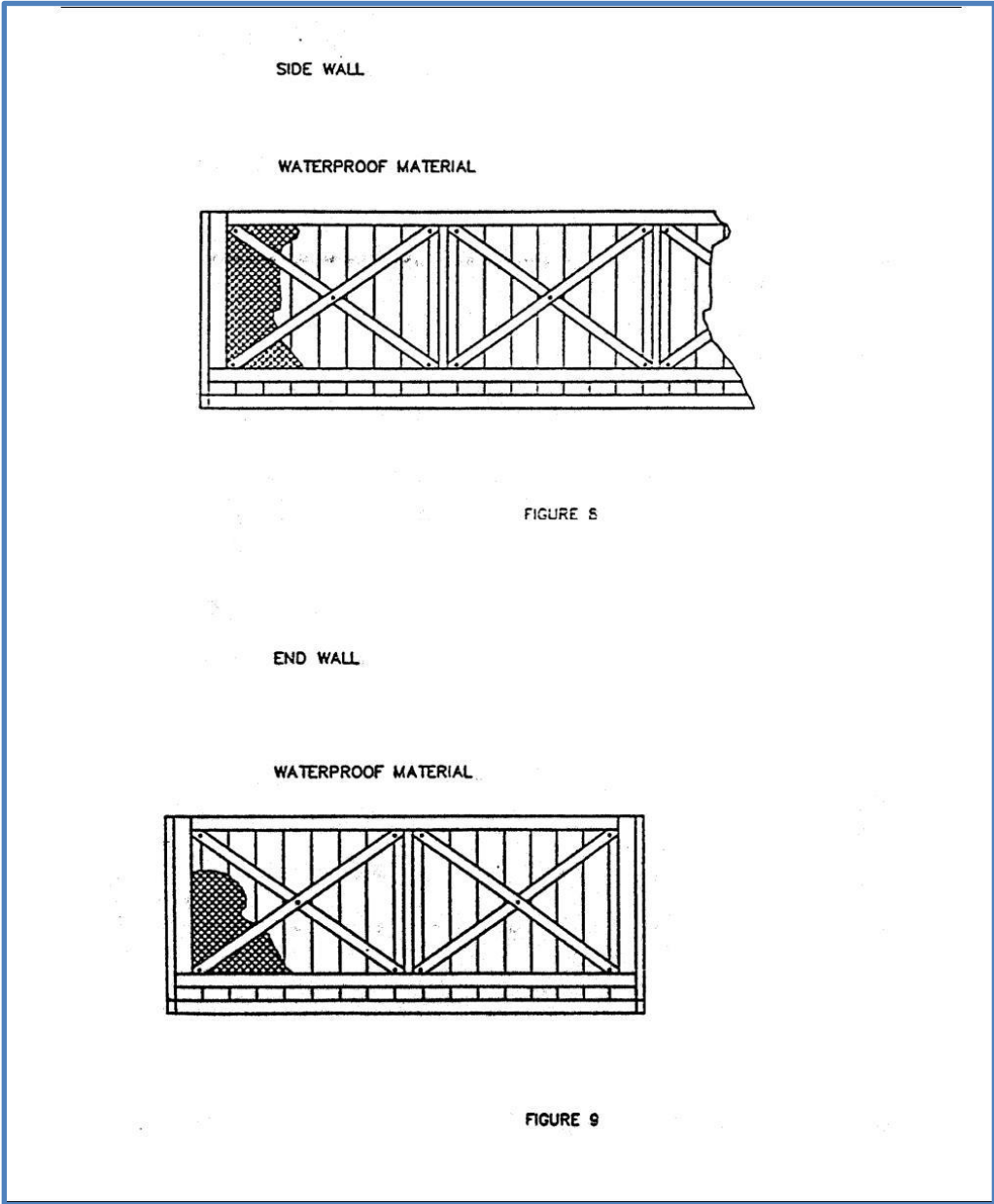
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IOCL GUJARAT REFINERY

CLIENT

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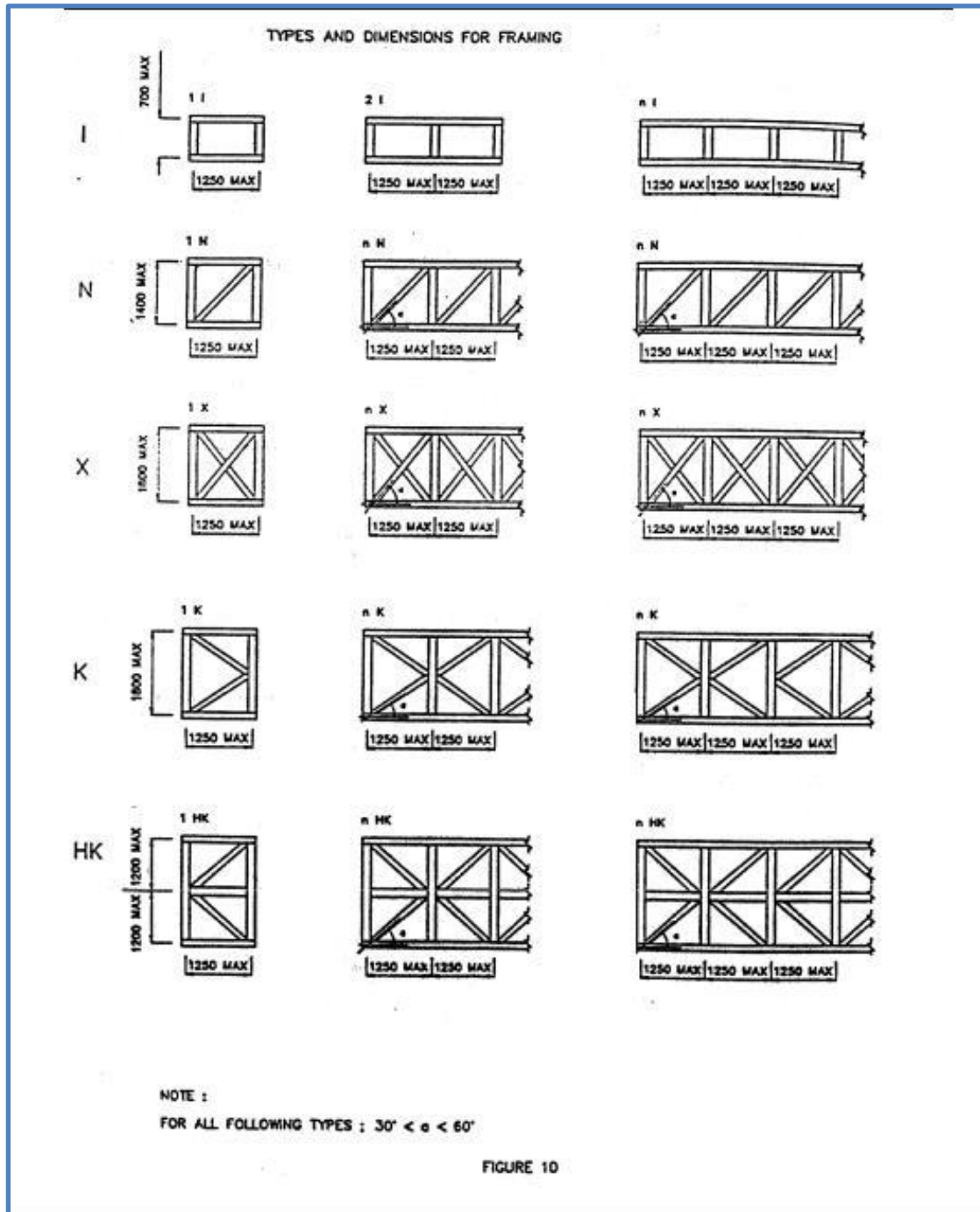
Packing, Marking and Shipping
Specifications

