IOCL PARADIP 525 TPD STANDBY SRU
Pre-Qualification Criteria (Technical)

Package Name : Ball Valves Package

Only manufacturers of Ball Valves (documentary evidence to be provided)**,** qualified as per the Pre-qualification criteria laid down below, **are allowed to bid**. Authorised Dealers, Agents, Stockists and Traders are not allowed to bid. However, offer consideration is subject to approval from end customer IOCL.

The bid evaluation shall be on Overall L1 basis. Bidder has to quote for all the items. Partial offers will not be considered for evaluation.

Qualification Criteria of the Bidder:

The Bidders shall meet the Pre-Qualification Criteria (listed below). *Non-compliance to any of the criteria listed below will lead to disqualification of bidder for the subject tender.*

1. The bidder should be an established Manufacturer of Ball Valves and should have successfully completed Design, Manufacture, Testing and Supply of **Fire Safe Ball Valves (Floating & Trunnion mounted Ball Design)**, according to the design/manufacturing standard **API 608** and the material standard **ASTM A105/ A216 Gr WCB**

2. The Bidder should have successfully completed supply of **Fire Safe Ball Valves (Floating & Trunnion mounted Ball Design) according to the design/manufacturing standard API 608 and the material standard ASTM A105/ A216 Gr WCB, in the size range of 0.75" and above with rating CL150 and above with limit switch,** in the last 5 years ending on original due date of this tender, with at least one order executed after 01.01.2018.

3. Detailed BOQ of the Ball Valves supplied, satisfying the criteria laid down above, shall be provided in the format enclosed as Annexure-1, with details like Project & Customer, Description, Quantity & Weight of Items supplied, PO details etc. as a minimum for assessing pre-qualification. **PO Copies, Inspection Reports and Dispatch documents shall be enclosed for the references provided.**

4. **The bidder should have a valid Fire Safe Test Certificate for Ball Valves .**

5. The bidder should not have been under suspension for business or blacklisted by any of the BHEL units or in the Blocked list of IOCL.

6. Consideration of the Bidder offer is subjected to end customer's approval.

Annexure-1

Supply References for the Last 5 Years ending on the Original due date of this tender

Details of Ball valves supplied by the Bidder:

Sl. No	Project Name along with name of Customer	Description Item(s) supplied	Qty.	Purchase Order No & Date (Copy to be enclosed)	Delivery Date as per Order	Value of Order	Inspection Reports / Dispatch Documents (Copy to be enclosed)	Remarks

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (भारत सरकार का उपक्रम) (A Govt. of India Undertaking)	PROJECT :	STANDBY SRU PROJECT						
	JOB NO. :	B366						
	CLIENT :	IOCL PARADIP	0	27-10-2021	ISSUED FOR BIDS	AM	AM	LSJ
			REV. NO	DATE	REVISION	BY	CHK	APPROVED

DATA SHEET FOR LIMIT SWITCH BALL VALVE

SR. No.	ITEM CODE	ITEM DESCRIPTION	QTY (Nos.)	VALVE TAG NO.	LIMIT SWITCH SPECIFICATION NO.	VMS SHEET NO.	VALVE TYPE	VALVE SIZE (INCH)	RATING	ENDS	LINE NO.	REMARKS
1		090-HZV-0458, 0.75" BALL VALVE WITH LIMIT SWITCH	1	090-HZV-0458	B366-999-YI-DS-7005	543TC	BALL	0.75	150#	FLGD ASME B16.5 / RF/ 125AARH	20-P-090-2201-A28A-NI	

NOTES

1 VENDOR TO PROVIDE DETAIL DIMENSIONAL DRAWING.

2 IN CASE OF ANY CONFLICT AMONGST VARIOUS DOCUMENTS ENCLOSED WITH MR. THE MOST STRINGENT REQUIREMENT SHALL GOVERN AND OWNER/EIL DECISION IN THIS REGARD SHALL BE FINAL.

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Limit Switches - Non Tag Item

General	1.	Type		Unit	Proximity type switches as per DIN 19234	
Haz.Location	2.	Electrical Area Classification			Zone-1 Gr. IIA & IIB	
Switch	3.	Hysterisis				
	4.	Form			Proximity	
	5.	Enclosure Type			IP66	
	6.	Mounting			On the valve	
	7.	Type of Protection			Intrinsically safe	
	8.	Power Supply			24VDC(thru IS barrier cum Amp)	
	9.	Contact Rating			0.5 A	
	10.	Cable Entry Power	Signal			1/2 ," NPTF
Options	11.	IS Barrier	Type		By Purchaser	NA
	12.	Switching Amplifier				
		Type	Contact Rating		NA	NA
	13.	Contact Status Before Actuation				
	14.	Contact Status After Actuation				
	15.	Mounting Accessories				
Certification	16.	Statutory			PESO	
	17.	Others				
Others	18.	Model No.				
	19.	Make				

Notes :

1. Vendor shall provide 1 No. Closed limit switch tag No. 090-ZSL-0458 & 1 No. Open limit switch tag No. 090-ZSH-0458 along with Valve tag No. 090-HZV-0458.
2. Vendor shall provide separate switches for open and close positions
3. For cable connections, flying leads are not acceptable. Suitable terminal blocks shall be provided for cable termination.
4. The limit switches shall be Weather proof to IP 66 / NAMUR Standard and Intrinsically safe. Certificates to this effect indicating the entity parameters shall be furnished from statutory body.
5. All Limit switches shall be minimum SIL-2 certified.

REV	DATE	BY	CHKD	APPVD		
0	27/05/2021	AK			REQUISITION NO :	LEGEND : ¤ Hold * By Vendor ^ Data Revised
					ORDER NO. :	
					VENDOR :	

ENGINEERS INDIA LIMITED NEW DELHI	PLANT : IOCL Paradip SRU UNIT : 999 CLIENT: IOCL	SPECIFICATION	REV
		B366-999-YI-DS-7005	0

Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Tag No: 543TC** **Sheet No. 1 of 2**

BALL VALVE SPECIFICATION

TAG NO. :543TC **PIPING CLASS :** A28A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 0.75" TO 0.75" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGD	ASTM A 105 (NORMALISED)		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	ASTM A 182 GR F316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7M		
BODY NUT		ASTM A194 GR 2HM		
OTHERS	FLOATING BALL			
REQUIREMENT OF GEAR OPERATOR				
REQUIREMENT OF RADIOGRAPHY				
SPECIAL SERVICE CONDITIONS	NACE + HIC	SOUR SERVICE + HIC RESISTANT, MAX. TEMP 200 DEG. C, AND FULL VACUUM AT 175 DEG C.		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1 THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2 ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3 NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4 ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
5 TESTING OF VALVES SHALL BE AS PER API-598.
6 ALL VALVES SHALL BE BIDIRECTIONAL.
7 BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
8 STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
9 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT TYPE WITH SIDE ENTRY BOLTED CONNECTION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	26/10/2021

543TC

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

10 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).
11 NACE REQUIREMENTS SHALL BE AS PER MR0103.
12 NACE, SOUR SERVICE AND HIC REQUIREMENT OF VALVES SHALL ALSO BE MET AS MENTIONED IN DOCUMENT 'JOB SUPPLY SPECIFCATION FOR VALVES'.

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LIST OF VENDORS(IOCL APPROVED VENDOR LIST) FOR PROCUREMENT OF 0.75" BALL VALVE WITH LIMIT SWITCH

Sl.no.	Vendor Name
1	ANAND TEKNOW AIDS ENGINEERING INDIA
2	BELGAUM AQUA VALVES PVT. LTD.
3	BRAY CONTROLS INDIA PRIVATE LIMITED
4	DEMBLA VALVES LTD.
5	FLOW CHEM INDUSTRIES,
6	INTERVALVE POONAWALLA LIMITED
7	LEADER VALVES LIMITED
8	MICON VALVES (I) PVT. LTD.
9	MICRO FINISH VALVES PVT LTD
10	SHALIMAR VALVES PVT. LTD.
11	MICON ENGINEERS (HUBLI) PVT. LTD.
12	AQUA CONTROL VAVES PVT LTD
13	GM ENGINEERING PVT. LTD.
14	HAWA ENGINEERS LTD
15	L & T VALVES LIMITED
16	NELES INDIA PVT LTD
17	NITON VALVE INDUSTRIES PRIVATE LTD .
18	NSSL PRIVATE LIMITED
19	OSWAL INDUSTRIES LTD
20	RAPPID VALVES INDIA PVT LTD
21	REYNOLD VALVES LTD
22	SHAYBURG VALVES PVT LTD
23	VAAS AUTOMATION PVT LTD
24	EMERSON PROCESS MANAGEMENT (INDIA) PRIVATE LIMITED
25	BDK VALVE PVT LTD
26	HAWA VALVES (INDIA) PVT LTD
27	NILON VALVES PRIVATE LIMITED
28	PHBB VALVES PRIVATE LIMITED
29	DELVAL FLOW CONTROLS PVT. LTD.
30	OMKAR VALVES PVT. LTD.
31	SWIMS TECHNOLOGIES PVT. LTD.

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BALL VALVES
for
525 TPD Standby Sulphur Recovery Unit (SRU),
IOCL Paradip Refinery

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1.0 SCOPE OF SUPPLY

1.1 This document indicates the requirements to be considered for supply of BALL VALVES, for IOCL Paradip 525 TPD Standby SRU Project.

1.2 The supplies shall meet the requirements of the following specifications, without any deviations:

- Bill of Material, Annexure-1
- Piping Material Specification: 080557C-000-JSD-1300-002_D
- Job Specification for Valves: 080557C-000-JSS-1310-001_C
- Specification for Painting and Coating: 080557C-000-JSD-2300-001_C
- Specification for Color Coding of Piping Materials: 080557C-000-SP-1390-009_A
- Inspection and Test Plan for Piping Bulk Items and Specialties: 080557C-000-ITP-1300-001_B
- Applicable Valve materials specification (VMS)

1.3 The documentation, quality and inspection requirements shall be as per the Contract specifications.

2.0 NOTES:

2.1 Bidder shall obtain necessary clarifications (if any) from BHEL, before bid submission. This is a no deviation tender and no deviation or price implication is acceptable after bid submission.

2.2 Bidder shall submit the following along with their bid:

- No Technical Deviation Certificate.
- Unpriced price bid format

+ + +

RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	02.02.2022	FIRST ISSUE	V Uday Kumar	Srikanth G

PROJECT ENGINEERING & SYSTEMS DIVISION
RC PURAM, HYDERABAD.
QUALITY & BUSINESS EXELLENCE

INSPECTION / TC REVIEW FORMAT

1	Vendor's Name:		5	Applicable BHEL Spec No:	
2	Project:		6	Approved Drawing No:	
3	PO No:		7	Approved Data Sheet No:	
4	Item Description:		8	Approved QAP No:	

OFFER LIST

S.No	BBU/ PO Sr. No.	Item Description	Total Qty as per PO/BBU	Qty. already accepted	Qty offered for TC review	Cumulative Qty	Balance Qty
A							
B							
C							
D							

TC REVIEW REQUISITION

BBU / PO Sr. No.	QAP Clause No.	Format of Record	Certificate No. & Date	Page No.	REMARKS
A. Item Description:					
B. Item Description:					
C. Item Description:					
D. Item Description:					
E. Item Description:					

SUPPLIER / VENDOR SIGNATURE WITH SEAL	BHEL/ BHEL's TPIA SIGNATURE WITH SEAL
Dt:	**Dt:**

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QAP GUIDELINES & FORMAT

(ANNEXURE)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

Note:

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

2. No deviation to reference document is acceptable.

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GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.

2. Each page of QAP shall contain the following information.
   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).

5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT, DP etc.), hydrostatic test, calibration check etc.)

6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.

7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)

8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)

9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.

10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.

11. Please refer 'Agency' in QAP format.
    Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR
    2: (Vendor / Sub vendor)

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Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, Under Witness (W) column use 1. Under 'Verify' column, use code1.

12. Under 'D' please put (⊓ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.

13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.

15.The following operations/characteristics/check points may be included (AS APPROPRIATE)

a) Visual check
b) Dimensional check
c) Mechanical and Chemical properties.
d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)
e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
f) Check for correctness for all components mounted as per General Arrangement Drawing, Bill of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
g) Verification of test certificate for protection class for the enclosures.
h) Mechanical functioning of switches.
i) Continuity of earthing and provision of earth points.
j) Colour coding of wiring, size, tightness & dressing of wiring.
k) Review of test certificates of assembled items, raw materials, internal test reports etc.
l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)
o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.
p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
r) Packing and Preservation.

16. **QAP Format enclosed.**

17. For inspections outside India, customer/PMC approved TPIA to be hired by vendor and TPIA charges to be borne by vendor.

TPIA list:

~~a. M/s TUV SUD South Asia Pvt. Ltd.~~
b. M/s SGS India Pvt. Ltd.
c. M/s VCS Quality Services Private Limited
d. M/s International Certification Services Pvt. Ltd.
e. M/s ABS Industrial verification Pvt. Ltd.

f. M/s Projects and Development India Ltd.
g. M/s TATA Project Limited
h. M/s Certification Engineers International Limited
i. M/s Bureau Veritas (India) Pvt. Ltd.

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VENDOR'S NAME & ADDRESS:	**MANUFACTURING QUALITY PLAN**		QP. NO.:	
	CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:	BHEL P.O.NO.: P.O. DATE: BHEL SPEC: REV:	REV NO:	DATE:
			PAGE 1 OF 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**PRESERVATION & PACKING**												

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE **1 FOR BHEL/BHEL NOMINATED TPIA** & **2 FOR VENDOR/SUB VENDOR** AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY VENDOR'S SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP

INSPECTION AND TEST PLAN FOR

PIPING BULK ITEMS AND SPECIALITIES

Inspection category: 3

			Written By	Checked By	Approved By	Authorized By
			Karthikeyan Chokkalingam 2020.06.09 11:22:10 +05'30'	Mathivanan Ganesan 2020.06.09 11:34:30 +05'30'	Vaidyasubramaniam V 2020.06.09 13:07:48 +05'30'	Morischristopher Jesumarian 2020.06.09 23:36:32 +05'30'
B	9-JUNE-2020	ISSUED FOR DESIGN	CK	GM	VV/SL	JMC
A	14-OCT-2019	ISSUED FOR DESIGN	CK	AS	VV	JM
REV.	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**	**AUTHORIZED**

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ATTACHMENTS:

1. Annexure-1 : ITP for Seamless Pipes
2. Annexure-2 : ITP for Welded Pipes
3. Annexure-3 : ITP for Fittings
4. Annexure-4 : ITP for Flanges
5. Annexure-5 : ITP for Valves
6. Annexure-6 : ITP for Gaskets
7. Annexure-7 : ITP for Bolting
8. Annexure-8 : ITP for Steam Traps
9. Annexure-9 : ITP for Strainers
10. Annexure-10: ITP for Hoses and Couplings

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1. INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India.

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
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
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related

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SRU	Sulphur Recovery Unit
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

3.1 This Inspection and Test Plan covers the minimum testing requirements of Piping components.

This Inspection and Test Plan is an engineering document which defines for each type of piping components:

- The type and extent of CONTRACTOR and PMC/OWNER involvement in each phase of fabrication, control and testing requiring an inspection.
- The resulting vendor's contractual obligations, in accordance with applicable project general purchase conditions.

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Note: This Inspection and Test Plan may under no circumstances be used as a substitute for the vendor's Quality Control Plan.

3.2 Conflicts, Deviations and Clarifications:

Any conflicts between this specification and other applicable Engineering Standards, Material Specifications, Standard Drawings, Engineering Procedures, Company Forms or Industry standards, specifications, Codes and forms shall be brought to the attention of Authorized Representative by the Contractor for resolution.

Until the resolution is officially made by the Authorized Representative, the most stringent requirement shall govern.

Where applicable Codes or Standards are not called by this standard or its requirements are not clear, it shall be brought to attention of Authorized Representative by Contractor for resolution.

Direct all requests for deviations or clarifications in writing to the Authorized Representative for final resolution.

4. TERMINOLOGY

DFT	Dry Film Thickness
DPT	Dye Penetrant Testing
DHT	De-hydrogen Heat Treatment
ERTL	Electronics Regional Test Laboratory
FCRI	Fluid Control Research Institute
HT	Heat Treatment
HIC	Hydrogen Induced Cracking
ITP	Inspection and Test Plan
IP	Ingress Protection
IHT	Intermediate Heat Treatment
IC	Inspection Certificate
IGC	Intergranular corrosion
MPT/MT	Magnetic Particle Testing
MTC	Material Test Certificate
MRT	Mechanical Run Test
NDT	Non-Destructive Testing
NPSH	Net Positive Suction Head
PO	Purchase Order

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PESO	Petroleum Explosive Safety Organization
PQR	Procedure Qualification Record
PR	Purchase Requisition
PMI	Positive Material Identification
RT	Radiography Testing
SSCC	Sulphide Stress Corrosion Cracking
TC	Test Certificate
TPI or TPIA	Third Party Inspection Agency
UT	Ultrasonic Testing
VDR	Vendor Data Requirement
WPS	Welding Procedure Specification
WPQ	Welders Performance Qualification

5. REFERENCE DOCUMENTS

PO / PR / Standards referred therein / Job Specifications / Approved documents.

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.

6. INSPECTION AND TEST REQUIREMENTS

6.1 Refer following Annexures for the Inspection and test requirements for the listed Piping bulk items and specialties.

- Annexure- 1 : ITP for Seamless Pipes
- Annexure - 2 : ITP for Welded Pipes
- Annexure - 3 : ITP for Fittings
- Annexure - 4 : ITP for Flanges
- Annexure - 5 : ITP for Valves
- Annexure - 6 : ITP for Gaskets
- Annexure - 7 : ITP for Bolting
- Annexure - 8 : ITP for Steam Traps
- Annexure - 9 : ITP for Strainers
- Annexure - 10: ITP for Hoses and Couplings

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6.2 Extent of Inspection:

The extent of Inspection activities are defined as follows:

H: (Hold) Point

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

Consequently, the attendance to witnessing is mandatory. The Supplier must notify the CONTRACTOR / PMC / OWNER by fax of the dedicated inspection activity at least fifteen (15) days in advance.

W: (Witness)

The Supplier must notify dedicated inspection activity at least fifteen (15) days in advance. CONTRACTOR / PMC / OWNER witnessing is not mandatory, but optional. If CONTRACTOR / PMC / OWNER does not elect to be present, the supplier may proceed with the intended activity, provided controls and test reports are made available for the inspector's review during his subsequent visit.

When a percentage value is indicated (i.e. W 10%) the inspection activities will be witnessed on spot basis as per percentage indicated.

R: (Review) - Review of Documents

The Supplier 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.

7. SUPPLIER'S FABRICATION AND QUALITY CONTROL PLAN

The Supplier must issue a Fabrication and Quality Control Plan for each Equipment / Machinery / Package/ Bulk Item.

The Supplier'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 MR.

Following information shall be clearly specified against each operation:

- Reference documents (drawings, procedures, etc.)
- Acceptance criteria (code, etc.)
- Recording documents for controls and tests

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- Involvement of the Quality Control department of the Supplier and/or his sub-supplier

This Supplier'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 Independent Inspection Authority and/or the Client.

8. INSPECTION RELEASE CERTIFICATE

This document issued by Inspector, permits the vendor to proceed with the packing and to notify the shipment.

9. QUALITY CONTROL MANUFACTURING DOSSIER "QCMD" (ex. Inspection Book)

This document must be completely reviewed during the final Inspection. Preliminary Copy (Waiting for CLIENT final approval), checked and signed by the Inspector, must be shipped together with the goods and indicated in the relevant Packing List.

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	CLIENT	INDIAN OIL CORPORATION LIMITED

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Annexure - 1

INSPECTION AND TESTING REQUIREMENTS FOR SEAMLESS PIPES

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test, Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	R	R		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Review of MTC for Chemical, Mechanical Properties, Size & steel making process, etc.	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.1	Heat Treatment	Normalizing, Tempering, Solution Annealing, Stabilization Heat treatment etc as applicable	100%	HT chart	P	R		
3.2	NDT As applicable	Surface & Internal Imperfections	PR/ Purchase Specifications	NDT Reports	P	R		
3.3	Identification of test Samples	Product Chemical, Tensile, Hardness, Impact, IGC and other test as applicable	Lots as per specification	Test Reports	P	H		
3.4	Product Analysis	Chemical Composition	Lot as per specification	Test Reports	P	W		
3.5	Destructive Testing	Tensile, Hardness, Impact, IGC and Other test as applicable	Lot as per specification	Test Report	P	W		
3.6	Corrosion Test (If any)	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.7	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Hydrostatic Testing	Leak Cheek	100%	Test Report	P	RW (Note 1)		
4.2	Visual and Dimensional Inspection (VDI)	Surface Condition, Straightness, End Finish, Bevel Angle,Root Face, Outer Dia, Thickness, length, End Finish, Marking, End Caps etc	100%	Inspection Report	P	W (Note-5)		
4.3	PMI Check(If applicable)	Chemical Check	As Applicable	Inspection Report	P	W		
4.4	Final Stamping	Stamping of Accepted Pipies	Stamping of Pipies which are witness by PMC/OWNER., Other pipes to have suppliers Identification	Inspection Report	P	H		
5.0	**Painting**							
5.1	Rust Preventive Coating & Color Coding(As applicable)	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. Carbon steel Pipes (Other than LTCS & Pipes for special services like NACE, H2, HIC, etc) upto 12" will be accepted on review of supplier test certificates. Supplier test Certificates to be reviewed by TPIA.

2.This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

4. For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN10204 type 3.2 certification from client approved suppliers.

5.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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Annexure - 2

INSPECTION AND TESTING REQUIREMENTS FOR WELDED PIPES

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test, Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	P	H		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	H		
2.0	**Material Inspection**							
2.1	Raw Material Inspection (**Special services like NACE, H2, HIC..etc)	Review of MTC for Chemical, & Mechanical Properties	100%	Test Certificates Suppliers inspection report	P	H		
3.0	**In Process Inspection**							
3.1	Welding	Welding Parameters as per WPS/PQR	100%	Inspection Reports	P	RW		
3.2	Heat Treatment	Stress Relieving, Normalizing, Tempering, Solution Annealing, Stabilization Heat treatment etc as applicable	100%	HT chart	P	W		
3.3	Corrosion & Metallurgical testing	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.4	Ferrite Checking of SS Pipes (as Applicable)	% Ferrite Check	Random On Weld	Inspection Report	P	W		
3.5	UT / RT As applicable	Surface & Internal Imperfections	PR / Purchase Specfication	RT Films, Reports & UT Reports	P	W		
3.6	Identification of test Samples	Product Chemical, Tensile, Hardness, Impact, IGC and other test as applicable	Lots as per specification	Test Reports	P	W		
3.7	Product Analysis	Chemical Composition	PR / Purchase Specfication	Test Reports	P	W		
3.8	Destructive Testing	Tensile, Hardness, Impact, IGC and Other test as applicable	Lot as per specification	Test Report	P	W		
3.9	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Hydrostatic Testing	Leak Cheek	100%	Test Report	P	W		
4.2	Visual and Dimensional Inspection (VDI)	Surface Condition, Straightness, End Finish, Bevel Angle,Root Face, Outer Dia, Profile Thickness, length,End Finish, Marking etc,	100%	Inspection Report	P	W (Note-4)		
4.3	Hardness test(If applicable)	As per specification	100%	Test Report	P	W		
4.4	Corrosion test(If applicable)	As per specification	100%	Test Report	P	W		
4.5	PMI Check	Chemical Check	As Applicable	Inspection Report	P	W		
4.6	Final Stamping	Stamping of Accepted Pipies	Stamping of Pipies which are witness by PMC/OWNER	Inspection Report	P	P		
5.0	**Painting**							
5.1	Rust Preventive Coating & Color Coding(As applicable)	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

3. For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN10204 type 3.2 certification from client approved suppliers.

4.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER

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Annexure - 3

INSPECTION AND TESTING REQUIREMENTS FOR FITTINGS

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Heat Treatment/NDT	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ(If applicable)	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	H		
2.0	**Material Inspection**							
2.1	Raw Material Inspection (Billets, Rounds, Pipes, Coil, Plates, etc) (**Special services line NACE, H2, HIC..etc)	Review of MTC for Chemical, & Mechanical Properties, size & steel making process, etc	100%	Mill test Certificates, Suppliers inspection Report	P	H		
3.0	**In Process Inspection**							
3.1	Forming Welding	Forming & Welding Parameters	100%	Supplier's records	P	RW		
3.2	Ferrite check of SS welds (If applicable)	% Ferrite Check	100%	Inspection report	P	RW		
3.3	Heat Treatment	Stress Relieving, Normalizing, Tempering, Solution Annealing, Stabilization Heat treatment etc as applicable	100%	HT Chart/Report	P	RW		
3.4	NDT-RT As Applicable	Surface & Internal Imperfections	PR / Purchase Specfication	RT Films, Reports & UT Reports	P	R		
3.5	Corrosion & Metallurgical testing	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.6	NDT / UT As applicable	Surface & Internal Imperfections	PR / Purchase Specfication	UT Reports	P	W		
3.7	NDT-DPT/MPT of bevel ends	Surface / sub surface defects	100%	Test report	P	RW		
3.8	Identification of test Samples	Product Chemical, Tensile, Hardness, Impact, IGC and other test as applicable	Lots as per specification	Test Reports	P	W		
3.9	Product Analysis (as applicable)	Chemical Composition	PR / Purchase Specfication	Test Reports	P	W		
3.10	Destructive Testing	Tensile, Hardness, Impact, IGC and Other test as applicable	100%	Test Report	P	W		
3.11	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Visual and Dimension	Size, Thickness / Schedule, Dimensions, Surface quality, Marking etc.	100%	Inspection Report	P	W (Note-6)		
4.2	Hardness testing on fittings (** Special services like NACE, H2, HIC,etc)	Hardness value of base metal & Weld / HAZ as applicable	Random 10%	Test report	P	W		
4.3	PMI Check (If applicable)	Chemical check	As Applicable	Inspection Report	P	W		
4.4	Final Stamping	Stamping of Accepted Fittings	Stamping of Fittings which are witness by PMC/OWNER	Inspection Report	P	P		
4.5	Final Stamping	Stamping of Accepted Pipies	Stamping of Pipies which are witness by PMC/OWNER	Inspection Report	P	P		
5.0	**Painting**							
5.1	Shot Blasting Rust Preventive Coating & color Coding	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.
3. For orders placed on stockist, items shall be accepted based on manufacturer's TC with EN10204 type 3.2 certification from client approved suppliers.
4. For welded fittings, it is recommended to use low hydrogen consumable for AS, SS 410 fittings & HIC resistant consumable for HIC service fittings.
5. TPIA reserves the right to check raw material consumption and traceability records.
6. 100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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Annexure - 4

INSPECTION AND TESTING REQUIREMENTS FOR FLANGES

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Heat Treatment, NDT and other Procedures	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	R		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, & Mechanical Properties	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.1	Welding / Forging	Forging & Welding Parameters	100%	Inspection report	P	RW		
3.2	Heat Treatment	Stress Relieving, Normalizing, Tempering, Solution Annealing, Stabilization Heat treatment etc as applicable	100%	HT Chart	P	RW		
3.3	Identification of test Samples	Product Chemical, Tensile, Hardness, Impact, IGC and other test as applicable	100%	Test Reports	P	RW		
3.4	Corrosion & Metallurgical testing	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.5	Product Analysis (As applicable)	Chemical composition	PR / Purchase Specfication	Test Reports	P	RW		
3.6	Destructive Testing	Mechanical, Impact, IGC and Other test as applicable	100%	Test Report	P	W		
3.7	NDT As applicable	Surface & Internal Imperfections	PR / Purchase Specfication	NDT Reports	P	RW		
3.8	Machining and Drilling	Visual & Dimensional check	Lot as per specification	Inspection report	P	R		
3.8	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Final Inspection	1.Visual 2. Dimesnions 3. Hardness 4. Marking etc	100%	Inspection Report	P	W (Note-4)		
4.3	PMI Check(If applicable)	Chemical check	As Applicable	Inspection Report	P	W		
4.4	Final Stamping	Stamping of Accepted Items	Stamping of items which are witnessed by PMC / OWNER	Inspection Report	P	P		
5.0	**Painting**							
5.1	Rust Preventive Coating & color Coding	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. For Non NACE & Non Hydrogen service Carbon Steel Flanges, Spectacle Blinds & Drip rings upto 24" - 300 ANSI Class will be accepted on review of Supplier Test Certificates. Supplier Test Certificates to be reviewed by TPIA.
2. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.
4.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER..

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Annexure - 5

INSPECTION AND TESTING REQUIREMENTS FOR VALVES

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test, Heat Treatment, NDT, Helium Leak Test and other Procedures	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	R, W - For New		
1.3	Pre-Qualification Tests	Fire safe Parameters & Qualification Record	PR / Purchase Specfication	Acceptance Report	P	W		
2.0	**Material Inspection**							
2.1	Cating & Forgings (Body, Bonnet, Disc, Stem, Body ring	Chemical, Mechanical, Heat Treatment, NDT, IGC & Other Properties as applicable	100%	Test Certificates	H	H		
2.2	Cating & Forgings (Body, Bonnet, Disc, Stem, Body ring	Visual & Dimensions	100%	Inspection Report	H	H		
2.3	Body and Bonnet Castings	Radiography Examination	PR / Purchase Specfication	Films and report	H	R		
2.4	Bars for Trim Material	Chemical Analysis	Each Heat	Test Certificates & Lab report	H	R		
2.5	Corrosion & Metallurgical testing (as applicable)	Intergranular corrosion	Lot as per specification	Test Report	P	W		
2.6	Magnetic particle testing /Dye penetrant testing	As per NDE specification	100%	Test Report	P	W		
2.7	Gaskets, Gear units, Fasteners, Gland, Packings, etc	Physical / Chemical Properties	100%	Test Certificates & Lab report	H	R		
2.8	Actuators as applicable	Performance, Statutory Certificates as applicable	100%	Test Certificates, Inspection reports	H	H		
3.0	**In Process Inspection**							
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection report	P	RW		
3.2	Machining of components	Visual / Dimension	100%	Inspection report	W	R		
4.0	**Final Inspection**							
4.1	Hydrostatic / Pneumatic Test and Helium Leak Test as applicable	Leak Check	PR / Purchase Specfication	Test Report	P	RW (Note-1)		
4.2	Visual / Dimension	Surface & Dimension Check	100%	Test Report	P	W (Note-4)		
4.3	Functional test for Actuator Operated Valves	Satisfactory Performance	100%	Test Report	P	RW		
4.4	PMI Check (as aplicable)	Chemical	As Applicable	Inspection report	P	RW		
4.5	Strip Check (As applicable)	Verify Components & Differential hardness if applicable	PR / Purchase Specfication	Inspection report	P	RW (Note-1)		
4.6	Final Stamping	Stamping of Accepted Valves	Stamping of items which are witnessed by PMC / OWNER	Inspection report	P	P		
5.0	**Painting**							
5.1	Painting & color Coding as applicable	Visual / DFT Check	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. For Non NACE & Non Hydrogen service Carbon Steel valves upto 12" will be accepted on review of Supplier Test Certificates. Supplier Test Certificates to be reviewed by TPIA.
2. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.
4. 100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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Annexure - 6