Project No.
077154C001

Document No.
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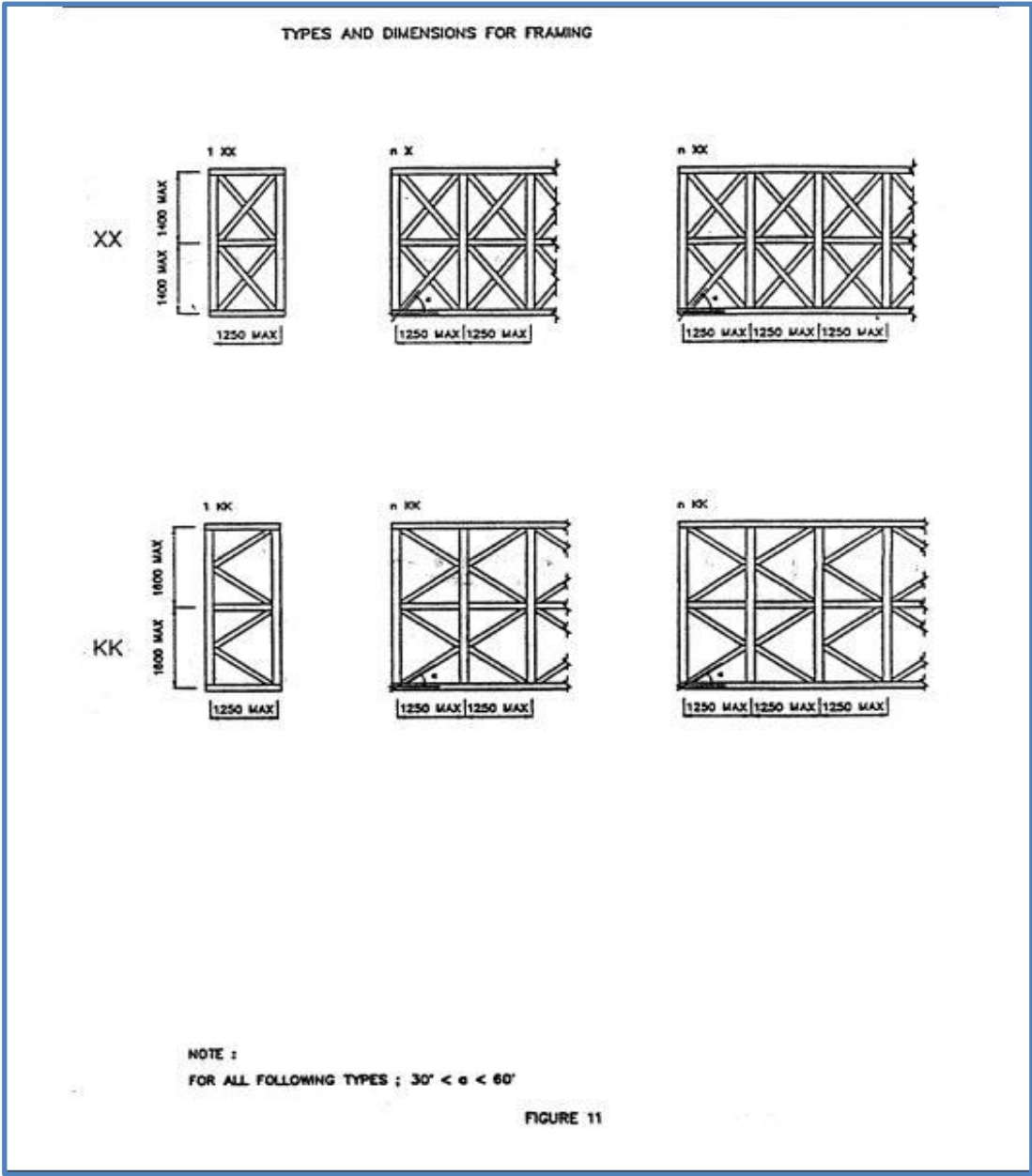
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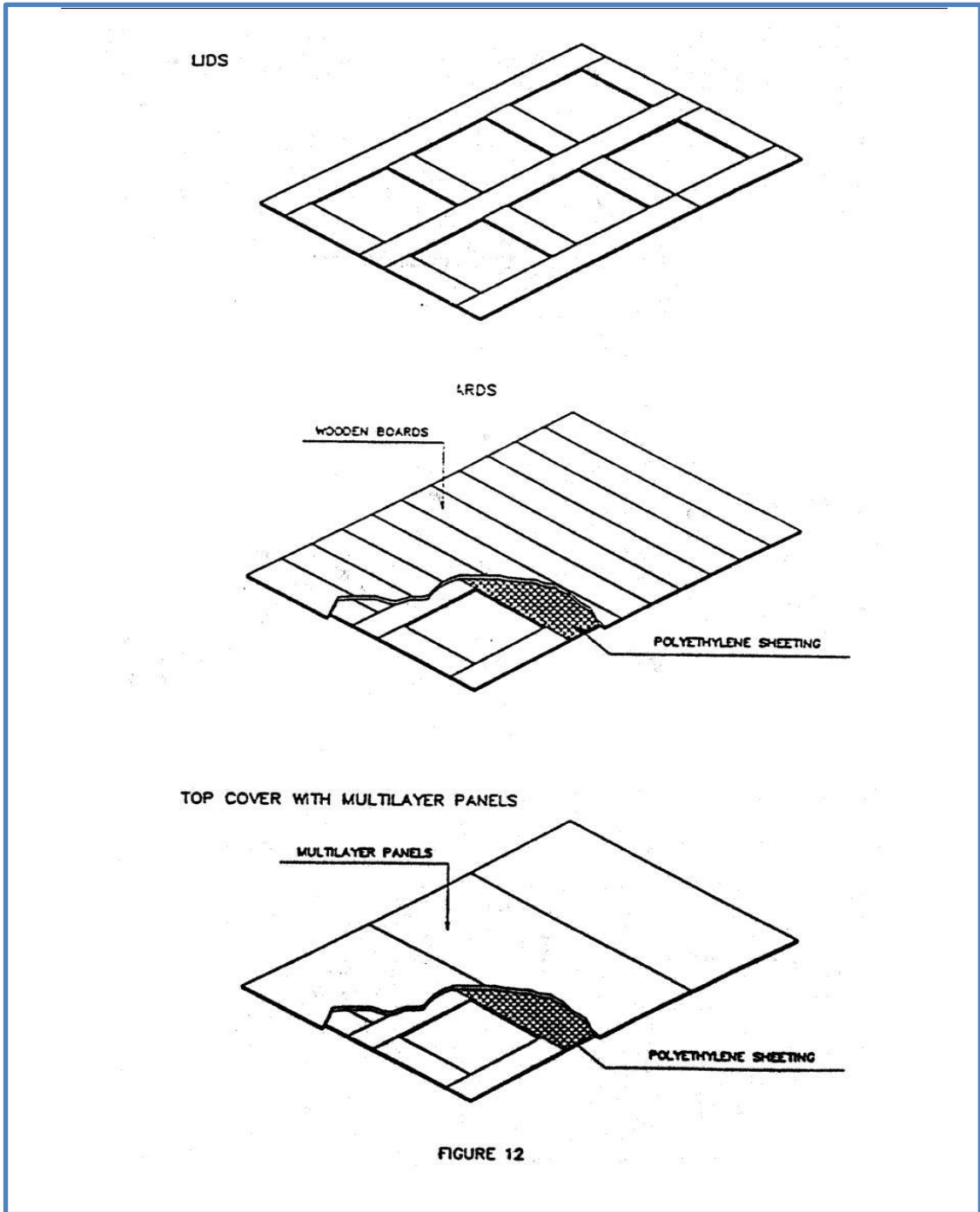
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11. List of Attachments

Packing guidelines for shop-assembled or prefabricated pressure vessels, tanks, heat exchangers, various skid units and coolers.

"B" – Packing guidelines for pumps, compressors, machinery and relevant accessories

"C" – Packing guidelines for:

- electrical motors, generators, panels, other electrical equipment, instrumentation
- electrical / instrumentation cables
- copper tubes
- cable trays.

"D" – Packing guidelines for piping materials (pipe, prefabricated piping, flanges, fittings, valves and bolts), steel structures and metal plates.



"E" - Packing guidelines for miscellaneous materials:

- vehicles
- welding electrodes
- refractory bricks
- cement
- mineral wool and foam glass
- chemical products and catalysts
- lubricants
- dangerous materials
- radioactive materials

12. Sample Documents

- Sample 1 - TYPICAL PACKING LIST FORMAT
- Sample 2 - LETTER FOR SPECIAL HANDLING INSTRUCTION
- Sample 3 - QUALITY CERTIFICATE
- Sample 4 – SUPPLIER DECLARATION OF ORIGIN

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ATTACHMENT "A"

PACKING GUIDELINES FOR SHOP-ASSEMBLED OR PREFABRICATED PRESSURE VESSELS, TANKS, HEAT EXCHANGERS, VARIOUS SKID UNITS AND AIR COOLERS.

- **SHOP-ASSEMBLED PRESSURE VESSELS, TANKS, HEAT EXCHANGERS AND VARIOUS SKID UNITS**



- Shop-assembled pressure vessels, tanks and heat exchangers shall be skidded with wooden or steel saddles (see figure 1 ,2 and 3), suitably shaped and fastened to the piece by proper metal strips (fastening by wire ropes is forbidden, unless otherwise specified). To avoid scratching the shell, soft neoprene strips shall be placed between the metal plate and the shell itself.
- Pressure vessels, tanks and exchangers with dimensions up to (length x width x height) mm 4000 x 1 000 x 1 000 shall be packed in crates.
- Saddles shall be manufactured with a minimum supporting angle of 90°. The saddle surface shall adhere to the equipment shell and a neoprene layer, or the like, shall be interposed between them in order to avoid sliding of the shell itself.
- Saddles shall be fastened to the piece so as to bear the saddle weight and allow easy removal and reassembly of the saddle itself.
- Turnbuckles shall be appropriately tensioned taking into account possible stacking, caused by wood shrinkage.
- Some special oceanic transports may require that the quantity of saddles, their dimensions and fastening system to the skid unit are calculated taking into account the effect of dynamic forces during navigation, due to the following acceleration:
 - Longitudinal: 0.36g
 - Trasversal: 0.59g
 - Vertical: 0.20g
- In such a case, detailed drawings and calculations for saddles/fastening system to skid unit structure shall be submitted to PURCHASER, for approval.
 - Height of saddles shall be the lowest possible, without prejudicing their strength and rigidity.

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- In principle, saddles or skids for equipment weighing more than 150 tons shall be entirely of steel unless otherwise agreed.
- Unless otherwise agreed, nozzles, manholes etc. Shall be sealed by means of compatible metal disks (min. thickness 3 mm) with gaskets (min. thickness 5 mm), duly bolted (see figures 4 and 5). Fixing by wire or adhesive tape is strictly forbidden.
- All parts (nozzles, flanges, instrumentation, coating supports and the like), as well as the outskirt itself, subject to damage or scratches by the lifting ropes or handling devices, shall be properly protected or removed whenever possible.
- The equipment skid-unit shall be lifted by two slings with an angle of 60° and a maximum height of 12 meters between the derrick hook and the bottom of the equipment skid-unit.
- Whenever special lifting/handling instruction are giving by SUPPLIER for which are necessary special devices such as lifting spreaders and similar, those devices shall be included in the supply, fully certified by the pertinent authority and complete with wired ropes or belts, shackles etc. to connect the material to the vessel's hook.
- The maximum distance between saddles or skid shall be 8 meters.
- When using saddles / skids made by two or more pieces of lumber, bolts and nuts shall be used for joining purposes Nails are forbidden.
- For equipment already provided with metal base saddles/skids, wooden boards shall be fixed beneath them by means of bolts and nuts. Nails are forbidden. The said wooden boards shall not be larger than the diameter of the skidded equipment.
- Parts that may increase volume excessively shall, whenever possible, be dismantled and separately packed and duly countersigned for assembly at job site.
- Lifting point symbols shall be placed in areas where no damage can be caused to the external assembled parts by lifting ropes. In any case the center of gravity shall be placed between the lifting points. Each lifting point shall be at the same distance from the center of gravity.
- All equipments or skid-units shall be provided, whenever possible, with lifting lugs to avoid scratches or damages to the equipment caused by the lifting ropes.

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- For exchangers fitting with expansion joints or bellow, a suspended protection must be provided. This protection shall consist of well fastened wooden reinforcements, or cagings, preventing movement in any direction.
- Wooden/steel saddles shall be at least as large as the external diameter of the vessel/exchanger/column/rector shell, to ensure safer stability during storage and/or transportation.
- Pressure vessels, tanks and heat exchangers shall be placed on saddles in horizontal position.
- Wooden/steel saddles shall be designed and constructed as to grant a maximum pressure of 12 tons per square meter on the ground.
- If specifically requested in the Purchase order, the equipment shall be protected with inert gas (dry nitrogen) at a pressure such to prevent infiltration of atmospheric air, which could transmit moisture to the internal parts of the equipment.



Internal production for ocean shipment shall be done as below:

Nitrogen blanketing, temporary rust preventive coatings or a vapor proof bag with moisture control may be used for carbon and low alloy steels.

Nitrogen blanketing at a pressure of 35 Kpa (5 psi) shall be provided for vessels made completely of Austenitic Stainless Steels, high alloy steel and non-ferrous materials and vessels internally clad or weld-over layed with Austenitic Stainless Steel, high alloy steel and non-ferrous materials in the following conditions.

- Ocean shipment
- Where vessel is not undergoing fabrication, construction activities, after hydrotesting or prior to commissioning.

Established pressure shall be maintained by connecting the inside of the equipment to a nitrogen cylinder through a suitable calibrated pressure reducer to compensate any loss of gas. Pressure gauges shall show the pressure both inside the nitrogen cylinder and inside the equipment. The system shall also include the valve for nitrogen outlet. The nitrogen cylinder shall be duly fastened to the equipment and shall be duly labeled and marked in accordance with regulations for **transportation of dangerous goods**.

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- All the equipment for ocean shipment shall be externally painted as per jobs specification and external surfaces of solid stainless vessels, high alloy steel and non-ferrous materials shall be protected using a temporary protective system compatible with those materials.

- **PREFABRICATED PRESSURE VESSELS, TANKS AND HEAT EXCHANGERS**

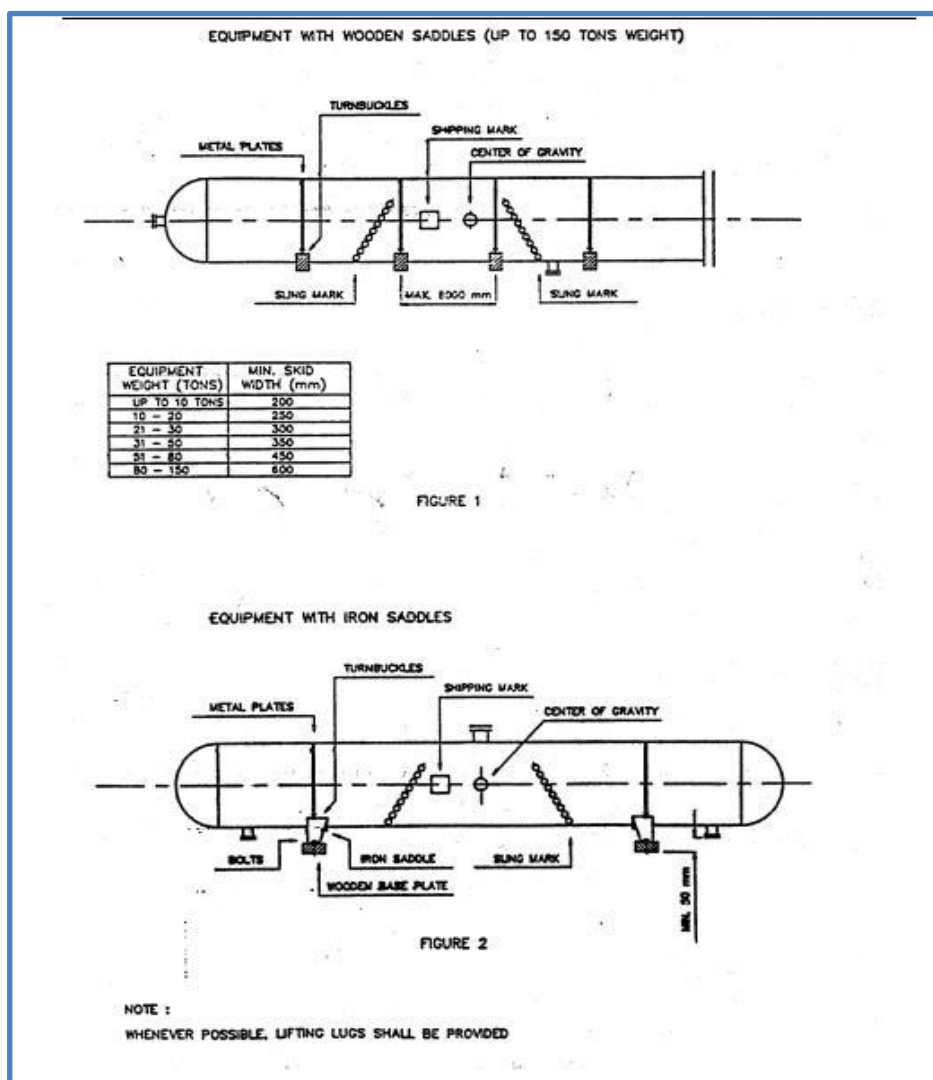
- Rolled metal plates shall be bundled and placed on wooden skids up to 2 tons weight or on U-Iron skid structures up to 20 tons weight, unless otherwise agreed (see figure 6).
- For painted or coated flat/rolled metal plates, PVC bars with a thickness of 8-10 mm shall be interposed as spacers.
- Loose painted or coated flat/rolled metal plates shall be lifted by fiber slings instead of metallic ropes or chains.
- In order to avoid water stagnation, rolled metal plates shall in principle be placed face-down on suitably-designed skids provided with lifting lugs to enable handling and stowing without deformation of the material (see figure 7)
- Rolled plates over 20 mm thickness may be shipped in bundles containing two or more pieces, duly clamped / welded with metal angles (see figure 8).
 - Rolled metal plates shall be provided with suitable bracing to avoid distortions during transit.
 - Spacers shall be provided between the rolled plates.
 - Steel skids, steel saddles, steel boxes, steel crates and any other steel work used for protection, packing and transportation of rolled plates, exchangers, columns, vessels, boilers, pipes, beams and the like shall be coated as to prevent rusting.
 - Packages for heat exchanger tubes of lengths > 8 mts shall be reinforced lengthwise by steel profiles.
 - Templates having diameter over two meters shall be cut into two or three sections to reduce their overall dimensions to facilitate handling and transportation.