INSPECTION AND TESTING REQUIREMENTS FOR GASKETS

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	HT & Test Procedure	Documented Procedures	100%	Procedure Documents	P	R		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, Physical and other Properties as per applicable material specification	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.1	Punching & Finishing	Finish & Dimension	100%	Inspection Report	P	H		
3.2	Heat Trement for RTJ Gaskets (As applicable)	Time & Temperature	100%	HT Chart	P	H		
3.3	Corrosion & Metallurgical testing	Intergranular corrosion	Lot as per specification	Test Report	P	W		
4.0	**Final Inspection**							
4.1	Final Visual, Dimension & Testing	Compressibility, Recovery, Seal ability, Groove Hardness for Ring & Tongue Joint etc as applicable and Visual / Dimension	100%	Inspection Report	P	W (Note-3)		
4.2	Final Stamping	Stamping Of Accepted Gaskets	100%	Inspection Report	P	W		
4.3	PMI Check	Chemical Check	As Applicable	Inspection Report	P	W		
5.0	**Painting**							
5.1	Rust Prevention & Color Coding (As applicable)	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

3.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL- Paradip Refinery
	CLIENT	INDIAN OIL CORPORATION LIMITED

INSPECTION AND TEST PLAN FOR PIPING BULK ITEMS AND SPECIALITIES	Project No. 080557C001	Document No. 080557C-000-ITP-1300-001	Rev. No. B	Page 1 of 1

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INSPECTION AND TESTING REQUIREMENTS FOR BOLTING

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Heat Treatmetn & NDT Procedures	Documented Procedures	100%	Procedure Documents	P	H		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, Steel making prcess, Macro etch, etc.,	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.1	Thread Rling, Hot Forging of Nuts/Boll Heads, Machining	Process parameters	100%	Inspection Reports	P	RW		
3.2	Heat Treatment	Normalizing & Tempering, Quenching & Tempering, Solution Annealing, Stabilization Heat Treatment, Strain Hardening, Nitriding etc., as applicable	100%	Inspection Reports	P	RW		
3.3	Corrosion & Metallurgical testing(If applicable)	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.4	NDT As applicable	Defects detection	100%	Test Reports	P	W		
3.5	Identification of test Samples	Product Chemical, Proof Load Test, Stress Rupture, Tensile, Hardness, Impact, and other test as applicable	Lots as per specification	Test Reports	P	H		
3.6	Destructive Testing	Product Chemical, Proof Load Test, Stress Rupture, Mechanical Impact, and other test as applicable	Lot as per specification	Test Report	P	W		
3.7	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Visual & Dimension	Visual Marking & Dimensions	100% by Suppler & Random by PMC/OWNER	Inspection Report	P	W(Note-3)		
4.2	Final Stamping	Stamping of Accepted Bolting Material	Stamping of bolting material which are witness by PMC/OWNER. Others to have suppliers Identification.	Inspection Report	P	W		
4.3	PMI Check(If applicable)	Chemical Check	As Applicable	Inspection Report	P	W		
5.0	**Painting**							
5.1	Rust Prevention & Color Coding (As applicable)	Visual & Color Coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

3. Final Visual and Dimension shall be checked as per below sampling plan.

Lot Size (Nos.)	Sample Size (Minimum)
Upto 100	2% (Min. 2 Nos.)
101 to 500	1% (Min. 3 Nos.)
501 and above	0.5% (Min. 5 Nos.)

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	CLIENT	INDIAN OIL CORPORATION LIMITED		
INSPECTION AND TEST PLAN FOR PIPING BULK ITEMS AND SPECIALITIES	**Project No.** 080557C001	**Document No.** 080557C-000-ITP-1300-001	**Rev. No.** B	Page 1 of 1

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INSPECTION AND TESTING REQUIREMENTS FOR STEAM TRAPS

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test, Heat Treatment, NDT, Helium Leak Test and other Procedures	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	R W - New		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, Mechanical, Heat Treatment, NDT, IGC & Other Properties as applicable	100%	Test Certificates	P	W		
3.0	**In Process Inspection**							
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection report	P	RW		
3.2	Heat Treatment	PWHT as applicable	100%	HT Chart	P	RW		
3.3	Corrosion & Metallurgical testing(If applicable)	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.4	RT As Applicable	Weld Defects	PR / Purchase Specfication	RT films & Reports	P	R		
3.5	NDT As Applicable	Surface & Internal Imperfections	PR / Purchase Specfication	Test Reports	P	RW		
4.0	**Final Inspection**							
4.1	Hydrostatic Testing	Leak Check	100%	Test Report	P	W		
4.2	Visual and Dimensional Inspection (VDI)	Surface Conditions & Dimension	100%	Inspection report	P	W (Note-3)		
4.3	PMI Check (If applicable)	Chemical Check	As Applicable	Inspection report	P	W		
4.4	Final Stamping	Stamping of Accepted traps	100%	Inspection report	P	W		
5.0	**Painting**							
5.1	Painting & color Coding	Visual, DFT & Color coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

3.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL- Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	

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INSPECTION AND TESTING REQUIREMENTS FOR STRAINERS

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test, Heat Treatment, NDT, Helium Leak Test and other Procedures	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	W-New R-Existing		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, Mechanical, Heat Treatment, NDT, IGC & Other Properties as applicable	100%	Test Certificates	P	RW		
3.0	**In Process Inspection**							
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection report	P	RW		
3.2	Heat Treatment	PWHT as applicable	100%	HT Chart	P	RW		
3.3	Corrosion & Metallurgical testing(If applicable)	Intergranular corrosion	Lot as per specification	Test Report	P	W		
3.4	RT As Applicable	Weld Defects	PR / Purchase Specfication	RT films & Reports	P	R		
3.5	NDT As Applicable	Surface & Internal Imperfections	PR / Purchase Specfication	Test Reports	P	W		
4.0	**Final Inspection**							
4.1	Hydrostatic Testing	Leak Check	100%	Test Report	P	W		
4.2	Visual and Dimensional Inspection (VDI)	Surface Conditions & Dimension	100%	Inspection report	P	W (Note-4)		
4.3	PMI Check (if applicable)	Chemical Check	As Applicable	Inspection report	P	W		
4.4	Final Stamping	Stamping of Accepted strainers	Stamping of Strainers which are witnessed by PMC/OWNER	Inspection report	P	W		
5.0	**Painting**							
5.1	Painting & color Coding	Visual, DFT & Color coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. For Non NACE & Non Hydrogen service Strainers upto 6" 300# ANSI will be accepted on review of Supplier Test Certificates duly reviewed by TPIA.

2. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

4.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER..

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	CLIENT	INDIAN OIL CORPORATION LIMITED

INSPECTION AND TEST PLAN FOR PIPING BULK ITEMS AND SPECIALITIES	Project No. 080557C001	Document No. 080557C-000-ITP-1300-001	Rev. No. B	Page 1 of 1

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INSPECTION AND TESTING REQUIREMENTS FOR HOSES(METALLIC) AND COUPLINGS

SL NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	CONTRACTOR/TPIA	PMC	OWNER
1.0	**Procedure**							
1.1	Hydrostatic Test & NDT Procedures	Documented Procedures	100%	Procedure Documents	P	R		
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	P	W- For New R-Existing		
2.0	**Material Inspection**							
2.1	Incoming Materials (Rubber hose / SS pipe / SS wire braiding / Flanges / Coupling)	Chemical & Mechanical Properties & IGC (For SS items if applicable)	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection report	P	RW		
3.2	NDT As Applicable	Weld soundness	100%	Test Reports	P	RW		
4.0	**Final Inspection**							
4.1	Hydrostatic/Pneumatic Testing	Leak Check	100%	Test Report	P	W		
4.2	Vaccum test, Steam Resistance, Electrical Continuity and other tests as applicable	Leak & Soundness check	100%	Test Report	P	W		
4.3	Visual and Dimensional Inspection (VDI)	Surface Conditions & Dimension	100%	Inspection report	P	W (Note-3)		
4.4	PMI Check	Chemical Check	As Applicable	Inspection report	P	W		
4.5	Final Stamping	Stamping of Accepted items	100%	Inspection report	P	W		
5.0	**Painting**							
5.1	Painting & color Coding	Visual, DFT & Color coding as applicable	100%	Inspection Report	P	W		
6.0	**Documentation & IC**							
6.1	Final documents	Review of Stage Inspection report / Test Reports	100%	Supplier TC & IC	P	H	R	
6.2	Inspection release certificate	Issue of Inspection release certificate	100%	Supplier TC & IC	-	H	R	

Legend: H-Hold (Do not proceed with approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.

3.100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection (TPI) and surprise checks by PMC/OWNER.

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TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev D**

JOB SPECIFICATION FOR DESIGN
PIPING MATERIAL SPECIFICATION

			Written By	Checked By	Approved By	Authorized By
			Karthikeyan Chokkalingam 2020.03.13 11:36:16 +05'30'	Loganathan Sudarsan 2020.03.13 11:55:44 +05'30'	Ilango Thottikalai 2020.03.13 12:15:59 +05'30'	Morischristopher Jesumarian 2020.03.13 13:20:07 +05'30'
D	12.03.2020	ISSUED FOR DESIGN	CK	AS/SL	VVS / TI	JM
C	25.11.2019	ISSUED FOR DESIGN	CK	AS	VVS	JM
B	04.11.2019	ISSUED FOR DESIGN	CK	AS	VVS	JM
A	24.10.2019	ISSUED FOR DESIGN	CK	AS	VVS	JM
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 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India

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
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
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsite related
SRU	Sulphur Recovery Unit
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute

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P&ID	Piping and Instrumentation Diagram
PMI	Positive Material Identification
A/G	Above Ground
U/G	Under Ground
B/L	Battery Limit
ISBL	Inside Battery Limit
MTO	Material Take Off

3. SCOPE

This Piping material specification and summary provides recommendations and guidance for selection and use of appropriate piping classes according to the service and design conditions of "Standby SRU and Additional tanks Project", IOCL Paradip Refinery, Odisha, India.

- CONTRACTOR shall follow this Piping material specification during detail engineering and execution of respective scope of work.

- During execution phase, if any change or update is required on this Piping material specification then, CONTRACTOR shall notify PMC and proceed after getting PMC approval.

- Branch table attached for each piping classes is preliminary and shall be validated and updated further suitably by CONTRACTOR

4. CONFLICTS, DEVIATIONS AND CLARIFICATIONS

Any conflicts between this specification and other applicable Engineering Standards, Material Specifications, Standard Drawings, Engineering Procedures, Company Forms or Industry standards, specifications, Codes and forms shall be brought to the attention of Authorized Representative by the Contractor for resolution.
Until the resolution is officially made by Authorized Representative, the most stringent requirement shall govern.
Where a licensor specification is more stringent than those of this standard, the Licensor's specific requirement shall apply.
Where applicable Codes or Standards are not called by this standard or its requirements are not clear, it shall be brought to attention of Authorized Representative by Contractor for resolution.

Direct all requests for deviations or clarifications in writing to the Authorized Representative for final resolution.

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5. REFERENCE DOCUMENTS

080557C-088-JSD-1300-001- Piping Design Basis

080557C-000-JSD-1300-006 - Standard Specification for Steam Tracing & Jacketing

080557C-000-JSD-2200-001 - Standard Specification for Hot Insulation of Vessels, Piping and Equipment

080557C -000-JSD-2300-001 - Standard Specification for Painting and Coating

080557C 000-JSC-1300-004 - Standard Specification for Bolt tensioning

080557C-000-JSS-1300-001 - Specification for coating of JSS for 3 Layer Polyethylene coating

080557C-000-JSS-1300-002 - JSS for 3 Layer Polyethylene coating of Internal surface of CS Pipelines & fittings for Firewater and Cooling water

080557C -000-JSS-1310-001 - JSS for Valves.

080557C -000-JSS-1320-001 – JSS for Pipes.

080557C -000-JSS-1330-001 - JSS for Fittings 2 inch and above.

080557C -000-JSS-1340-001 - JSS for Fittings 1.5 inch and below.

080557C -000-JSS-1350-001 - JSS for Flanges.

080557C -000-JSS-1360-001 - JSS for Gaskets.

080557C -000-JSS-1370-001 - JSS for Fasteners

080557C-000-SP-1390-009 - Specification for color coding of piping materials supplied by vendor

080557C-000-PP-804 – Positive Material Identification at Site

080557C-000-JSS-6300-002 - Positive Material Identification at vendor's works.

080557C-000-PP-814 – Welding and NDE specification for Fabrication of Piping

080557C-000-PP-815 – Welding Specification Chart for Piping

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080557C-000-PP-820 – Standard specification for Pressure testing, Flushing and Reinstatement of piping system
080557C-000-JSC-1300-001 – Standard specification for Fabrication and Erection of Piping
080557C-088/000-STD-1380-001 - Piping Standard – Hook up Assembly Drawings.
080557C -000-STD-1380-002 - Design and construction standard.

6. REFERRED CODES & STANDARDS

The latest issue of the following major Codes and Standards shall be referred to as a part of the Piping material specification. Other codes and standards not listed herein may also be used for any other design purpose.

The design, materials, equipment and related items in all the systems (i.e. gas, oil, steam, water, air etc.) shall be in accordance with the latest edition of ASME B 31.3 and ASME B 31.1, where the provisions of these standards are applicable.

American standards and recommended practices, along with other internationally recognized codes as guidelines, shall be used for the design activity.

ASME B 31.3	Process Piping
ASME B 31.1	Power Piping
ASME Vol. VIII & IX	ASME Boiler and Pressure Vessel Code
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory Made Wrought Steel Butt Welding Fittings
ASME B16.34	Valves – Flanged, Threaded, and welding End
ASME B16.47	Large Diameter Steel Flanges
ASME B1.20.1	Pipe threads, General Purpose, Inch
ASME B16.10	Dimensions of Ferrous Valves
ASME B16.11	Forged Steed Fittings, Socket welding and Threaded
ASME B16.20	Metallic Gaskets for Pipe Flanges – Ring Joints, Spiral Wound and Jacketed

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ASME B16.21	Non-metallic Flat Gaskets for Pipe Flanges
ASME B16.25	Buttwelding Ends
ASME B18.2.1	Square & Hexagonal Bolts & Screws (Inch Series)
ASME B18.2.2	Square & Hexagonal Nuts (Inch Series)
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19M	Stainless steel pipe
ASME B 46.1	Surface texture
API 594	Wafer and Wafer-lug Check Valve
API 598	Valves inspection and testing
API 599	Metal Plug Valves – Flanged, Threaded and Welded Ends
API 600	Steel Gate Valves, Flanged or Buttwelding Ends
API 602	Compact CS gate valves flanged threaded, welded & extended body ends
API 607	Fire test for soft seated quarter turn valves
API 609	Lug and Wafer Type Butterfly valves
BS 1868	Spec. for steel check valves (flanged and butt welding ends) for petroleum, petrochemical and allied industries
BS 1873	Steel globe and globe stop and check valves (flanged and butt welding ends) for the petroleum petrochemical and allied industries
BS 5351	Steel ball valves for petroleum, petrochemical and allied industries
BS 5352	Steel wedge gate, globe and check valves, 50mm and smaller for petroleum, petrochemical and allied industries
MSS-SP-6	Standard finishes for contact faces of pipe flanges and connected end flanges of valves and fittings
MSS-SP-25	Standard marking system for valves, fittings, flanges and unions

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MSS SP43	Wrought Stainless Steel Butt Welding Fittings
MSS SP44	Steel Pipe Line Flanges
MSS SP48	Steel Butt Welding Fittings (26" and larger)
MSS SP75	High Test Wrought Butt Weld Fittings
MSS SP83	Carbon Steel Pipe Unions, Socket Welding and Threaded
NACE MR0103 - 2007 / ISO17945	Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments
NACE MR0175 / ISO15156	Materials for use in H2S containing Environments in Oil and Gas Production
TM 0284	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking
IBR	Indian Boiler Regulation

7. GENERAL CONSIDERATION FOR PIPING MATERIAL SPECIFICATION

This Piping class summary provides pressure temperature conditions based on the service criteria of generic refinery project.

The rating for the Piping classes may vary based on the pressure temperature criteria and licensor requirements.

The base material and corrosion allowance considered shall be revalidated by the contractor based on the latest Material Selection Diagram / fluid list.

Piping class codification has been made to meet the IOCL requirements. This codification will be revalidated / revised / modified by contractor based on Licensor's requirements.

Special requirements such as PWHT for caustic service, IBR for steam service, NACE requirements, etc has been stipulated based on PMC experience.

Special requirements for Hydrogen service has been stipulated based on PMC experience. Modifications if any shall be discussed with the licensor and modified.

While PMC has given a broad guideline, it is the responsibility of the contractor to select appropriate piping class and ensure compliance with specific requirements of licensor. However, modification, addition and deletion of requirements shall be brought to the notice of PMC for its approval.

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Metallic piping has only been considered in this piping material summary. However, in case of non-metallic piping requirements such as FRP, GRP, HDPE, CPVC, RTRP, etc shall be developed based on licensor needs and vendor specifications.

8. MATERIAL SPECIFICATIONS

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

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

The Carbon content of carbon steels shall be 0.25% maximum and carbon equivalent (CE) shall be 0.43 maximum for normal piping classes, whereas for specific requirements like NACE, the respective job supply specification shall be applicable.

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

Stainless steel pipes shall be lower grade (SS304L and SS316L) as specified in Piping class summary.

9. PIPES

- Pipe dimension shall be in accordance with ASME B36.10, B36.10 / B36.19 for Carbon steel pipe and stainless steel pipes respectively.
- Threaded Pipes shall not be used except for galvanised piping and Instrument connection.
- Welded pipes shall be acceptable only with longitudinal weld made employing automatic welding.
- ERW Pipes shall not be used.
- Pipe thicknesses covered in different classes of this specification shall be calculated to meet specific job requirement based on actual max. design condition to economise on thickness if required. However, in such cases the thickness shall be calculated at not less than 80% of class rating unless defined otherwise in the Job Engineering Design Basis (Piping).
- E.F.W or Seamless pipes shall only be considered for Utility and process Piping. As per IOCL's internal report/lessons learnt feedback IS specification pipes shall not be used to avoid corrosion and leakage issues that are prevalent in existing refinery cooling

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water/firewater lines.

- B.W ends shall be as per B 16.25.
- Plain nipples to be cut from pipes. However, threaded nipples shall be one schedule higher thickness than the normal. Nipples (TOE), Length = 100 mm and threading as per B 1.20.1.
- All pipes where galvanization is required shall be hot dip galvanized to ASTM A 153 after spool prefabrication.
- Maximum of 10% of Corrosion Allowance may be adjusted to optimize on pipe schedule for special cases. However, if CA is suffixed by 'minimum', this downward adjustment shall not be used.
- Non-standard pipe sizes 1¼", 2½", 3½", 5" & 22" shall not be treated as a part of this specification unless these sizes are separately called out.
- The wall thickness of piping components shall be expressed first as the Schedule Number (e.g., Schedule 40, Standard etc.). Where a thickness does not correspond to either of these designations, MM shall be used (e.g., 22 MM).
- For all wall thicknesses greater than 19.05mm (3/4"), all welds shall be subject to post weld heat treatment.
- For welded Pipe, seamless is an acceptable substitute. However, the negative tolerance on thickness of such substitution of Seamless pipe shall not exceed 0.3 mm.
- All AS pipes shall be supplied in the normalized and tempered condition.
- All SS pipes shall be supplied in the solution annealed and descaled condition.
- All technical requirements under this category shall be as per Job Supply Specification for Pipes.

10. FLANGES

- Flanges shall be in accordance with the following codes except where otherwise noted,
  - Up to 24" (150#-2500#) ASME B 16.5.
  - Above 24" (150# -1500#) ASME B16.47 Series `B'
- Flanges to MSS-SP-44 or any other standard may be specified to match with equipment or valve flanges with the corresponding bolting.

Finish of steel flange faces shall be as follows:

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- Serrated / Smooth Finish 125 -250µ in
- AARH Extra Smooth Finish (For RTJ groove) 32-63 µ in

- The bore of WN flanges shall match the ID of the attached pipe. (Bore of SW flanges shall be to suit the pipe OD and its thickness). Ends shall be beveled to suit the specified schedule/ thickness.
- Brinell hardness for RTJ groove shall be 20-50 Brinell Hardness more than that of corresponding gasket as specified. However minimum Brinell hardness for RTJ facing of flanges shall be as per JSS for Flanges.
- For RTJ flanges, blinds & spacers, the hardness of the groove shall be specified on the Test report.
- Threaded flanges shall not be used except for galvanized piping and instrument connections.
- Forged Flanges in place of Flanges Fabricated from Plate can be accepted for all material grades.
- All CS flanges shall be supplied in the normalized condition.
- All AS flanges shall be supplied in the normalized and tempered condition.
- Orifice flanges shall confirm to ASME B16.36. They shall be limited to 2" minimum of 300# shall be used for orifice flanges. For 900# and above pressure tap holes shall be 0.75", however it shall be checked with Instrument hook up drawings.
- All SS flanges shall be supplied in the solution annealed and descaled condition.
- All technical requirements under this category shall be as per Job Supply Specification for Flanges.

11. FITTINGS

- Forged steel SW 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 standard.
- All fittings shall be seamless in construction unless otherwise specified.
- BW Fittings shall be in accordance with ASME B16.9, unless otherwise specified.
- Dimensions of steel BW fittings for sizes not covered in ASME B16.9 shall conform to MSS-SP-48
- Usage of unions shall be restricted to category D water lines only.
- All welded fittings shall be normalized for CS, normalized & tempered for AS: and 100%

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radiographed by X-ray for all welds made by fitting manufacturer as well as for welds on the parent material.

- Fittings thickness tolerance shall match pipe thickness tolerance.
- For welded fittings, seamless is an acceptable substitute.
- All welded fittings shall be double welded. Inside weld projection shall not exceed 1.6 mm, and the welds shall be ground smooth at least 25 mm from the ends.
- For fittings made of welded pipe, the pipe itself shall be of double welded type, manufactured with addition of filler material & made by employing automatic welding only.
- For all wall thicknesses greater than 19.05mm (3/4”), all welds shall be subject to post weld heat treatment.
- Branch reinforcing fittings shall be designed in accordance with the requirements of ASME B31.3, Vendor shall submit sample calculations for approval with his bid.
- Threaded fittings shall not be used except for galvanised piping and Instrument connection
- All welded fittings shall have maximum negative tolerance equivalent to pipe selected.
- Bevel ends of all BW fittings shall undergo 100% MP/DP test.
- Thickness of fittings at ends to match Pipe thickness for BW fittings.
- SW fittings shall be 3000#, 6000# or 9000# depending on pipe thicknesses S80, S160 and above S160 respectively.
- Tell-tale hole to be tapped in all reinforcement pads.
- Miters and Reducers fabricated from Pipe may be used if specified in particular piping Class. 90degree miters shall be minimum 4-piece construction up to 24" and minimum 5-piece construction for 26" & above. 45degree miter shall be minimum 3-piece construction. Miters require higher thickness than corresponding Pipe / Elbow to hold the same pressure (Refer ASME B31.3).
- All technical requirements under this category shall be as per Job Supply Specification for Fittings

12. GASKETS

- Non-metallic gaskets shall not be used.
- Spiral wound gaskets (SPR. WND or SPWD) shall conform to B16.20 and shall match flanges to ASME B 16.5 up to 24”, and ASME B 16.47 Series B above 24”.
- Graphite used as filler shall be at least 99% pure with the addition of corrosion inhibitor.
- Metallic components in the metallic gaskets shall be in accordance with applicable ASTM material specification.
- Ring type and spiral wound gasket shall be self-aligning type.

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- OVAL Ring Joint gasket shall conform to B16.20 & Brinell Hardness shall be 20-50 BHN less than corresponding Flange Groove Hardness.
- All RTJ gaskets should have material marking on it. Material test certificate shall be supplied with the gasket.
- Asbestos filler for spiral wound gasket shall not be used.
- Compliance to following requirements for spiral wound gaskets are mandatory.
  a) C.S. outer ring irrespective of temperature-spiral strip material (except subzero temperatures).
  b) Inner ring material shall be provided as per ANSI B 16.20 for all spiral wounded gaskets, however the minimum pipe wall thickness suitable for the use of spiral wound gaskets with inner rings for ASME B 16.5 flanges shall be validated by the contractor.
- Material of inner ring to be C.S/SS for C.S classes & same as that of spiral strip material for other than C.S. classes.
- Spiral wound gaskets shall be made of alternate plies of preformed metal winding and filler that are tightly wound spirally. The filler shall be essentially flushed with, but not below the metal winding on both contact faces of the gasket.

13. STUD BOLTS, NUTS AND JACK SCREWS

- All bolts, nuts &studs shall be of metric type.
- All bolting shall be as per ASME/ ANSI B18.2.1 for studs, M/C Bolts and Jack screws,
- All nuts shall be as per ASME/ ANSI B18.2.2 for studs, M/C Bolts and Jack screws,
- Threads shall be unified (UNC for 1" dia. and 8 UN for >1" dia.) as per ANSI B 1.1 with class 2 A fit for Studs, M/C Bolts and jackscrews, and class 2B fit for nuts
- The nuts shall be double chamfered, semi finished heavy hexagonal type. The length of the studs/bolts shall be such that minimum two threads should be out of nut on either side. All the stud/bolt should have metallurgical certificates, in case of alloy/ SS metallurgy with identified colour marking at the stud ends/ bolt side face.
- The recommended anti-seize compound shall be used for all high temperature flange Fasteners
- Wherever bolt tensioning is specified stud bolt length shall be longer by minimum one Diameter to suit bolt tensioner
- Heads of jackscrews and M/C bolts shall be heavy hexagonal type. Jackscrew end shall be rounded
- Stud bolt/Hexagonal head bolt lengths shall be the effective thread length excluding the

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end points, in accordance with ASME B16.5.

14. VALVES

- Nominal pressure ratings for valves are expressed in pounds (e.g.,150lb, 300lb, etc).
- Face to face / End to end dimensions of valves shall conform to B16.10, API 594, API 609 to the extent covered. For valves not covered in above standard reference shall be made to BS 2080 and/ or the manufacturer's drawings.
- Flange/weld ends of the valve shall be as per the corresponding flange/fitting ends of the piping class, unless otherwise specified.
- Pressure-temperature rating of flanged and butt-welding end valves shall be as per ASME B16.34 except for ball, plug & butterfly valves unless specified in the piping classes. For these valves refer Table for pressure-temp rating for ball, plug & butterfly valves. Wall thickness of valve body at different locations should not be less than as calculated as per B16.34.
- Welding of flanges on to valves to meet the requirements for a flanged end valve is acc eptable without prior approval.
- Wherever the grafoil gland packing is specified, vendor shall give both top and bottom rings as Inconel braided graphite with corrosion inhibitor and flexible grafoil middle rings.
- For details of the valves specifications, refer detailed pipe class attached below.
- Unless called-out specifically, valves shall be as per the following standards:
- Unless otherwise specifically called for, upto 600# rating, 2" and larger size steel Gate,Globe & Check valves in Hydrocarbon and utility service shall have bolted bonnets. Pressure-seal Bonnets or covers shall be used for Classes 900# and above to minimize bonnet leakage. However, valves with Pressure seal Bonnet shall have wall thickness & stem diameter as per API-600, (if required). Welded bonnets or screwed & seal welded bonnets are acceptable for sizes lower than 2" for Classes 900# & above.

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Valve	Size	Rating	Des. Std	Testing Std.
Gate/ Globe / Check	1/2"-1-1/2"	800/1500/2500	API 602/API 600/ISO 15761/BS 1868/BS 1873/API 6D	API-598
Gate	2"-24"	150/300/600/900 /1500/2500	API-600	API-598
Gate	26"-60"	150/300	API 600 Where Applicable/API 600/ASME B16.34	API-598
Globe	2"-24"	150/300/600/900 /1500/2500	BS 1873/API 623	API-598
Check	2"-80"	150/300/600/900 /1500/2500	BS 1868/API 594	API-598
Ball	1/2"-24"	150/300/600	API 6D + ASME B16.34/ API 608/BS 5351	BS-6755 Pt. I / API-598
		900 / 1500 / 2500	API 6D + ASME B16.34	API-598
Plug	1/2"-12"	All	API-599 / BS5353	API-598 / BS 6755 Pt.I
Butterfly	3" & above.	All	API-609 / BS5155/ AWWA C504	API-598 / BS-6755 Pt-I / AWWA
Diaphram	ALL	-	BS-5156	BS-67S5 Pt-I
Bronze			RELEVANT IS STD.	RELEVANT IS STD.
Cast Iron			RELEVANT IS STD.	RELEVANT IS STD.

- For requirement of gear operator and radiography examination, refer Job Supply Specification for Valves.
- All technical requirements under this category shall be as per Job Supply Specification for Valves.
- Strahman Piston type valves, Intermittent blow down valves, continuous blowdown valves, steam angle check valves, that are shown in PID are special type valves, hence data sheets have to be prepared by contractor for each tag mentioned in PID based on Process specification.

15. NDT AND WELDING SPECIFICATION

- For detailed welding and fabrication specification, refer " 080557C-000-PP-814" and " 080557C-000-PP-815"

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16. SPECIAL REQUIREMENTS FOR NACE AND HIC

All items under this category shall be as per NACE MR-0103 (special requirement of NACE service) any other applicable standards shall also be followed. Hardness shall be below BHN 200 for C.S. material, Carbon equivalent (CE) shall be limited to value that is specified in Job supply specification for respective piping components.

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

Materials under HIC testing is required to pass the NACE Standard .TM0284 by using the test solution specified in NACE TM0177.

17. SPECIAL REQUIREMENTS FOR HYDROGEN SERVICE

For special requirements of Hydrogen service refer Job supply specification for Valves, Pipes, Fittings, Flanges.

18. REQUIREMENT FOR IBR ITEMS

All items under purview of 'IBR' (Indian Boiler Regulations) shall be accompanied with IBR certificate original in Form III A for pipes and IIIC for other piping items, duly approved by IBR Authority/Local Authority empowered by Central Board of India. Alternatively, photocopy original certificate duly countersigned and attested by Local Boiler Inspection, is the minimum requirement.

In carbon steel piping, carbon content shall not exceed 0.25% for all Pipes, fittings, flanges & valve bodies, etc. that may require welding. Moreover, for flanges the Sulphur and phosphorus also shall be as per IBR regulations.

Based on the current IBR regulations Piping for steam jacketing does not fall under purview of IBR, Hence IBR not specified for Jacketed Piping .

Wall thickness calculation for IBR Piping classes shall be as per IBR regulation 350.

19. BASIS FOR WALL THICKNESS

Calculation of pipe thickness and branch reinforcement shall be based on requirements of ASME B31.3 & B31.1. Proper corrosion allowance and mill tolerance shall be considered to achieve the selected thickness. All pipes and fittings shall be designed with proper corrosion allowance and mill tolerance. ±12 ½ %

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For carbon steel and low alloy steel pipes minimum pipe thickness shall be as follows:

'S160' up to 0.75" NB (for other than steam tracing),

'XS' up to 0.75" NB (for steam tracing),

'XS' for 1" to 2"NB,

'STD' for above 2NB.

For Stainless Pipes minimum pipe thickness shall be

80S up to 0.75”

40S for 1” to 2”

10S for above 2”

The philosophy of minimum thickness/schedule is applicable for both seamless and welded pipes.

The above mentioned minimum thickness/schedule criteria is not applicable to category –D pipe classes, firewater service above ground and non-corrosive hydrocarbons service specification.

All pipes (seamless & welded) shall have uniform negative wall thickness tolerance of 12.5% for wall thickness calculations purpose, except for pipes made out of plate material where the applicable ASTM codes shall be followed.

For thickness exceeding minimum thickness/schedule criteria, schedule XS shall be selected for CS & AS classes (for 2" & above). Intermediate schedules between STD & XS shall be ignored. Similarly for SS classes (2" & above) S10, S20, S30 & 40S may be selected beyond minimum thickness/schedule criteria.

If, the thickness exceeds XS in CS &AS classes and 40S in SS classes, only then, the thickness shall be calculated based on actual service conditions subject to a minimum of 80% class rating. Maximum 10% of corrosion allowance may be reduced in special cases, to optimize the pipe schedules.