- **AIR COOLERS**



- Air cooler bundles shall be packed in wooden crates.

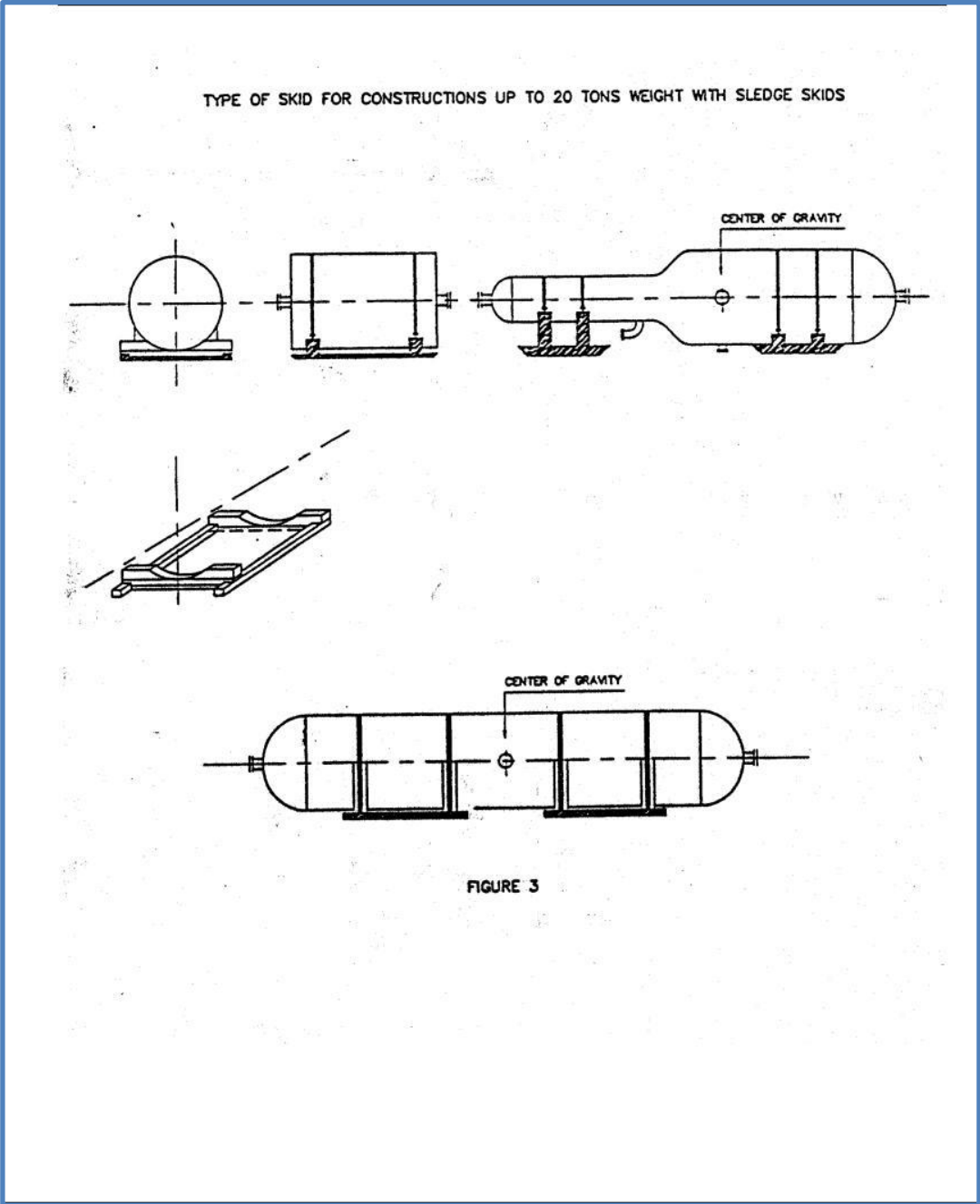
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- Inside the crate, finned surfaces shall be protected by a sheet of plastic material or equivalent capable of preserving the fins from bumping. The SUPPLIER shall check that the finned tubes are properly separated from each other by spacers and shall guarantee the equipment against bumps or bending moments due to out-of-balance weight during transport, loading and unloading operations.
- The separate parts of the cooler can be packed in wooden cases or crates.