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20. PIPING CLASS CODIFICATION

Following Piping class codification is used for common units and units of licensors for uniform application & homogeneity.

The class designation shall consist of not more than three components made up of a letter, a number and a letter as follows,

- The first letter indicated pressure rating.

A	150 Class	D	600 Class	G	2500 Class
B	300 Class	E	900 Class	J	125 class
C	400 Class	F	1500 Class	S	Tubing class

- The middle number indicates the difference in specifications with in the same rating and material, and a detailed tabular column is provided in the following pages.

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2nd digits	Carbon Steel	SS 304/304L/304H	SS 316/316L/ 317/321/347	Alloy Steel	Monel/Hastelloy/ Duplex
1	CA = 1.5mm Aboveground	CA = 0.8 mm Aboveground	CA = 0.8 mm Aboveground	CA=1.5 mm Aboveground	CA= 1mm Above ground (Alloy 825)
2	CA = 1.5mm Aboveground (Steam under B31.1)	CA=1mm Above ground	CA = 1 mm Aboveground	CA = 3 MM Aboveground	CA=1.5mm Aboveground (Alloy 825)
3	CA = 3mm Aboveground	CA=0.25 mm Above ground	CA = 0 mm Aboveground (Jacketed)	CA = 3 MM Aboveground Grayloc	CA=1.5mm Aboveground (Duplex)
4	CA = 1.5 mm Low Temperature Aboveground	CA=0mm Above ground	CA = 3 mm Aboveground (SS321) RTJ	CA = 1.5 MM Aboveground Grayloc	CA = 1.5 MM Aboveground
5	CA = 1.5 mm Hydrogen service Aboveground	CA = 1mm Aboveground	CA = 5 mm Aboveground (SS347)	CA = 1.5 mm Hydrogen service Aboveground	CA=1.5mm Aboveground (Alloy 880)
6	CA = 1.5 mm Aboveground	CA = 1.5mm Aboveground	CA = 1 mm Aboveground (SS321)	CA = 4.5 mm Aboveground	
7	CA = 3 mm Low Temperature Flare, Drain	CA=0.8 mm Sour service Above ground	CA=1.5 mm Above ground	CA=1.5 mm Aboveground	
8	CA = 3 mm Chemical service / Amine Aboveground	CA=0mm Hydrocarbons Above ground	CA = 1 mm Aboveground (SS321) RTJ	CA=3 mm Aboveground	
9	CA = 3mm Aboveground (Non-corrosive utilities)	CA=1.5mm (SS304)	CA = 3 mm Aboveground (SS321) Grayloc	CA=1.5 mm (Steam under B31.1) Aboveground	
10	CA = 1.5mm Offsite Aboveground	CA = 0 mm Underground	CA = 1 mm Aboveground (SS347) Grayloc		
11	CA = 3mm Aboveground	CA = 0mm Aboveground	CA = 5 mm Aboveground (SS347) Grayloc	CA = 1.5 mm Hydrogen service Aboveground, RTJ	
12	CA = 3mm Aboveground	CA=0mm Above ground	CA = 1 mm Aboveground (SS321) Grayloc		

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2nd digits	Carbon Steel	SS 304/304L/304H	SS 316/316L/ 317/321/347	Alloy Steel	Monel/Hastelloy/ Duplex
13	CA = 3mm Acid Flare Aboveground	CA = 0.8 mm Amine Aboveground	CA = 0.0 mm Aboveground		
14	CA = 1.5 mm Steam under B31.1 Aboveground	CA =1 mm Aboveground	CA =0.8 mm Full vacuum service Aboveground		
15	CA = 3.0mm (Liquid Sulphur) Aboveground	Solid additives CA=0mm Aboveground			
16	CA= 4.5 mm Aboveground	Pellets(Solid services) CA=0mm Aboveground			
17	CA=6 mm High Corrosive	Powder service CA-0mm, aboveground			
18	CA=1.5 mm galvanized				
19	CA=3.0 mm (Caustic / Amine, Stress relieved) Aboveground				
20	CA= 1.5 mm Aboveground (Jacketed)				
21	CA = 3.0 mm Sour service Aboveground	CA = 0 mm Hydrogen service Aboveground	CA = 1.5 mm Chemical Aboveground	CA = 3 mm Aboveground	
22	CA=3.0 mm (LPG + Caustic / Amine, Stress relieved) Aboveground		CA = 1.5 mm Aboveground (SS321) RTJ		
23	CA = 1.5mm Utility water Aboveground				
24	CA = 3.0 mm utility Aboveground	CA = 1.5 mm Aboveground		CA = 6 mm Aboveground	
25	CA= 3 mm Caustic Service Aboveground	CA = 0 mm Aboveground		CA=3 mm Hydrogen Aboveground	

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2nd digits	Carbon Steel	SS 304/304L/304H	SS 316/316L/ 317/321/347	Alloy Steel	Monel/Hastelloy/ Duplex
26	CA = 1.5mm Utility Underground	CA = 0 mm Hydrogen service Aboveground			
27	CA = 3mm Sour service Aboveground		CA = 1 mm Sour service Aboveground		
28	CA = 3 mm Amine Aboveground		CA = 1.5 mm Aboveground (SS347)		
29	CA = 3mm Fire water, Cooling water Aboveground				
30	CA = 3mm Fire water, cooling water Underground				
31	CA = 3.0mm Steam(B31.1) Aboveground				
33	CA = 1.5mm LPG Underground				
34	CA = 3mm Chemical Underground <= 65°C				
35	CA = 3mm Sour service Underground > 65°C				
36	CA = 3mm Sour service Underground > 65°C				
37	CA = 3mm T = 205 °C Underground				
38	CA = 3.0mm Sour service Aboveground				
41	CA = 1.5 mm Low Temperature Underground				

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2nd digits	Carbon Steel	SS 304/304L/304H	SS 316/316L/ 317/321/347	Alloy Steel	Monel/Hastelloy/ Duplex
46	CA = 3mm Sour service / Amine Aboveground				
47	CA = 3mm Hydrogen + Sour service Aboveground				
48	CA = 6mm Sour service Aboveground				
49	CA = 6mm Sour service Aboveground				
50	CA = 1.5mm Pipeline ASME B31.4 Underground				
51	CA = 1.5mm Pipeline ASME B31.4 Underground				
52	CA = 3 mm Aboveground				
53	CA=0/1.5 mm Galvanized				
54	CA = 3 mm Aboveground			CA = 0.8 mm Aboveground Hydrogen Service	
55	CA = 6 mm Hydrogen + Sour Service Aboveground	CA = 1.5 mm Hydrogen Aboveground			
56	CA = 3mm Hydrogen Aboveground				
82	Tubing				
88	CA = 3mm Sulfuric Acid Aboveground				
91	CA = 3mm Full vacuum service Aboveground	CA = 0 mm Full vacuum service Aboveground	CA = 1.5 mm /Full vacuum service	CA = 6mm Full vacuum service Aboveground	CA = 1.5 mm Aboveground (Monel)

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2nd digits	Carbon Steel	SS 304/304L/304H	SS 316/316L/ 317/321/347	Alloy Steel	Monel/Hastelloy/ Duplex
92	CA = 6mm Above ground	CA = 1.5 mm Aboveground	CA = 1.0 mm Aboveground SS 347	CA = 4.5 mm Aboveground	CA = 0 mm Aboveground (Hastelloy)
93	CA = 3 mm Sour service / Amine Aboveground		CA = 1.5 mm Hydrogen Aboveground SS 321	CA = 3 mm Aboveground	
94	CA = 1.5mm Aboveground		CA =1 mm Aboveground SS321	CA = 3 mm Aboveground	
95	CA = 6 mm Full Vacuum Aboveground		CA = 0 mm Aboveground SS321	CA = 3 mm Aboveground	
96	CA = 1.5 mm Steam (31.1) / Full Vacuum Above Ground		CA = 0.8 mm Aboveground SS321/ 321H	CA = 1 mm Aboveground	
97	CA = 3mm Sour/ Amine / Full Vacuum Aboveground		CA = 0.8 mm Hydrogen service Aboveground SS321		
98	CA = 1.5mm Full Vacuum Aboveground		CA = 1.5 mm Aboveground		
99	CA = 3mm Aboveground				

Note: The unused rows corresponding to digits are kept intentionally blank to be reserved for future additions.

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- The third letter indicates the type of material

A	Carbon steel
C	1.0% Cr., 0.5% Mo.
D	1.25% Cr.,0.5%Mo.
E	2.25% Cr.,1%Mo.
F	5.0 % Cr.,0.5%Mo.
G	Carbon steel Galvanised
K	Stainless steel type 304,304H,304L
L	9.0% Cr., 1.0% Mo
M	Stabilized stainless steel type 316,316H,321, 347
N	Stainless steel type 316L, 317L
P	Monel/Alloy 20
Q	Hastealloy/Inconel/Incoloy
Y	Lined steel(Rubber lined, Teflon lined etc)
Z	HDPE/PDVF/Teflon/PVC

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APPENDIX A

PIPING CLASS SUMMARY

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APPENDIX A
PIPING CLASS SUMMARY
FOR
STANDBY SRU & ADDITIONAL TANKS
IOCL PARADIP REFINERY

Project N°	Unit	Doc. Type	Mat'l Code	Serial N°	Rev.
080557C001	000	JSD	1300	002	D

Sl. No.	PIPING CLASS	EQUIVALENT REFINERY (FOSTER WHEELER) PIPING CLASS	LOCATION	BASIC MATERIAL (DESIGN CODE)	CORROSION ALLOWANCE (MM)	RATING / FACING / GASKET / BOLTING	DESIGN CONDITIONS P (Kg/Cm^2g)	DESIGN CONDITIONS T (Deg C)	SERVICE FLUID CODE	SERVICE DESCRIPTION	SPECIAL REQUIREMENT NACE	SPECIAL REQUIREMENT HIC	SPECIAL REQUIREMENT PWHT	OTHER REQUIREMENT	VALVES Type	VALVES Trim	NPS Max. (Inch)	REMARKS
1	A12A	A2AP	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	N OWS P PA SL	NITROGEN OILY WATER SEWER PROCESS PLANT AIR LOW PRESSURE STEAM					GAT GLO CHE BUT PLG	8 8 8 13%Cr 13%Cr	36	Wall Thickness have been verified for Full Vacuum @240^{O} C
2	A15A	A2AF	A/G	CARBON STEEL (ASME B31.3)	3.00	150lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 14.21	38 200	P PA SL	PROCESS PLANT AIR LOW PRESSURE STEAM				JACKETED	GLO CHE PLUG BAL	8 8 13%Cr RPTFE	16	Wall Thickness have been verified for Full Vacuum @175^{O} C
3	A17A	A4UV	U/G	CARBON STEEL (ASME B31.3)	6.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	ATM(1.03)	65	CRWS OWS V	CONTAMINATED RAIN WATER SEWER OILY WATER SEWER VENT ATMOSPHERIC				3LPE COATED			40	
4	A1A	A1AP	A/G	CARBON STEEL (ASME B31.3)	1.50	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	CL N OWS P SS WS	LOW PRESSURE CONDENSATE NITROGEN OILY WATER SEWER PROCESS STORM SEWER SERVICE WATER					GAT GLO CHE BUT PLG	8 8 8 13% Cr 13% Cr	38	Wall Thickness have been verified for Full Vacuum @175^{O} C
5	A1K	A0JV	A/G	SS 304L (ASME B31.3)	0.80	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	16.17 10.55	-29/38 260	V WDM	VENT ATMOSPHERIC DEMINIRALIZED WATER					GAT GLO CHE	12 12 12	2	Wall Thickness have been verified for Full Vacuum @175^{O} C
6	A21N	A1LV	A/G	SS 316L (ASME B31.3)	1.50	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	16.17 7.71	-29/38 371	P	PROCESS					GAT GLO CHE	12 12 12	10	Wall Thickness have been verified for Full Vacuum @175^{O} C
7	A23A	A1AA	A/G	CARBON STEEL (ASME B31.3)	1.50	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	10.5 10.5	-29/38 100	AI AP N	INSTRUMENT AIR PLANT AIR NITROGEN					GAT GLO CHE	8 8 8	6	

APPENDIX A
PIPING CLASS SUMMARY
FOR
STANDBY SRU & ADDITIONAL TANKS
IOCL PARADIP REFINERY

Project N°	Unit	Doc. Type	Mat'l Code	Serial N°	Rev.
080557C001	000	JSD	1300	002	D

Sl. No.	PIPING CLASS	EQUIVALENT REFINERY (FOSTER WHEELER) PIPING CLASS	LOCATION	BASIC MATERIAL (DESIGN CODE)	CORROSION ALLOWANCE (MM)	RATING / FACING / GASKET / BOLTING	DESIGN CONDITIONS P (Kg/Cm^{2}g)	DESIGN CONDITIONS T (Deg C)	SERVICE FLUID CODE	SERVICE DESCRIPTION	SPECIAL REQUIREMENT NACE	SPECIAL REQUIREMENT HIC	SPECIAL REQUIREMENT PWHT	OTHER REQUIREMENT	VALVES Type	VALVES Trim	NPS Max. (Inch)	REMARKS
8	A28A	A2AR	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7M / A194 Gr.2HM	20.04 11.95	-29/38 260	N P SL	NITROGEN PROCESS LOW PRESSURE STEAM	YES	YES	YES		GAT GLO CHE BUT	12 12 12 SS 316	28	Wall Thickness have been verified for Full Vacuum @240^{O}C
9	A29A	A2AU	A/G	CARBON STEEL (INTERNAL PHENOLIC BAKED EPOXY LINED) (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	16 16	-29/38 65	WF WCR WCS	FIRE WATER COOLING WATER RETURN COOLING WATER SUPPLY					GAT GLO CHE	BRONZE / 8 BRONZE / 8 BRONZE / 8	24	
10	A2A	A1AS	A/G	CARBON STEEL (ASME B31.1)	1.50	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	BD CL SH SL	BLOW DOWN LOW PRESSURE CONDENSATE HIGH PRESSURE STEAM LOW PRESSURE STEAM				IBR / FV	GAT GLO CHE	5 5 5	18	Wall Thickness have been verified for Full Vacuum @240^{O}C
11	A30A	A2UU A2UW	U/G	CARBON STEEL (INTERNAL PHENOLIC BAKED EPOXY LINED & EXTERNAL 3LPE COATED) (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	16 16	-29/38 65	WF WCR WCS	FIRE WATER COOLING WATER RETURN COOLING WATER SUPPLY				3LPE COATED	GAT GLO CHE BUT	BRONZE / 8 BRONZE / 8 BRONZE / 8 13% Cr	24	
12	A31A	A2AS	A/G	CARBON STEEL (ASME B31.1)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62 14.8/FV	-29/38 427 175	BD CH CL N OWS SH SL	BLOW DOWN HIGH PRESSURE CONDENSATE LOW PRESSURE CONDENSATE NITROGEN OILY WATER SEWER HIGH PRESSURE STEAM LOW PRESSURE STEAM				IBR / FV	GAT GLO CHE	5 5 5	12	Wall Thickness have been verified for Full Vacuum @175^{O}C
13	A3A	A2AW	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	OWS V WCR WCS WS	OILY WATER SEWER VENT ATMOSPHERIC COOLING WATER RETURN COOLING WATER SUPPLY SERVICE WATER					GAT GLO CHE BUT	8 8 8 13% Cr	8	Wall Thickness have been verified for Full Vacuum @175^{O}C
14	A49A	A4AR	A/G	CARBON STEEL (ASME B31.3)	6.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7M / A194 Gr.2HM	20.04 5.62	-29/38 427	FAG FG OWS P WP	ACID GAS FLARE FUEL GAS OILY WATER SEWER PROCESS PROCESS WATER	YES	YES	YES		GAT GLO CHE	12 12 12	10	Wall Thickness have been verified for Full Vacuum @175^{O}C

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IOCL PARADIP REFINERY

Project N°	Unit	Doc. Type	Mat'l Code	Serial N°	Rev.
080557C001	000	JSD	1300	002	D

Sl. No.	PIPING CLASS	EQUIVALENT REFINERY (FOSTER WHEELER) PIPING CLASS	LOCATION	BASIC MATERIAL (DESIGN CODE)	CORROSION ALLOWANCE (MM)	RATING / FACING / GASKET / BOLTING	DESIGN CONDITIONS P (Kg/Cm^2g)	DESIGN CONDITIONS T (Deg C)	SERVICE FLUID CODE	SERVICE DESCRIPTION	SPECIAL REQUIREMENT NACE	SPECIAL REQUIREMENT HIC	SPECIAL REQUIREMENT PWHT	OTHER REQUIREMENT	VALVES Type	VALVES Trim	NPS Max. (Inch)	REMARKS
15	A52A	A2AD	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 18.01	-29/38 100	FG	FUEL GAS					GAT GLO CHE BAL	8 8 8 RPTFE	4	
16	A53G	S0RA S1RW	A/G	CARBON STEEL (Galv.) (ASME B31.3)	1.50	150 lbs FF Synthetic Fiber W/NBR ~~A307 Gr.B(GALV) / A563 Gr.B(GALV)~~ A193 Gr.B7 / A194 Gr.2H (Hot Dip Galv)	16 16	0/38 65	AI AP WDK WF	INSTRUMENT AIR PLANT AIR DRINKING WATER FIRE WATER (AFTER DELUGE)					GAT GLO CHE	BRONZE BRONZE BRONZE	8	
17	A95A	A4AV	A/G	CARBON STEEL (ASME B31.3)	6.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	P	PROCESS					GAT GLO CHE BUT	12 12 12 SS 316	36	Wall Thickness have been verified for Full Vacuum @175^{O} C
18*	A13A	A2AQ	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7M / A194 Gr.2HM	20.04 5.62	-29/38 427	P	HYDROCARBONS, SOUR WATER, SOUR GAS, SLOPS, ACID GAS FLARE,	YES		YES		GAT GLO CHE	12 12 12	24	Wall Thickness have been verified for Full Vacuum @175^{O} C
19*	A8A	A2AL	A/G	CARBON STEEL (ASME B31.3)	3.00	150 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	20.04 5.62	-29/38 427	P	AMINES AND NON NACE MILD SOUR			YES		GAT GLO CHE BUT	12 12 12 SS316	24	Wall Thickness have been verified for Full Vacuum @175^{O} C
20	B12A	B2AP	A/G	CARBON STEEL (ASME B31.3)	3.00	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	52.03 28.83	-29 427	N OWS P	NITROGEN OILY WATER SEWER PROCESS					GAT GLO CHE BUT PLG	8 8 8 13%Cr 13%Cr	26	Wall Thickness have been verified for Full Vacuum @175^{O} C
21	B19A	B1AL	A/G	CARBON STEEL (ASME B31.3)	1.50	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	52.03 28.83	-29 427	P	PROCESS			YES		GAT GLO CHE	12 12 12	16	Wall Thickness have been verified for Full Vacuum @175^{O} C

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IOCL PARADIP REFINERY

Project N°	Unit	Doc. Type	Mat'l Code	Serial N°	Rev.
080557C001	000	JSD	1300	002	D

Sl. No.	PIPING CLASS	EQUIVALENT REFINERY (FOSTER WHEELER) PIPING CLASS	LOCATION	BASIC MATERIAL (DESIGN CODE)	CORROSION ALLOWANCE (MM)	RATING / FACING / GASKET / BOLTING	DESIGN CONDITIONS P (Kg/Cm^{2}g)	DESIGN CONDITIONS T (Deg C)	SERVICE FLUID CODE	SERVICE DESCRIPTION	SPECIAL REQUIREMENT NACE	SPECIAL REQUIREMENT HIC	SPECIAL REQUIREMENT PWHT	OTHER REQUIREMENT	VALVES Type	VALVES Trim	NPS Max. (Inch)	REMARKS
22	B1A	B1AP	A/G	CARBON STEEL (ASME B31.3)	1.50	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	52.03 28.83	-29 427	P	PROCESS					GAT GLO CHE PLG	8 8 8 13% Cr	16	Wall Thickness have been verified for Full Vacuum @175^{O} C
23*	B2A	B1AS	A/G	CARBON STEEL (ASME B31.1)	1.50	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	40 18 FV	150 350 305	SM BD	MEDIUM PRESSURE STEAM, BLOW DOWN STEAM				IBR / FV	GAT GLO CHE	5 5 5	10	Wall Thickness have been verified for Full Vacuum @305^{O} C
24*	B28A	B2AR	A/G	CARBON STEEL (ASME B31.3)	3.00	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7M / A194 Gr.2HM	52.03 28.83	0 427	P	PROCESS	YES	YES	YES		GAT GLO CHE	12 12 12	16	Wall Thickness have been verified for Full Vacuum @175^{O} C
25	B31A	B2AS	A/G	CARBON STEEL (ASME B31.1)	3.00	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	40 18 FV	150 225 194	WB	BOILER FEED WATER				IBR / FV	GAT GLO CHE	5 5 5	3	Wall Thickness have been verified for Full Vacuum @194^{O} C

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Project N°	Unit	Doc. Type	Mat'l Code	Serial N°	Rev.
080557C001	000	JSD	1300	002	D

Sl. No.	PIPING CLASS	EQUIVALENT REFINERY (FOSTER WHEELER) PIPING CLASS	LOCATION	BASIC MATERIAL (DESIGN CODE)	CORROSION ALLOWANCE (MM)	RATING / FACING / GASKET / BOLTING	DESIGN CONDITIONS P (Kg/Cm^{2}g)	DESIGN CONDITIONS T (Deg C)	SERVICE FLUID CODE	SERVICE DESCRIPTION	SPECIAL REQUIREMENT NACE	SPECIAL REQUIREMENT HIC	SPECIAL REQUIREMENT PWHT	OTHER REQUIREMENT	VALVES Type	VALVES Trim	NPS Max. (Inch)	REMARKS
26	B49A	B4AR	A/G	CARBON STEEL (ASME B31.3)	6.00	300 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7M / A194 Gr.2HM	52.03 28.83	0 427	FAG OWS WP	ACID GAS FLARE OILY WATER SEWER PROCESS WATER	YES	YES	YES		GAT GLO CHE	12 12 12	3	Wall Thickness have been verified for Full Vacuum @175^{O}C
27	D2A	D1AS	A/G	CARBON STEEL (ASME B31.1)	1.50	600 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	79 46 FV	150 427 427	CL OWS SH	LOW PRESSURE CONDENSATE OILY WATER SEWER HIGH PRESSURE STEAM				IBR / FV	GAT GLO CHE	5 5 5	18	Wall Thickness have been verified for Full Vacuum @425^{O}C
28*	D3A	D2A2	A/G	CARBON STEEL (ASME B31.3)	3.00	600 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	104.05 58/FV	-29/38 427	P	PROCESS VACUUM - NON SOUR					GAT GLO CHE	8 8 8	8	Wall Thickness have been verified for Full Vacuum @425^{O}C
29	D31A	D2AS	A/G	CARBON STEEL (ASME B31.1)	3.00	600 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B7 / A194 Gr.2H	82.0 46.0 FV	150 280 280	BD CH CL OWS WB	BLOW DOWN HIGH PRESSURE CONDENSATE LOW PRESSURE CONDENSATE OILY WATER SEWER BOILER FEED WATER				IBR / FV	GAT GLO CHE	5 5 5	10	Wall Thickness have been verified for Full Vacuum @280^{O}C
30*	D9D	D1DS	A/G	ALLOY STEEL (1.25Cr 0.5 Mo) (ASME B31.1)	1.50	600 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B16 / A194 Gr.4	52/FV	435	SH	HIGH PRESSURE STEAM			YES	IBR / FV	GAT GLO CHE	5 5 5	8	Wall Thickness have been verified for Full Vacuum @435^{O}C
31*	D9L	D1ZS	A/G	ALLOY STEEL (9 Cr 1 Mo V) (ASME B31.1)	1.50	600 lbs RF Spiral Wound Gasket SS316 / Graphite A193 Gr.B16 / A194 Gr.4	46 FV	438 427	SH	HIGH PRESSURE STEAM			YES	IBR / FV	GAT GLO CHE	5 5 5	8	

* denotes newly added classes from rev C document

APPENDIX B

DETAILED PIPING CLASSES

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Detailed Piping Class

Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A12A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @240 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)							
DBB (1)	BRAN (1)	PIP (1)	ESN (1)	TEER (1)	FX6 (781)	B6F (1)
BLF (1)	GAS (1)	GX3 (1)	PLUG (1)	CAP (541)	GLO (1)	CSN (1)
ERE (1)	B1F (1)	B3F (1)	PLU (1)	FX3 (773)	CHE1 (1)	GAT (1)
CAP (1)	CRE (1)	NIP (1)	YST (1)	DBB (2)	BUT (1)	45E (1)
CPLR (1)	B1F3 (1)	FLW (173)	F8S (1)	CPL (1)	B1F2 (1)	SOL (1)
FLG (1)	B3F6 (1)	TST (1)	GX6 (1)	90E (1)	ORI (1)	REIN (1)
TEE (1)	PADL (1)	PAD (1)	CHE (1)	NIP (731)		

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
20 IN S-STD	24 IN S-STD	26 IN S-XS	28 IN S-XS	30 IN S-XS	32 IN S-XS	34 IN S-XS
36 IN S-XS						

S50TR02 - (2967)

* Added or modified

Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	36	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	36	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	36	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	36	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	

S50TR02 - (r2967)

Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16	36	IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830030000	
		8	34	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, - ,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	36	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830030000	
		8	34	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	36	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	36	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830030000	
		12	34	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	36	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			
SOL	1	2	36	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			

Flanges

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Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
BLF	1	26	36	IN	Blind Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL24C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLG	1	26	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FX3	773	26	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
FX6	781	26	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	3	8	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, LO, -, -, -, -,	VYAB23C4000AL16W073400	
BUT	1	10	24	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -,	VYAB23C4000AL16W043400	

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Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	26	36	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -,	VYAB23C4000AL16W041900	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y0900	
CHE	1	26	36	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.47 Series B, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y1T00	
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL10K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L10C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L10C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4000AL101050300	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4000AL101040300	

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Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	26	36	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4000AL10104B000	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L90D050500	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4000AL107050400	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4000AL107040400	
PLUG	1	8	12	IN	Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPSB20C4000AL139044500	
PLUG	1	14	24	IN	Plug Valve Flanged Ends, Venturi Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPVB20C4000AL139044500	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OI01L10100	
PADL	1	26	36	IN	Paddle Blind & Spacer, Prj Std, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.47 Series B, -, 150 Lbs, -, -, -, -,	MMFRP0C6OI01L10300	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L10A010103	

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Specification		A12A			Carbon Steel-150#-Raised Face-CA=3mm		

Miscellaneous Items

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5C830L10A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GAS	1	26	36	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL101080H00	
GX3	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX3	1	26	36	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX6	1	26	36	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL800080H00	

Bolts

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	8	IN			
BRAN	1	16	16	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRPPP0C40N3000	
		2	10	IN			

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Specification	A12A	Carbon Steel-150#-Raised Face-CA=3mm

Branches

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	18	36	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRRPP0C40N3000	
		2	30	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	36	IN	bolt assembly 150 RF		
B1F2	1	.5	36	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	24	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	36	IN	bolt assembly 300 RF		
B3F6	1	.5	24	IN	bolt ORIFICE 300 RF		
B6F	1	.5	36	IN	bolt assembly 600 RF		
REIN	1	18	36	IN	90° Branch to header with reinforcing pad		
		2	30	IN			

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Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service	
Basic Material	Carbon steel + NACE + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A13A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	-	Control Level	-
Ped Fl Phase	-	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for Sour service specific requirements

PWHT is required for all weld joints irrespective of thickness
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Wall Thickness have been verified for Full Vacuum @175 Deg. C

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)							
DBB (1)	DBB (2)	45E (1)	ERE (1)	YST (1)	GLO (1)	PIP (1)	
90E (1)	CPL (1)	NIP (731)	FLW (173)	CHE (1)	CHE1 (1)	CAP (1)	
TEE (1)	FX6 (781)	TST (1)	GAS (1)	GX6 (1)	REIN (1)	BLF (1)	
ORI (1)	PAD (1)	GAT (1)	ESN (1)	NIP (1)	WOL (1)	BOL (1)	
PADL (1)	CPLR (1)	CRE (1)	FLG (1)	FX3 (773)	F8S (1)	CSN (1)	
TEER (1)	GX3 (1)						

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
20 IN S-STD	24 IN S-STD					

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* Added or modified

Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -, -	PPPP20C403I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, BE, -, -, -	PPPP20C40330000000	
PIP	1	16	24	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A671 Gr.CC60 Cl.32 + Sour Service, BE, -, -, -	PPPP20C43O30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE420C5C3L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE420C5C3L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE420C5C730010000	
45E	1	16	24	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -	DBE420C5CI30030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE920C5C3L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE920C5C3L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE920C5C730010000	
90E	1	16	24	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -	DBE920C5CI30030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 6000 Lbs, -	DFCP20C5C3L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 3000 Lbs, -	DFCP20C5C3L0LE0000	
CAP	1	2	24	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBCP20C5C730010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCF20C5C3L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCF20C5C3L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCR20C5C3L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCR20C5C3L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRC20C5C730010000	

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* Added or modified

Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16 8	24 20	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -,	DBRC20C5CI30030000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -,	DFSCI0C5C3300000	
ERE	1	3 2	14 12	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -,	DBRE20C5C730010000	
ERE	1	16 8	24 20	IN IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -,	DBRE20C5CI30030000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -,	DFSEI0C5C3300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -,	DFNP20C403I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE/NPTM End, -, -,	DFNP20C403I101040000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -,	DFTE20C5C3L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -,	DFTE20C5C3L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -,	DBTE20C5C730010000	
TEE	1	16	24	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -,	DBTE20C5CI30030000	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -,	DFTR20C5C3L0LG0000	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -,	DFTR20C5C3L0LE0000	
TEER	1	3 2	14 12	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -,	DBTR20C5C730010000	
TEER	1	16 6	24 20	IN IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service, BW Ends, -, -,	DBTR20C5CI30030000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 0.5	24 1.5	IN IN	Weldolet, MSS SP-97, ASTM A105N + PWHT + Sour Service, BW Ends, as per ASME B16.25, -,	LTLWI0C5DA300100	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes

S50TR02 - (r2967)

Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF, -, -, -,	FGBL25C5C302L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L10000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N + Sour Service, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C306L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L50000	
FX3	773	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7M/A194 Gr.2HM, -, ASME B16.36, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs ASTM A105N + Sour Service, -, -,	FFF120C5C306L53E00	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N + Sour Service, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCLD23C5C3L0L9283800	
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4030AL15C0900	
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0C4030AL1021E00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C301L102050I00	

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Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C303L102050I00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C3L0L90H050R00	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4030AL104050R00	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4030AL104040R00	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C3L0L909050K00	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4030AL104050J00	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4030AL104040J00	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 + Sour Service, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OJ01L10100	

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Specification		A13A			Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service		

Miscellaneous Items

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70 + Sour Service, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OJ01L10100	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + Sour Service, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C730L10A010D03	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + PWHT + Sour Service, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -, Welded body	MMSDMMC5CI30L10A010D04	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N + Sour Service, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C3X0L90A011W00	

Gaskets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7M/A194 Gr.2HM, -, -,	BTS222A007010000	

Branches

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	18	24	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A671 Gr.CC60 Cl.32 + Sour Service, BE, -,	BRRPP0C43O3000	
		2	16	IN			

Assemblies

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Specification	A13A	Carbon Steel+PWHT-150#-Raised Face-3mm-Sour Service

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	18	24	IN	90° Branch to header with reinforcing pad		
		2	16	IN			

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Detailed Piping Class

Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A15A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C