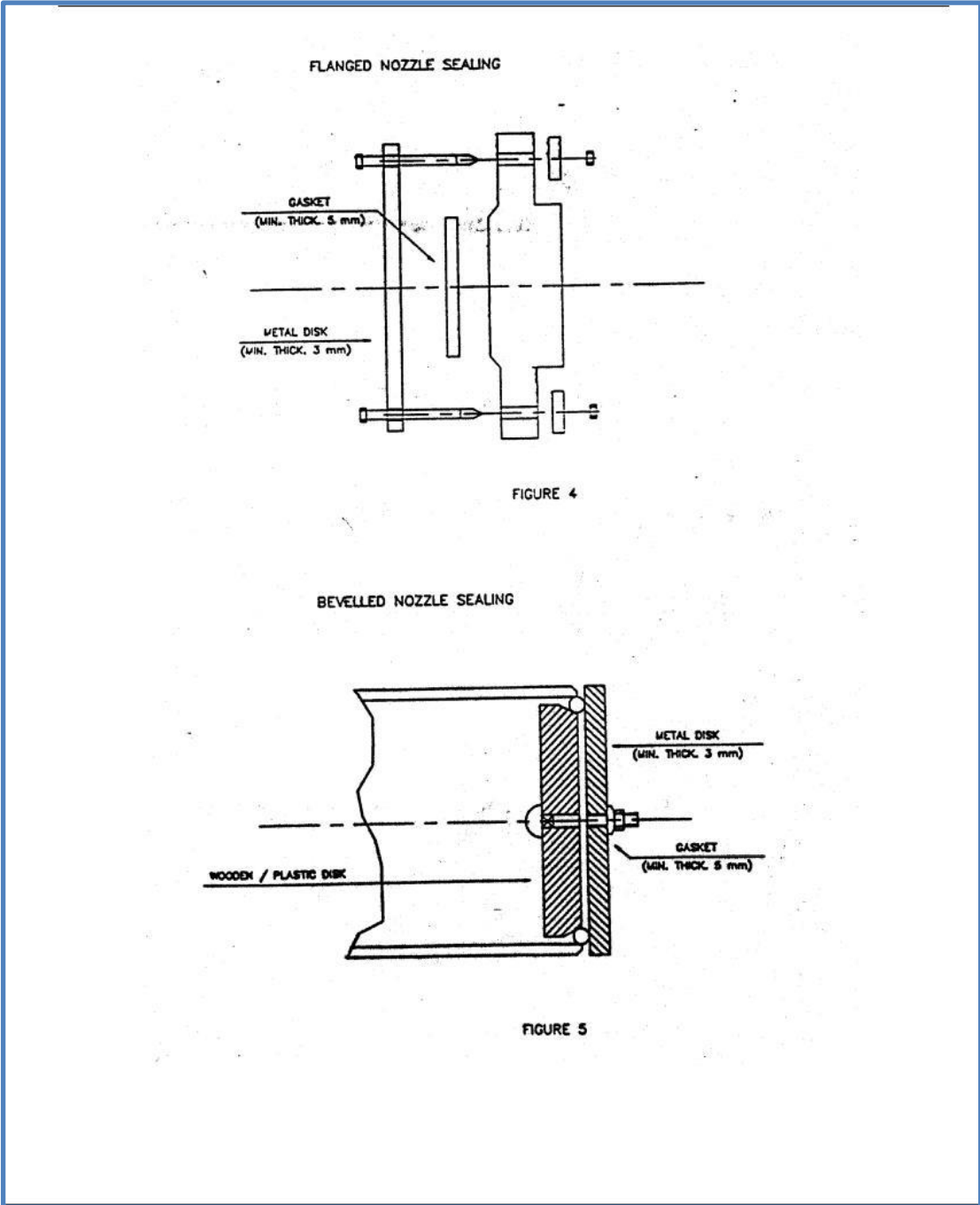
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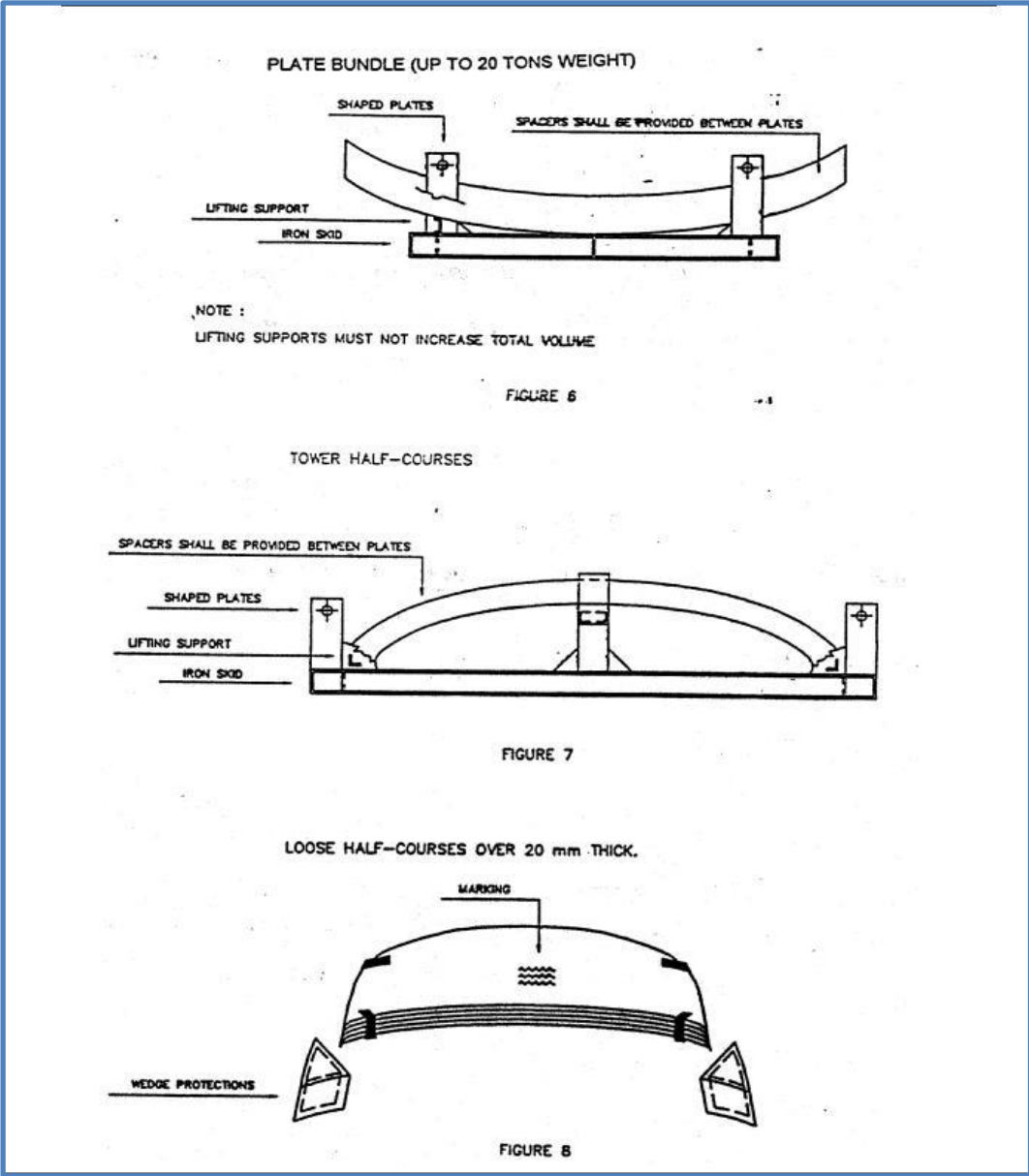
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ATTACHMENT "B"

PACKING GUIDELINES FOR PUMPS, COMPRESSORS, MACHINERY AND ACCESSORIES.

Pumps, compressors, machinery and the like shall be packed in wooden cases.

Surface protection shall be as per para 2.3 of the Packing & Marking Guidelines.

Threaded connections shall be closed by well-greased threaded plugs.



All flanged connections shall be protected by bolted metal disks and rubber gaskets.

The base plate shall be bolted to the case bottom.

All disassembled parts shall be protected, identified and packed separately, even if contained in the same case.

For machinery/compressors over 30 tons, even if delivered in seaworthy packing, protruding lifting lugs or cords, well fixed to their skid-frames shall be provided.

Vapour barrier bags shall be sealed to avoid air infiltration.

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ATTACHMENT "C"

PACKING GUIDELINES FOR

- ELECTRICAL MOTORS, GENERATORS, PANELS, OTHER ELECTRICAL EQUIPMENT
- INSTRUMENTATION
- ELECTRICAL INSTRUMENTATION CABLES
- COPPER TUBES CABLE TRAYS.

- **ELECTRICAL MOTOS, GENERATORS, PANELS, OTHER ELECTRICAL EQUIPMENT AND INSTRUMENTATION**

Equipment/materials shall be packed in wooden cases and be protected by a thermo-welded hermetic barrier according to point 2.12 of packing & Marking Guidelines.

Plug-in instrumentation installed on panels shall be properly fastened to the frame.

If damages or deterioration during transportation and / or storage period, expected for the Plug-in instruments, then they should be removed and packed separately.

Instrumentation shall be packed with a considerable quantity of cushioning material, to absorb shocks, thus preventing damage.



For materials and equipment particularly subject to deterioration, due to vibration or shocks (e.e. telemetering and telecontrol equipment, cases shall be constructed with double bottoms or double casing, supported by suitable rubber or synthetic pads.

- **ELECTRICAL / INSTRUMENTATION CABLES**

Cables shall be supplied on reels

The reels shall be provided with thermo-retractable caps in order to avoid moisture penetration, especially for cables with mineral paper or hygroscopic insulation.

The external surface of cables placed peripherally shall be protected with tarred paper and/or cellophane sheeting.

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- **COPPER TUBES**



These shall be supplied on reels.

- **CABLES TRAYS**

These shall be crated.

- **TRANSFORMERS**

- Transformers up to 2.500 KVA shall be packed in wooden cases suitable for sea transport, with all the relevant accessories assembled as well as filled up with oil (ready for service).
- Transformers over 2.500 KVA shall be shipped according to the following instructions:
 - Transformers shall be shipped with low oil level and with all the accessories (i.e. conservator, radiators, eta.) removed.
 - The accessories shall be packed in wooden cases suitable for sea transport as per point 5.1.
 - The transformers' oil shall be contained in steel drums, duly fastened on pallets.
 - The transformer itself shall be shipped in wooden crate.
 - The active part of transformers, located inside the tank over the oil level, shall be protected with inert gas (dry nitrogen) at a pressure such to prevent infiltration of atmospheric air, which could transmit moisture to the insulation.
 - Established pressure shall be maintained by connecting the inside of the transformer tank to a nitrogen cylinder through a suitable calibrated pressure reducer to compensate any loss of gas.
 - Pressure gauges shall show the pressure either inside the nitrogen cylinder or inside the transformer's tank.
 - The system shall also include the valve for nitrogen outlet.

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- The nitrogen cylinder shall be duly fastened to the transformer skid and shall be duly labeled and marked in accordance with regulations for **transportation of dangerous goods**.



ATTACHMENT "D"

PACKING GUIDELINES FOR PIPING MATERIALS (PIPE, PREFABRICATED PIPING, FLANGES, FITTINGS, VALVES AND BOLTS), STEEL STRUCTURES AND METAL PLATES.

- PIPES**

- In order to protect the beveled ends of pipes over 4", shall be plugged with plastic caps with a minimum depth of 80 mm. Beveling of pipes over 38" diameter shall be protected by Aluminum-Rings or wooden paddings, unless otherwise agreed.
 - CS pipes, alloy pipes, galvanized pipes and externally-coated or bituminized pipes shall be:
 - packed in crates with a maximum weight of 2 ton, (in this case maximum length of pipes shall be 8 meters) if the gauge is less than 1/2"
 - Packed in bundles when diameter is between 1/2" and 10".
 - Loose when diameter is equal to or larger than 10".
- Externally-coated or bituminized pipes included in a bundle shall be protected by winding vegetable or synthetic fibre cord, in order to avoid direct contact between the metal strap or, in general, the fastening elements, and the surface of the pipe; fibre slings shall be used instead of wire ropes; when transported loose, pipes shall be provided with plastic or rubber rings, in order to avoid damage to the coating.
 - SS pipes, cast iron pipes, Aluminum pipes and plastic pipes shall be crated.
 - Cemented pipes shall be transported loose. They shall be handled with particular care (use of forklift is forbidden - fibre slings shall be used instead of wire ropes); the maximum distance between the supporting or lifting points shall be 1.8 meters to avoid bending; the supports of each pipe shall be lined with rubber in order to absorb shock during transport, maximum stacking height shall be 2 meters.