Temperature	DEG C	38	93	149	200
Pressure	KG/CM2G	20.04	18.28	16.17	14.21

Schedule / Thickness

Short Code (Opt.)	PLUG (1)	45E (1)	CRE (1)	TST (1)	CPLR (1)	STR (1)	FLGR (1)
	B1F3 (1)	BRAN (1)	CAP (1)	PLU (1)	PIP (1)	ESN (1)	TEE (1)
	FLG (1)	PADL (1)	CRO (1)	B1F (1)	CHE1 (1)	F8S (1)	90E (1)
	TEER (1)	SOL (1)	GLO (1)	NIP (731)	CHE (1)	BAL (1)	BLF (1)
	NIP (1)	ORI (1)	YST (1)	ERE (1)	B1F2 (1)	CPL (1)	CSN (1)
	FLW (173)	GAS (1)					
Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	

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Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	16	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	16	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	16	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	16	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CRE	1	16 8	16 14	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830030000	

S50TR02 - (r2967)

Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRO	1	1	14	IN	Equal cross, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBXE20C5C830010000	
CRO	1	16	16	IN	Equal cross, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBXE20C5C830030000	
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -	DFSCI0C5C4300000	
		.75	1.5	IN	,		
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	16	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830030000	
		8	14	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	16	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	16	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830030000	
		12	14	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	3	16	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			
SOL	1	3	16	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			

Flanges

S50TR02 - (r2967)

Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	16	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLGR	1	2	2	IN	Reducing slip-on Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGRL25C5C407L10000	
		0.5	1.5	IN			
FLGR	1	3	16	IN	Reducing slip-on Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGRL25C5C406L10000	
		2	12	IN			
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
ORI	1	2	16	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BAL	1	.5	1.5	IN	Fully Jacketed Ball Valve Flg Ends, Reduced Bore, Long Pat, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, 1 Pc Body End Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, Service: Liquid Sulfur, -, -, Jacketed valve with oversized flanges	VBJC20C5C40AL153070401	
BAL	1	2	4	IN	Fully Jacketed Ball Valve Flg Ends, Reduced Bore, Long Pat, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, 1 Pc Body End Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, Service: Liquid Sulfur, -, -, Jacketed valve with oversized flanges	VBJC20C4000AL153070401	
BAL	1	6	6	IN	Fully Jacketed Ball Valve Flg Ends, Reduced Bore, Long Pat, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, 1 Pc Body End Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, GO, -, -, Service: Liquid Sulfur, -, -, Jacketed valve with oversized flanges	VBJC20C4000AL153040401	

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Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BAL	1	8	12	IN	Fully Jacketed Ball Valve Flg Ends, Reduced Bore, Long Pat, Trunnion Ball, API 608, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, Top entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: AISI 316, Seat Inserts: RPTFE, -, Fire Safe as per API 607, GO, -, -, Service: Liquid Sulfur, -, -, Jacketed valve with oversized flanges	VBJC20C4000AL1VW040401	
CHE	1	.5	1.5	IN	Fully Jacketed Lift Check Valve Flanged Ends, -, API 602, ASTM A105N, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, Jacket Connections: 2 Connections 0.75in Flanged end, Service: Liquid Sulfur, -, -, Oversized flanges to suit Jacket Pipe size	VCJC23C5C40AL12J0J01	
CHE	1	2	6	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, Fully jacketed, Liquid Sulfur, Oversized flanges to suit Jacket Pipe size	VCDA20C4000AL14Y0903	
CHE1	1	2	6	IN	Fully Jacketed Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, BS Trim CR13, -, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit Jacket Pipe size	VCJAN0C4000AL10C0K01	
GLO	1	.5	1.5	IN	Fully Jacketed Globe Valve Flanged Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit jacket Pipe size	VLGJ21C5C40AL107050701	
GLO	1	2	10	IN	Fully Jacketed Globe Valve Flanged Ends, -, API 602, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit jacket Pipe size	VLGJ21C4000AL107050701	
GLO	1	12	12	IN	Fully Jacketed Globe Valve Flanged Ends, -, API 602, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit jacket Pipe size	VLGJ21C4000AL107040701	

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Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PLUG	1	.5	1.5	IN	Fully Jacketed Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, LO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit Jacket Pipe size	VPJB20C5C40AL139070L01	
PLUG	1	2	4	IN	Fully Jacketed Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, LO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit Jacket Pipe size	VPJB20C4000AL139070L01	
PLUG	1	6	12	IN	Fully Jacketed Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, Jacket Connections: 2 Connections 0.75in Flanged end, -, Service: Liquid Sulfur, -, -, Oversized flanges to suit Jacket Pipe size	VPJB20C4000AL139040L01	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
PADL	1	10	16	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OI01L10100	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 150 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve).	MMTAMMC5C402L150070201	01
TST	1	2	12	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L10A010103	
TST	1	16	16	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5C830L10A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

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Specification	A15A	Carbon Steel-150#-Raised Face-CA=3mm

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	16	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	8	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	16	IN	bolt assembly 150 RF		
B1F2	1	.5	16	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	16	IN	bolt for F8S assembly 150 RF		

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Detailed Piping Class

Specification	A17A	Carbon Steel-150#-Raised Face-CA=6mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	6 MM	Branch Table	A17A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	UG

Notes

All buried Pipes and Fittings shall be externally 3LPE coated at site as per JSS
The wall thickness specified in this calculation are based on internal pressure only. For additonal external Civil loads for buried Piping shall be taken care by Civil

Temperature	DEG C	65
Pressure	KG/CM2G	1.03

Schedule / Thickness

Short Code (Opt.)	CRE (1)	BLF (1)	CAP (1)	ESN (1)	TST (1)	PIP (1)	TEER (1)
	GAS (1)	45E (1)	PLU (1)	BRAN (1)	B1F (1)	90E (1)	NIP (1)
	YST (1)	CPL (1)	CPLR (1)	CSN (1)	ERE (1)	NIP (731)	TEE (1)
	FLG (1)						

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN
Sch/Thk.	S-XXS	S-XXS	S-XXS	S-XXS	S-160	S-XS	S-XS
	6 IN	8 IN	10 IN	12 IN	14 IN	16 IN	18 IN
	S-XS	S-XS	CALC	CALC	CALC	CALC	CALC
	20 IN	24 IN	26 IN	28 IN	30 IN	32 IN	34 IN
	CALC	CALC	CALC	CALC	CALC	CALC	CALC
	36 IN	38 IN	40 IN				
	CALC	CALC	CALC				

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* Added or modified

Specification	A17A	Carbon Steel-150#-Raised Face-CA=6mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	40	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFE420C5C4L0LH0000	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFE920C5C4L0LH0000	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 9000 Lbs, -,	DFCP20C5C4L0LH0000	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFCF20C5C4L0LH0000	
CPLR	1	.75	1.5	IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFCR20C5C4L0LH0000	
		.5	1	IN			
CRE	1	3	8	IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
		2	6	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, - ,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	8	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	6	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFTE20C5C4L0LH0000	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	

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Specification	A17A	Carbon Steel-150#-Raised Face-CA=6mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFTR20C5C4L0LH0000	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSDMMC5C830L10A010108	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSJMMC5C4X0L90A011A08	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	.75	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

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Specification	A17A	Carbon Steel-150#-Raised Face-CA=6mm

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	4	8	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		.5	6	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	8	IN	bolt assembly 150 RF		

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Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm		
Basic Material	Carbon steel		Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs		Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM		Branch Table	A1A
Facing	RF		Branch Design	ASME B31.3
Fluid Category	NORMAL		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)	F8S (1)	TST (1)	B1F3 (1)	CHE (1)	BUT (1)	90E (1)	NIP (1)
	NIP (731)	FLG (1)	FX6 (781)	B1F2 (1)	B6F (1)	DBB (2)	TEE (1)
	PADL (1)	YST (1)	GX6 (1)	B3F (1)	CAP (1)	GAS (1)	B3F6 (1)
	PLUG (1)	DBB (1)	CHE1 (1)	GAT (1)	GLO (1)	CPL (1)	CPLR (1)
	ERE (1)	B1F (1)	CAP (541)	CRE (1)	CSN (1)	ESN (1)	PLU (1)
	BLF (1)	GX3 (1)	REIN (1)	PAD (1)	PIP (1)	TEER (1)	BRAN (1)
	45E (1)	SOL (1)	FX3 (773)	FLW (173)	ORI (1)		

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
	20 IN S-STD	24 IN S-STD	26 IN S-STD	28 IN S-STD	30 IN S-STD	32 IN S-XS	34 IN S-XS
	36 IN S-XS	38 IN S-XS					

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Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	38	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	38	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	38	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	38	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 1.5	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	

S50TR02 - (r2967)

Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16	38	IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830030000	
		8	36	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, - ,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	38	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830030000	
		8	36	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	38	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	38	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830030000	
		12	36	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	38	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			
SOL	1	2	38	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			

Flanges

S50TR02 - (r2967)

Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
BLF	1	26	38	IN	Blind Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL24C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLG	1	26	38	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FX3	773	26	38	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
FX6	781	26	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	26	38	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -,	VYAB23C4000AL16W041900	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y0900	

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Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	26	38	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.47 Series B, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y1T00	
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL10K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L10C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L10C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4000AL101050300	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4000AL101040300	
GAT	1	26	38	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4000AL10104B000	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L90D050500	

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Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2C4000AL107050400	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -,	VLGIN2C4000AL107040400	
PLUG	1	8	12	IN	Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPSB20C4000AL139044500	
PLUG	1	14	24	IN	Plug Valve Flanged Ends, Venturi Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPVB20C4000AL139044500	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OI01L10100	
PADL	1	26	38	IN	Paddle Blind & Spacer, Prj Std, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.47 Series B, -, 150 Lbs, -, -, -, -,	MMFRP0C6OI01L10300	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L10A010103	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5C830L10A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	
YST	1	2	4	IN	Strainer Y type Flanged Ends, Mnf Std, ASTM A216 Gr.WCB, 150 Lbs, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSIMMC40002L10A011T00	

Gaskets

S50TR02 - (r2967)

Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GAS	1	26	38	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL101080H00	
GX3	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX3	1	26	38	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX6	1	26	36	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	8	IN			
BRAN	1	16	20	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRPPP0C40N3000	
		2	14	IN			
PAD	1	24	38	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRRPP0C40N3000	
		2	32	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	38	IN	bolt assembly 150 RF		
B1F2	1	.5	38	IN	bolt for PSV inlet assembly 150 RF		

S50TR02 - (r2967)

Specification	A1A	Carbon Steel-150#-Raised Face-CA=1.5mm

Assemblies

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F3	1	.5	24	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	38	IN	bolt assembly 300 RF		
B3F6	1	.5	24	IN	bolt ORIFICE 300 RF		
B6F	1	.5	36	IN	bolt assembly 600 RF		
REIN	1	24	38	IN	90° Branch to header with reinforcing pad		
		2	32	IN			

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Detailed Piping Class

Specification	A1K	SS 304L-150#-Raised Face-CA=0.8mm	
Basic Material	Stainless steel (SS304L)	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	0.8 MM	Branch Table	A1K
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Positive Material Identification (PMI) is required for all materials supplied under this specification.

Wall Thickness have been verified for Full Vacuum @175 Deg. C

Temperature	DEG C	-29	38	93	149	204	260
Pressure	KG/CM2G	16.17	16.17	13.71	12.3	11.25	10.55

Schedule / Thickness

Short Code (Opt.)							
DBB (2)	ESN (1)	SOL (1)	GX3 (1)	PIP (1)	FLG (1)	90E (1)	
FX6 (781)	FLW (173)	GX6 (1)	GAT (1)	CAP (1)	CPL (1)	GLO (1)	
45E (1)	FX3 (773)	BLF (1)	TST (1)	CHE (1)	DBB (1)	CSN (1)	
PLU (1)	TEE (1)	YST (1)	GAS (1)	NIP (1)	TEER (1)	CHE1 (1)	
CPLR (1)	NIP (731)	ORI (1)	F8S (1)	BOL (1)			

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN
Sch/Thk.	S-80S	S-80S	S-40S	S-40S	S-40S

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* Added or modified

Specification	A1K	SS 304L-150#-Raised Face-CA=0.8mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.19/B36.10, ASTM A312 Gr.TP304L, PE, -, -, -,	PPPP21S408I0000000	
PIP	1	2	2	IN	Seamless, Pipes, ASME B36.19/B36.10, ASTM A312 Gr.TP304L, BE, -, -, -,	PPPP21S40830000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFE420S5C7L0LE0000	
45E	1	2	2	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304L, BW Ends, -, -,	DBE420S5DI30010000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFE920S5C7L0LE0000	
90E	1	2	2	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A403 Gr.WP304L, BW Ends, -, -,	DBE920S5DI30010000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A182 Gr.F304L, SW End, -, 3000 Lbs, -,	DFCP20S5C7L0LE0000	
CAP	1	2	2	IN	Cap, Seamless, ASME B16.9, ASTM A403 Gr.WP304L, BW Ends, -, -,	DBCP20S5DI30010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFCF20S5C7L0LE0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFCR20S5C7L0LE0000	
CSN	1	2 .75	2 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A182 Gr.F304L, BE/PE, -, -,	DFSCI0S5C7300000	
ESN	1	2 .75	2 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A182 Gr.F304L, BE/PE, -, -,	DFSEI0S5C7300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP304L, PE, -, -,	DFNP21S408I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP304L, PE/NPTM End, -, -,	DFNP21S408I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A182 Gr.F304L, NPTM End, -, -,	DFPL20S5C7R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFTE20S5C7L0LE0000	
TEE	1	2	2	IN	Equal tee, Seamless, ASME B16.9, ASTM A403 Gr.WP304L, BW Ends, -, -,	DBTE20S5DI30010000	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F304L, SW Ends, -, 3000 Lbs, -,	DFTR20S5C7L0LE0000	

Olets

S50TR02 - (r2967)

Specification	A1K	SS 304L-150#-Raised Face-CA=0.8mm

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 .5	2 1.5	IN IN	Sockolet, MSS SP-97, ASTM A182 Gr.F304/304L, 3000 Lbs, SW Ends, -, - ,	LTLSI0S5C4L0LE0000	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	2	IN	Blind Flange, ASME B16.5, ASTM A182 Gr.F304L, 150 Lbs, RF, -, -, - ,	FGBL25S5C702L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F304L, 150 Lbs, RF/SW End, -, -, - ,	FGSW25S5C707L10000	
FLG	1	2	2	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F304L, 150 Lbs, RF/BW End, -, -, - ,	FGWN25S5C706L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A182 Gr.F304L, RF/BW End, -, 300 Lbs, -, - ,	FGWL25S5C706L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F304L, 300 Lbs, RF/SW End, -, -, - ,	FGSW25S5C707L50000	
FX3	773	2	2	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F304L, 300 Lbs, RF/BW End, -, -, - ,	FGWN25S5C706L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F304L, 600 Lbs, RF/SW End, -, -, - ,	FGSW25S5C707L80000	
FX6	781	2	2	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F304L, 600 Lbs, RF/BW End, -, -, - ,	FGWN25S5C706L80000	
ORI	1	2	2	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A182 Gr.F304L, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A182 Gr.F304/304L -, -,	FFF120S5C706L51400	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A182 Gr.F304L, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCLD23S5C7L0L9280200	
CHE	1	2	2	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A351 Gr.CF3M, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20S4030AL15C0900	
CHE1	1	2	2	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A351 Gr.CF3, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0S4010AL1020B00	

S50TR02 - (r2967)

Specification	A1K	SS 304L-150#-Raised Face-CA=0.8mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A182 Gr.F304L, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGDEB5S5C701L102050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A182 Gr.F304L, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGDEB5S5C703L102050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F304L, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24S5C7L0L90H050B00	
GAT	1	2	2	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A351 Gr.CF3, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22S4010AL104050300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F304L, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21S5C7L0L909050500	
GLO	1	2	2	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A351 Gr.CF3, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2S4010AL104050400	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	2	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A240 Gr.304L, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820S6O301L10100	
TST	1	2	2	IN	Strainer T type BW Ends, Mnf Std, ASTM A403 Gr.WP304L, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMS5DI30L10A010100	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A182 Gr.F304L, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMS5C7X0L90A011A00	

S50TR02 - (r2967)

Specification	A1K	SS 304L-150#-Raised Face-CA=0.8mm

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
YST	1	2	2	IN	Strainer Y type Flanged Ends, Mnf Std, ASTM A351 Gr.CF3, 150 Lbs, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSIMMS40102L10A011T00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	2	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	2	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	2	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

S50TR02 - (r2967)

Specification	A21N	SS 316L-150#-Raised Face-CA=1.5mm	
Basic Material	Stainless steel (SS316L)	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM	Branch Table	A21N
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Positive Material Identification (PMI) is required for all materials supplied under this specification.