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- **PREFABRICATED PIPING**

- Prefabricated parts may be packed in crates or, with PURCHASER's prior agreement, in a S.O.C. - approved container. For partial consignments, each shipment shall include all prefabricated parts belonging to a single Isometric drawing.

- **FLANGES, FITTINGS, VALVES, BOLTS AND NUTS**

These shall be packed in cases except for fitting > NB 150 which may be packed in crates.

They shall be protected against corrosion by special heavy-duty grease.

Contract surface of flanges and flanged fittings shall be duly protected to avoid mechanical damage.

Valves shall be protected by plugs of plastic material and be placed inside the packing in a vertical position, to avoid damage to hand wheel caps.

Important remark

Over stacking of flanges, fittings, valves or bolts in boxes without proper fixing may compress and subsequently break the package walls.



To prevent this and injury to by-standers, it is mandatory that the said materials be packed so as to keep a maximum package height of 800+ 1000 mm where possible.

- **STEEL STRUCTURES**

Steel structures, profiles, ladders and/or any prefabricated items shall be bundled as long as their shapes, lengths and weights allow a bundling easy to handle. Otherwise they shall be placed in one-way used containers or in steel crates constructed with steel bars having sections like those of the packed items, so that to enable their reutilization at the job-site.

- **FLAT METAL PLATES**

These shall be crated or bundled with PURCHASER's prior agreements.

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ATTACHMENT "E"



PACKING GUIDELINES FOR MISCELLANEOUS MATERIALS

- VEHICLES
- WELDING ELCTRODES
- REFRACTORY BRICKS
- CEMET
- MINERAL WOOL AND FOAM GLASS
- CHEMICAL PRODUCTS AND CATALYSTS
- LUBRICANTS
- DANGEROUS MATERIALS
- RADIOACTIVE MATERIALS

• **VEHICLES**

- The following protective measures shall be taken:
- Minimize the quantity of fuel, cooling water, and lubricating oil.
- Disconnect the battery.
- Remove forklift forks, crane accessories, and truck hoods and packs separately.
- Securely fasten accessories to the operator's seat wherever possible.
- Remove spare tyres.
- Grease the axles adequately.
- Glass parts must be protected by plywood or other screening material in order to avoid handling damage.

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- **WELDING ELECTRODES**

- Welding electrodes shall be contained in hermetically soldered metallic boxes, absolutely water and moisture proof, and packed in wooden cases.

- **REFRACTORY BRICKS**

- Refractory bricks shall be protected by polyethylene sheeting, allowing air circulation, and packed in wooden cases.

- **CEMENT**

- Cement shall be packed in to three-wall paper bags wrapped in polyethylene bags and fastened on to the pallets.

- **MINERAL WOOL-FOAM GLASS**

- Unless otherwise agreed, mineral wool shall be packed in double polyethylene bags, fastened on to the pallets. Foam glass shall be packed in three-wall cartons lined with polyethylene wrapping, and fastened onto the pallets.



- **CHEMICAL PRODUCTS, CATALYSTS**

- Unless of a hazardous nature, these materials may be packed in bags protected by polyethylene sheeting or in steel drums, fastened onto the pallets.
 - Large quantities of drums are preferably shipped, with PURCHASER's prior agreement, in C.S.C. homologated containers.

- **LUBRICANTS**

- Lubricants shall be shipped in 220 ltrs steel drums duly fastened onto the pallets.
 - If drums are designed with welded top covers they may be shipped loose. SUPPLIER, besides all the export documentation, shall make available, whenever required by the rules/regulations of the exporting country, the export form (UTIF-certificate or the like) duly filed-in and signed.

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- **DANGEROUS MATERIALS**

- Good classified as dangerous (i.e. paints, gas bottles, chemicals, or the like) must be packed, labeled and marked in accordance with IMO/ADRIATA regulations.
- The SUPPLIER shall advise the PURCHASER of all packages containing dangerous goods as classified by IMDG, RID/ ADR and/or IATA regulations (e.g., paint, gas bottles, chemicals).
- The following specific details of the goods shall be stated:
 - Trade name/ chemical name/ synonyms
 - IMDG Class No. :
 - U.N. No. : / Page No.:
 - Packing group :
 - Properties : (flashpoint etc.)
 - Type of danger : (e.g., flammable, explosive)
 - Effects of over-exposure :
- The SUPPLIER shall use official 'Material Safety Data Sheets', which shall accompany the goods.
- Packages containing dangerous goods shall be additionally marked with all required symbols.

Dangerous goods shall never be packed together with non-dangerous goods.
- The SUPPLIER shall strictly adhere to the regulations of the relevant transport authorities.
- Dangerous parts contained in any main supply must be packed separately in accordance with the above regulations and be handled as a single shipment.
- It is recommended that hazardous materials shall, whenever feasible, be packed in small volumes to enable partial deliveries.

- **RADIOACTIVE GOODS**



Instruments, lighting-road or the like, containing a specific activity of more than 74 KBq/Kg (0.002 M Ci/g) are classified as radioactive.

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Radioactive goods must be sealed in leaded safes and packed in wooden cases.

Packing, labelling and marking shall be according to "IATA" regulations.

Other types of package not foreseen by these guidelines shall be agreed upon with the PURCHASER



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SAMPLE 2 - LETTER FOR SPECIAL HANDLING INSTRUCTION

SUPPLIER LETTERHEAD	
HANDLING INSTRUCTIONS FOR P.O. SHEET OF.....	
1. Purchase Order No.: 2. Description of goods: 3. Shelf live expiration date: 4. Temperature and Humidity Conditions required: Temperature Allowance : °C to °C Humidity Allowance : % to % 5. Storage Precautions : () Stored under normal warehouse conditions () Stored in Warehouse with minimal temperate/humidity variation () Stored in "Dangerous Goods" Warehouse () Stored in outside storage area () Stored outside covered against weather () Others (to be specified) 6. Other Precautions : () Protect against exposure to Rain or Water () Protect against exposure to Sunlight () Do not subject to shocks or vibration () Use dunnage to spread load when stacking cargo () Refer to attached Hazardous Cargo Sheet () Others (to be specified)	Mark x in () where applicable
SIGNED:	DATE:

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Sample 3 - QUALITY CERTIFICATE

Note: This Certificate is to be issued on SUPPLIER Letterhead.

Date :

TO :

PROJECT NO. :

REQ NO. :

ITEM NO.:

COMMODITY :

We hereby certify that the above mentioned commodity has been inspected and tested in conformity with the conditions of the contract.



SUPPLIER's Company Name:

Signature

Title Manager Quality Control

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Sample 4 – SUPPLIERs Declaration of Origin

SUPPLIER'S DECLARATION OF ORIGIN

The text inside the box, suitably completed in conformity with the footnotes below, constitutes a suppliers' declaration. The footnotes do not have to be reproduced.

I, the undersigned, declare that the goods listed on this invoice¹⁾ were produced

²⁾ - in the European Community, namely in³⁾, and satisfy the rules of origin governing Community Customs Code according to Regulation (EEC) 2913/92 articles 22 to 27 and/or Regulation (EEC) 2454/93 annex 10 and 11.

- outside the European Community and originate in⁴⁾.

I undertake to make available to the Chamber of Commerce⁵⁾ evidence in support of this declaration.

.....
(place and date)

.....
(name and function in company)

.....
(signature)

Verification of this declaration by means of a certificate of origin, issued by the supplier's regional Chamber of Commerce, may be required by the buyer's regional Chamber of Commerce.



IMPORTANT !
This declaration is not valid for goods having preferential origin status and which qualify for movement certificates EUR.1. For such use the "supplier's declaration for products having preferential origin status" according to Regulation (EC) 1207/2001 is applicable.

¹⁾ State the number of the invoice or other document in which the shipment is sufficiently specified.
 — When instead of the invoice another document or an annex to the invoice is being used, the kind of document concerned shall be mentioned instead of the word 'invoice'.
 — When the statement concerns only part of the goods listed on the invoice, these should be clearly indicated or marked. Furthermore, this marking should be indicated on the declaration as follows: '... listed on this invoice and marked were produced in and





²⁾ State the applicable option
³⁾ State the country of origin (member state of the European Union)
⁴⁾ State the country of origin
⁵⁾ State the name of the supplier's regional Chamber of Commerce

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VENDOR DOCUMENT MANAGEMENT PROCEDURE

			 kashok 2021.03.23 17:47:53 +05'30'	 Vidysagar Dapati 2021.03.24 17:46:32 +05'30'	 Vidysagar Dapati 2021.03.24 17:46:58 +05'30'	 Ganeshy D Sanyal 2021.03.25 07:56:04 +05'30'
A	22.03.2021	ISSUED FOR IMPLEMENTATION	KA	RS	VSD	PSSG
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. INTRODUCTION:

INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 9th April 2018 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for BDEP preparation for Open Art units, FEED & DFR preparation, Detailed Engineering, Procurement & Expediting services, Tendering & Award of LSTK contracts, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for capacity expansion (From 13.7 to 18 MMTPA) of Gujarat Refinery in Vadodara, Gujarat, India.

However after completion of PMC-1 services covering Detailed Feasibility Report and + 10% cost estimate, due to the Fuel demand forecasts and to meet the increased demand for petrochemicals, IOCL decided to change the process configuration envisaged under “J18 Capacity expansion Project” and included some additional units and accordingly made its Financial Investment Decision in September 2020. IOCL after the change in the configuration of original J18 has renamed the project to “**Petrochemical and Lube Integration Project “LuPech” (J18)**”.



2. DEFINITIONS:

2.1 Wherever used in this procedure, the following words shall have the meaning as given hereunder

OWNER or IOC or IOCL	INDIAN OIL CORPORATION LIMITED
PMC or CONSULTANT	TECHNIP INDIA LIMITED
CONTRACTOR	The bidder selected by the OWNER for performing the scope of works specified in the bid documents.
AUTHORISED REPRESENTATIVE	OWNER’s/CONSULTANT’s representative authorized to act for and on behalf of OWNER/CONSULTANT, as the case may be
VENDOR	Any third party selected by either the OWNER or CONSULTANT for supplying any of the equipment/materials for the Unit specified in the bid documents.
PROJECT	Petrochemical and Lube Integration Project “LuPech” (J18)
UNIT	The totality of the units and facilities comprised in the Scope of work, which forms a distinct operating system

2.2 Abbreviations:

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DCI	Document Control Index
FOA	Fax of Acceptance
IC	Inspection Certificate
IRN	Inspection Release Note
ITP	Inspection and Test Plan
LOA	Letter of Acceptance
MOU	Memorandum of Understanding
MR	Material Requisition
PO	Purchase Order
SR	Supplier Requisition
QMS	Quality Management System
TPIA	Third Party Inspection Agency

3. **SCOPE**

This document stipulates the general instructions for vendor documentation requirements from Vendors. All documents/data against the PO/SR/MR shall be developed and submitted to PMC/Owner by the Vendors for review/ records, in line with this specification.

4. **REFERENCE DOCUMENTS**



Sl. No.	Document Title	Document Reference
01	077154C-000-PP-274	Vendor Final Documentation

5. **DOCUMENTATION REQUIREMENTS**

5.1 **Drawings/Documents/Data to be Submitted by the Vendor**

5.1.1 The Vendor shall submit drawings/documents and data against the PO/SR/MR as per the list given in respective PO/SR/MR

5.1.2 Review of the Vendor critical drawings/documents by PMC/OWNER would be only to review the compatibility with basic designs and concepts and in no way absolve the Vendor of his responsibility/contractual obligation to comply with SR requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/installation shall be promptly corrected by the Vendor without any

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time and cost implications, irrespective of comments on the same were received from PMC/OWNER during the drawing review stage or not.

- 5.1.3** Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent/Letter of Intent / Fax of Acceptance (FOA)/ Letter of Acceptance (LOA):

QMS	1 week
Drawing/Document Control Index	2 weeks
Other Documents/Drawings	As per approved Drawing/Document Control Index/ Schedule

- 5.1.4** Documents as specified in PO/SR/MR are minimum requirements. Vendor shall submit any other document/data required for completion of the job as per PMC/Owner instructions.

5.2 Major Document System Requirements

5.2.1 Language and Units

All drawings and documents shall be written in ENGLISH.

All units and dimensions shall be in the metric system unless otherwise specified. Specifically piping and equipment nozzles connected to piping shall be expressed in inches.

5.2.2 Documents size and format

Document size shall be according to ISO rules. The largest size for drawings is A2 (420x594mm) and the smallest A4 (210x297mm). The A1 format may be used for General outline drawing and PID's and with prior authorization of PMC/OWNER for other documents.



A1 and A2 size document must be legible in A3 size when printed.

Documents shall be produced on CAD system, as far as practicable.

5.2.3 Electronic files

During the project execution, VENDOR must produce all documents as electronic files (drawings, spreadsheets, etc.) in Acrobat® PDF format even if native formats are required for the final documentation. PDF format must be under "text" mode (and not "Html" mode), which corresponds to an "electronic print" of the document.

VENDOR must have Acrobat® XI system available in his organization, at his own cost, to issue documentation to PMC/OWNER. No deviation will be accepted by PMC/OWNER.

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Electronic files must be generated directly from their native software tool only and not to be scanned. In case, VENDOR wants to submit only a scanned document, he must obtain PMC/OWNER authorization prior to sending it and scan the document using low resolution. Document electronic size must be limited to 10 Mb in order to prevent from transmission problems. In case, document size exceeds 10 MB, document may be divided into two or more parts with file size less than 10 Mb. In this case, each part must have its own unique document reference stated in the coversheet.



5.2.4 Legibility

A1 and A2 size document must be legible when printed in A3 size. A3 size legibility must need VENDOR to consider that:

- The text height for notes and dimensions or line thickness must be suitable for reading after reduction.
- Information to be shown on the document must be strictly limited to information required by PMC/OWNER.

5.2.5 Other requirements

- A document having more than one sheet must be defined as only one electronic file under one common document reference in PDF format, with as many sheets as necessary merged in the file. The common document reference must appear on each page of the document.
- Document must not be protected.
- Document shall be converted in PDF so that they can be read on screen without needing to rotate any page. Zip format, Colour Views and Protected documents are prohibited.
- The title block must be placed in the bottom right hand corner of A1 and A2 drawings. It shall be noted that A1 and A2 documents could be printed and folded automatically. In case the document layout does not conform to the two above-mentioned requirements, the plotters will fold it up with the title block hidden inside.

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5.2.6 Document template / tile block

- Purchase Order (PO) number
- Material Requisition number (SR Number)
- CONSULTANT Document Number
- VENDOR Reference (Number, Revision, Date)
- Document Title
- Equipment Tag number (s)
- Doc Item (s)
- Submission Status
- Review Code

The “title block” shall be provided by CONSULTANT to the successful vendor at the time of kick-off meeting.

The said “title block” shall be incorporated in a legible manner in the document, whatever the document size.

5.2.7 ELECTRONIC SIGNATURE

The documents coversheet must be electronically stamped, as explained below:

- The document originator, who electronically signs in the tab “written by”
- The document checker, who electronically signs in the tab “checked by”
- The document approver, who electronically signs in the tab “approved by”

Writer and Checker shall be different people. Checker and Approver can be the same person.



The electronic signature shall not hide the signatory’ name.

Sufficient space for PMC/OWNER comments stamp shall be provided in documents and drawings.

5.2.8 Drawing and Document sizes

All documents must be defined under ACROBAT with smallest size as **A4** size (210 x 297mm) and largest size as **A2** (420x594mm) only.

The A1 format may be used for General Outline Drawing & PID’s with Prior authorization of PMC/OWNER for other documents. A1 and A2 size document shall be legible when printed in A3 Size.

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One document of more than one sheet (A4 or A3 size) shall be defined as only one electronic file under ACROBAT, with as many sheets as necessary. The common document reference shall appear on each page of the document.

5.2.7.1 Important notes:

The maximum size of drawings and documents is intentionally limited to A3 size for printing, reproducing, and scanning reasons.

The Vendor is strongly recommended to limit the size of his native files to A1 size (prior to reducing via ACROBAT DISTILLER). Since, the documents reduced to A3 size reveal to be hardly legible and the text height (for notes and dimensions) or line thickness must be suitable for reading after reduction.

A3 size limitation will need the Vendor to consider the following:

- Limitation of information to be indicated on these documents, in order to cope only with information requested by PMC/OWNER.
- In case some documents contain too many information, Vendor shall split it in 2 or 3 documents.

Example for a PID: one PID could be provided for oil system and another one for Seal system. In this particular case, it is strongly recommended to generate only **ONE** PDF file, for each sheet.

5.2.8 Electronic File Name

5.2.8.1 General

Each electronic file will have a name, which will be in relation with part II of the SR and equipment tag number, with the extension ".PDF".

5.2.8.2 Syntax

Purpose of this syntax is to know the transmitted document and its status, without opening ACROBAT. It will also increase the reliability in document transmission accuracy.

Vendor shall use the following electronic file name



MR Number-Document Category Code-Sequence Number-Rev Number -R.pdf

- ◆ R means document issued to PMC/OWNER for review, approval or information.

Similarly when document is returned to Vendor the electronic file name will be

MR Number-Document Category Code-Sequence Number-Rev Number-C.pdf

- ◆ C = document with comments & no comments returned to Vendor.

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6. DOCUMENT WORKFLOWS: DELIVERY, REVIEW AND TRANSMISSION

6.1 General

The required documents shall contain all the necessary information for:

- Checking of supply during all phases (schedule, design, procurement, fabrication, testing, etc.);
- Installation of the equipment and/or material supply at site.

As indicated in the SR, documents are either:

- For information
- For review

These documents shall provide all data necessary to appraise the methods for construction, assembly, disassembly, fastening and connection of equipment. They must clearly indicate the limits of supply and specify all details necessary for installation.

Data related to maintenance and operation shall also be provided where applicable.

6.2 Review Category



Following review codes shall be used for review of Vendor drawings/documents

- Review Code 1: Document does not conform to basic requirements as marked. Revised and Resubmit for review.
- Review Code 2: Proceed with manufacture/fabrication as per the commented document.
- Review Code 3: No comments. Proceed with manufacture/ fabrication As per the document.

6.3 Documents transmission

The electronic transmission of documents is mandatory and unless otherwise approved by PMC/OWNER. The documents have to be converted in Acrobat PDF prior to submission.

In case paper copy transmission has been requested by PMC/OWNER, documents shall be sent (in the requested number of paper copies) together with a transmittal note indicating all P.O references (project number, SR number, P.O. number), as well as the vendor's document number,

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revision index, title and chronological transmittal reference. The said documents shall be addressed as indicated in the P.O.

Note: Vendor shall follow CONSULTANT's Electronic document transmission system for transmitting the documents for CONSULTANT's review / approval.

6.4 **Document Review process**

Documents “for review” (IFR) shall be received by the dates specified in the Part II of the SR.

All documents must be submitted by VENDOR by due dates and finally accepted by PMC/OWNER before the date of equipment and/or material delivery.

Each next revision of a vendor document must be submitted **within 7 working days** after the receipt of comments.

Furthermore, for documents required for erection and installation (all A5 series in the SR part II), one copy (in ENGLISH languages) shall be delivered in the packages with the equipment or material.

6.5 **Documents Priorities**

Vendors' drawings and documents shall be identified through ranking in the order of priority listed below. It should be noted that this list of documents is not restrictive. Requirements shall be compliant with contractual documents and information to be included as specified in the requisition and the specifications attached to the requisition.

Priority 1:

Drawings necessary to perform layout studies and civil engineering design.

These drawings are:



- General arrangement drawings;
- Foundation layout and loading plan;
- All PID's;
- List of Vendor's documents and drawings.

Priority 2:

Drawings and documents necessary for electrical, instrumentation and control design.

These drawings are:

- List of electrical consumers and filled in data sheet for electric motors;
- Logic diagrams;

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- List of inputs/outputs to DCS;
- Wiring diagrams and junction box drawings;
- All PID's (with complete instrumentation).

Priority 3:

Drawings and documents necessary to ensure equipment compliance with construction and maintenance requirements.

These drawings are submitted to equipment specialist only, and are included in the operation and maintenance manual.

These drawings are:

- Cross section drawings and bills of materials
- Detailed drawings

6.6 Quality of submitted documents

Documents shall be of sufficient quality to allow immediate and accurate use, without any interpretation due to possible illegibility. Any illegible or indecipherable drawing will be systematically returned to Vendor who shall in no case allege documents being returned as a reason for any delay affecting delivery.

It is mandatory for copies to be of the highest quality, so as to avoid prints/copies of poor quality.



Vendor shall send to PMC/OWNER only copies produced from the original, in order to guarantee maximum legibility.

For instruction manuals and bulletins, the required number of copies, as per the number indicated in the SR part II, shall be delivered. These shall be legible as well, and with top quality

All A4 format documents shall have sufficient border for punching as required for Filing purposes

6.7 Statutory Approvals

Wherever approval by any statutory body is required to be taken by Vendor, the Vendor shall submit copy of approval by the authority to PMC/OWNER.

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6.8 Details of Contact Persons of Vendor

After placement of order, Vendor shall assign a Project Manager for that order. The details such as name of Project Manager, e-mail address, mailing address, telephone nos., fax nos. and shall be sent to PMC/OWNER.

However, a detailed Communication Protocol shall be established during the Kick-Off Meeting.



6.9 Schedule and Progress Reporting

Vendor shall submit monthly progress report and update procurement, engineering and manufacturing status (schedule vs. actual) every month, beginning within 2 weeks from FOA/LOA. In case of exigencies, PMC/Owner can ask for report submission as required on weekly/fortnightly/adhoc basis depending upon supply status and Vendor shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Vendor during kick off meeting or within one week of receiving FOA/LOA, whichever is earlier.

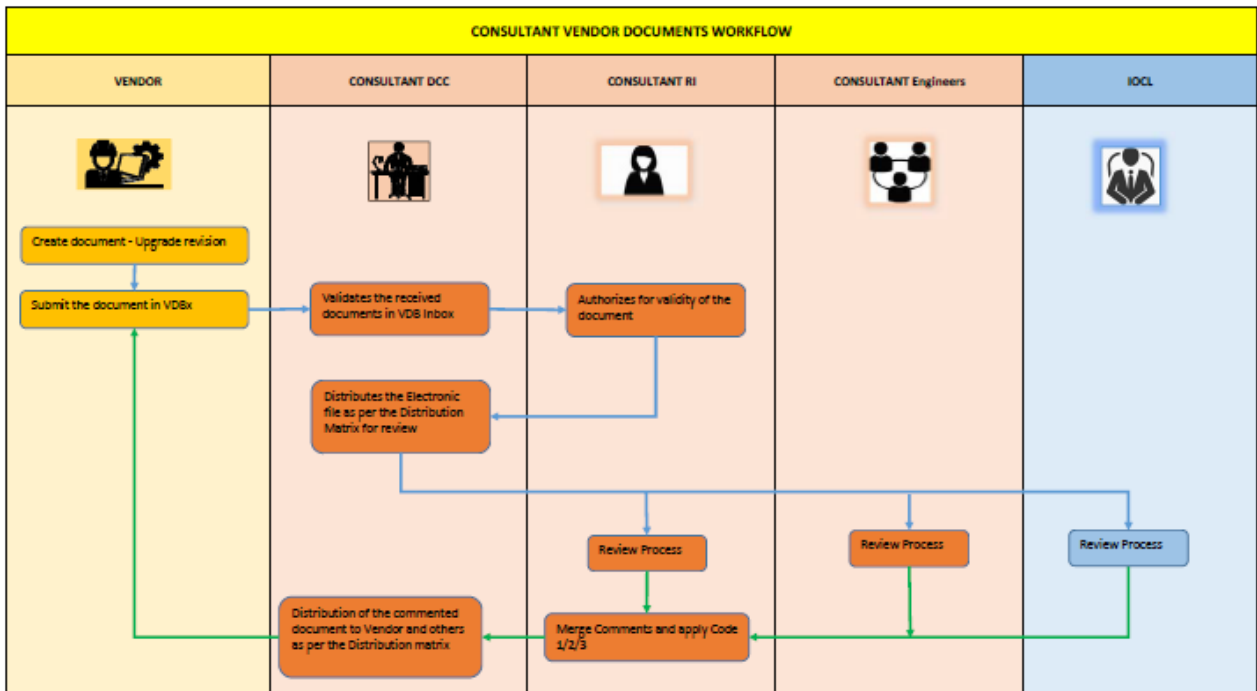
6.10 Quality Assurance Plan/Inspection and Test Plan

Inspection and test plans (ITP) attached if any, to the MR/PR are to be followed. However for cases wherein ITPs have not been attached with MR/PR, Vendor shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for manufacturing, covering quality control of critical bought out items/materials, inspection & testing at various stages of production, quality control records and site assembly & testing as may be applicable to the specific order and obtain approval from concerned personnel of TPIA/PMC/OWNER, as applicable.

For Package equipment contracts, the Vendor shall prepare a list of items/ equipment and their inspection categorization plan for all items included in the scope of supply immediately after receipt of order and obtains approval for the same from PMC/OWNER. The items shall be categorized into different categories depending upon their criticality for the scope of inspection of TPIA and/or PMC/OWNER.

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ANNEX-1 - VENDOR DOCUMENT WORKFLOW



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