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	38	93	149	204	260	316	371
Pressure	KG/CM2G	7.71	7.71	7.71	7.71	7.71	7.71	7.71	7.71

Schedule / Thickness

Short Code (Opt.)	DBB (1)	CPL (1)	FX3 (773)	TST (1)	YST (1)	DBB (2)	BLF (1)
	PIP (1)	CPLR (1)	FLW (173)	PADL (1)	GX6 (1)	CHE1 (1)	45E (1)
	90E (1)	CHE (1)	NIP (1)	FLG (1)	CAP (1)	NIP (731)	PLU (1)
	TEE (1)	TEER (1)	SOL (1)	FX6 (781)	GX3 (1)	GLO (1)	ORI (1)
	F8S (1)	GAS (1)	GAT (1)	BOL (1)			

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	10 IN
Sch/Thk.	S-80S	S-80S	S-40S	S-40S	S-20

S50TR02 - (r2967)

Specification	A21N	SS 316L-150#-Raised Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.19/B36.10, ASTM A312 Gr.TP316L, PE, -, -, -,	PPPP21S40DI0000000	
PIP	1	10	10	IN	EFW + 100% RT, Pipes, ASME B36.19/B36.10, ASTM A358 Gr.316L Cl.1, BE, -, -, -,	PPPP21S41930030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFE420S5CHL0LE0000	
45E	1	10	10	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316L, BW Ends, -, -,	DBE420S5DP30030000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFE920S5CHL0LE0000	
90E	1	10	10	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316L, BW Ends, -, -,	DBE920S5DP30030000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A182 Gr.F316L, SW End, -, 3000 Lbs, -,	DFCP20S5CHL0LE0000	
CAP	1	10	10	IN	Cap, Seamless, ASME B16.9, ASTM A403 Gr.WP316L, BW Ends, -, -,	DBCP20S5DP30010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFCF20S5CHL0LE0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFCR20S5CHL0LE0000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP316L, PE, -, -,	DFNP21S40DI001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.19/B36.10, ASTM A312 Gr.TP316L, PE/NPTM End, -, -,	DFNP21S40DI101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A182 Gr.F316L, NPTM End, -, -,	DFPL20S5CHR2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFTE20S5CHL0LE0000	
TEE	1	10	10	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A403 Gr.WP316L, BW Ends, -, -,	DBTE20S5DP30030000	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F316L, SW Ends, -, 3000 Lbs, -,	DFTR20S5CHL0LE0000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes

S50TR02 - (r2967)

Specification	A21N	SS 316L-150#-Raised Face-CA=1.5mm

Olets

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	10 .5	10 1.5	IN IN	Sockolet, MSS SP-97, ASTM A182 Gr.F316/316L, 3000 Lbs, SW Ends, -, -,	LTLSI0S5CEL0LE0000	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	10	IN	Blind Flange, ASME B16.5, ASTM A182 Gr.F316L, 150 Lbs, RF, -, -, -,	FGBL25S5CH02L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F316L, 150 Lbs, RF/SW End, -, -, -,	FGSW25S5CH07L10000	
FLG	1	10	10	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F316L, 150 Lbs, RF/BW End, -, -, -,	FGWN25S5CH06L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A182 Gr.F316L, RF/BW End, -, 300 Lbs, -, -,	FGWL25S5CH06L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F316L, 300 Lbs, RF/SW End, -, -, -,	FGSW25S5CH07L50000	
FX3	773	10	10	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F316L, 300 Lbs, RF/BW End, -, -, -,	FGWN25S5CH06L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F316L, 600 Lbs, RF/SW End, -, -, -,	FGSW25S5CH07L80000	
FX6	781	10	10	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F316L, 600 Lbs, RF/BW End, -, -, -,	FGWN25S5CH06L80000	
ORI	1	10	10	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A182 Gr.F316L, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A182 Gr.F316/316L, -, -,	FFF120S5CH06L50J00	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A182 Gr.F316L, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCLD23S5CHL0L9280200	
CHE	1	10	10	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A351 Gr.CF3M, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20S4030AL15C0900	
CHE1	1	10	10	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A351 Gr.CF3, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0S4010AL1020B00	

S50TR02 - (r2967)

Specification	A21N	SS 316L-150#-Raised Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A182 Gr.F316L, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGDEB5S5CH01L102050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A182 Gr.F316L, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGDEB5S5CH03L102050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F316L, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24S5CHL0L90H050B00	
GAT	1	10	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A351 Gr.CF3M, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22S4030AL104050300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F316L, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21S5CHL0L909050500	
GLO	1	10	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A351 Gr.CF3M, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2S4030AL104050400	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	1.5	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A240 Gr.316L, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820S6O901L10100	
PADL	1	10	10	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A240 Gr.316L, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20S6O901L10100	
TST	1	10	10	IN	Strainer T type BW Ends, Mnf Std, ASTM A403 Gr.WP316L, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMS5DP30L10A010104	

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* Added or modified

Specification	A21N	SS 316L-150#-Raised Face-CA=1.5mm

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A182 Gr.F316L, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMS5CHX0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	10	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316L/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I00G0OL101080H00	
GX3	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm		
Basic Material	Carbon steel		Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs		Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM		Branch Table	A23A
Facing	RF		Branch Design	ASME B31.3
Fluid Category	CATEGORY D		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes

Temperature	DEG C	-29	0	38	50	65	100
Pressure	KG/CM2G	10.5	10.5	10.5	10.5	10.5	10.5

Schedule / Thickness

Short Code (Opt.)	CHE1 (1)	ERE (1)	BLF (1)	ORI (1)	F8S (1)	YST (1)	GX3 (1)
	BRAN (1)	B3F (1)	B6F (1)	GLO (1)	PIP (1)	45E (1)	90E (1)
	PLU (1)	TEE (1)	B3F6 (1)	FLG (1)	FX6 (781)	FLW (173)	CHE (1)
	GAT (1)	ESN (1)	NIP (1)	NIP (731)	TEER (1)	B1F2 (1)	CPLR (1)
	TST (1)	CAP (541)	B1F (1)	CAP (1)	CSN (1)	CPL (1)	CRE (1)
	SOL (1)	DBB (1)	DBB (2)	B1F3 (1)	FX3 (773)	GAS (1)	GX6 (1)

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN
Sch/Thk.	S-160	S-160	S-XS	S-XS	S-XS	S-STD	S-STD
	6 IN						
	S-STD						

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	6	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	6	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	6	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	6	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	6 4	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSCI0C5C4300000	
ERE	1	3 2	6 4	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	6	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
TEER	1	3 2	6 4	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	6 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
SOL	1	2 .5	6 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	6	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	6	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	6	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	6	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	6	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	6	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y0900	
CHE1	1	.5	1.5	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A105, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C5C20AL10K0B00	
CHE1	1	2	6	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL10K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L10C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L10C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	2	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22C4000AL101050300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGE21C5C4L0L90D050500	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2C4000AL107050400	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	6	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
TST	1	2	6	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C830L10A010100	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	6	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	6	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	6	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

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Specification	A23A	Carbon Steel-150#-Raised Face-CA=1.5mm

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	6	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	2	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	6	IN	bolt assembly 150 RF		
B1F2	1	.5	6	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	6	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	6	IN	bolt assembly 300 RF		
B3F6	1	.5	6	IN	bolt ORIFICE 300 RF		
B6F	1	.5	6	IN	bolt assembly 600 RF		

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Detailed Piping Class

Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Basic Material	Carbon steel + NACE + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A28A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for Sour service specific requirements

Refer to JSS corresponding to each component for HIC specific requirements

PWHT is required for all weld joints irrespective of thickness

Wall Thickness have been verified for Full Vacuum @240 Deg. C
Requirements of HIC resistant steels shall apply to plate, products made from plate and welded pipe & fittings offered in place of seamless type.
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95

Schedule / Thickness

Short Code (Opt.)	PAD (1)	BUT (1)	GAT (1)	90E (1)	ORI (1)	DBB (2)	BLF (1)
	PADL (1)	CHE (1)	CHE1 (1)	TEE (1)	FX6 (781)	GAS (1)	YST (1)
	GX3 (1)	GX6 (1)	PIP (1)	FLW (173)	F8S (1)	ESN (1)	DBB (1)
	GLO (1)	45E (1)	NIP (1)	CPL (1)	FX3 (773)	CRE (1)	TST (1)
	PLU (1)	WOL (1)	REIN (1)	CAP (1)	NIP (731)	TEER (1)	CPLR (1)
	ERE (1)	FLG (1)	CSN (1)	BOL (1)			

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
	20 IN S-STD	24 IN S-STD	26 IN S-XS	28 IN S-XS			

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* Added or modified

Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -, -	PPPP20C403I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, BE, -, -, -	PPPP20C40330000000	
PIP	1	16	28	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A671 Gr. CC60 Cl.32 + Sour service + HIC Test, BE, S2, S3 supplementary requirements as per ASTM A 671 -, -,	PPPP20C41P30030001	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE420C5C3L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE420C5C3L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE420C5C730010000	
45E	1	16	28	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBE420C5D830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE920C5C3L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE920C5C3L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE920C5C730010000	
90E	1	16	28	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBE920C5D830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 6000 Lbs, -	DFCP20C5C3L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 3000 Lbs, -	DFCP20C5C3L0LE0000	
CAP	1	2	28	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBCP20C5C730010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCF20C5C3L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCF20C5C3L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCR20C5C3L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCR20C5C3L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRC20C5C730010000	

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Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16 8	28 26	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBRC20C5D830030000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSCI0C5C3300000	
ERE	1	3 2	14 12	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRE20C5C730010000	
ERE	1	16 8	28 26	IN IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBRE20C5D830030000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSEI0C5C3300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -	DFNP20C403I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE/NPTM End, -, -	DFNP20C403I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N + Sour Service, NPTM End, -, -	DFPL20C5C3R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFTE20C5C3L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFTE20C5C3L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTE20C5C730010000	
TEE	1	16	28	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBTE20C5D830030000	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFTR20C5C3L0LG0000	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFTR20C5C3L0LE0000	
TEER	1	3 2	14 12	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTR20C5C730010000	
TEER	1	16 12	28 26	IN IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBTR20C5D830030000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 .5	28 1.5	IN IN	Weldolet, MSS SP-97, ASTM A105N + PWHT + Sour Service, BW Ends, as per ASME B16.25, -	LTLWI0C5DA300100	

Flanges

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Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF, -, -, -	FGBL25C5C302L10000	
BLF	1	26	28	IN	Blind Flange, ASME B16.47 Series B, ASTM A105N + Sour Service, 150 Lbs, RF, -, -, -	FGBL24C5C302L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/SW End, -, -, -	FGSW25C5C307L10000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/BW End, -, -, -	FGWN25C5C306L10000	
FLG	1	26	28	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N + Sour Service, 150 Lbs, RF/BW End, -, -, -	FGWN24C5C306L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N + Sour Service, RF/BW End, -, 300 Lbs, -, -	FGWL25C5C306L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/SW End, -, -, -	FGSW25C5C307L50000	
FX3	773	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -	FGWN25C5C306L50000	
FX3	773	26	28	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -	FGWN24C5C306L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/SW End, -, -, -	FGSW25C5C307L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -	FGWN25C5C306L80000	
FX6	781	26	28	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -	FGWN24C5C306L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7M/A194 Gr.2HM, -, ASME B16.36, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs ASTM A105N + Sour Service, -, -	FFF120C5C306L53E00	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	26	28	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Eccentric Disc - Triple Offset Type, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: AISI 316 Weld Overlay, SPW AISI 316/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -	VYAB23C4030AL16V045I00	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N + Sour Service, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -	VCLD23C5C3L0L9283800	

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* Added or modified

Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4030AL15C0900	
CHE	1	26	28	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.47 Series B, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4030AL15C1T00	
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0C4030AL1021E00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C301L102050I00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C303L102050I00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C3L0L90H050R00	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4030AL104050R00	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4030AL104040R00	
GAT	1	26	28	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4030AL10404B900	

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Specification	A28A	Carbon Steel-150#-Raised Face-CA=3mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C3L0L909050K00	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4030AL104050J00	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4030AL104040J00	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OG01L10100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OG01L10100	
PADL	1	26	28	IN	Paddle Blind & Spacer, Prj Std, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.47 Series B, -, 150 Lbs, -, -, -, -,	MMFRP0C6OG01L10300	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + Sour Service, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C730L10A010D00	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5D830L10A010D04	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N + Sour Service, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C3X0L90A011W00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes

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Specification		A28A			Carbon Steel-150#-Raised Face-CA=3mm-Sour Service		

Gaskets

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GAS	1	26	28	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL101080H00	
GX3	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX3	1	26	28	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX6	1	26	28	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL800080H00	

Bolts

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7M/A194 Gr.2HM, -, -,	BTS222A007010000	

Branches

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	18	28	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A671 Gr. CC60 Cl.32 + Sour service + HIC Test, BE, -,	BRRPP0C41P3000	
		2	20	IN			

Assemblies

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	18	28	IN	90° Branch to header with reinforcing pad		
		2	20	IN			

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Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A29A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Temperature	DEG C	-29	0	38	50	65
Pressure	KG/CM2G	16	16	16	16	16

Schedule / Thickness

Short Code (Opt.)	CHE (1)	90E (1)	FLW (173)	GAS (1)	REIN (1)	CAP (1)	F8S (1)
	PADL (1)	B3F6 (1)	B1F3 (1)	TST (1)	CSN (1)	CRE (1)	ORI (1)
	45E (1)	ERE (1)	PAD (1)	B1F2 (1)	GAT (1)	CPLR (1)	BRAN (1)
	SOL (1)	GLO (1)	PIP (1)	TEE (1)	FLG (1)	BLF (1)	B1F (1)
	CHE1 (1)	ESN (1)	TEER (1)				

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
	20 IN S-STD	24 IN S-STD					

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Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	3	IN	Flanged Pipes, Seamless, ASME B36.10, ASTM A106 Gr.B Galv. as per ASTM A153, -, -, RF, as per ASME B16.5, 150 Lbs, -, -, -,	PPFP20D41F02L1000100	
PIP	1	4	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B Phenolic Epoxy Coated, BE, -, -, -,	PPPP20D41D30000000	
PIP	1	16	24	IN	EFW, Pipes, ASME B36.10, API 5L Gr.B PSL2 Phenolic Epoxy Coated, BE, -, -, -,	PPPP20D44230010000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	3	IN	Flanged 45 Degree elbow, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGE420D5D802L1010000	
45E	1	4	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBE420D5D530010000	
45E	1	16	24	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBE420D5D530030000	
90E	1	.5	3	IN	Flanged 90 Degree elbow, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGE920D5D802L1010000	
90E	1	4	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBE920D5D530010000	
90E	1	16	24	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBE920D5D530030000	
CAP	1	4	24	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBCP20D5D530010000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N Galv. as per ASTM A153, SW Ends, -, 6000 Lbs, -,	DFCR20D5CPL0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N Galv. as per ASTM A153, SW Ends, -, 3000 Lbs, -,	DFCR20D5CPL0LE0000	
CRE	1	3 1.5	3 2	IN IN	Flanged Concentric reducer, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGRC20D5D802L1010000	
CRE	1	4 1.5	14 12	IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBRC20D5D530010000	
CRE	1	16 8	24 20	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBRC20D5D530030000	
CSN	1	2 .75	2 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N Galv. as per ASTM A153, BE/PE, -, -,	DFSCI0D5CP300000	
ERE	1	3 1.5	3 2	IN IN	Flanged Eccentric reducer, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGRE20D5D802L1010000	
ERE	1	4 1.5	14 12	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBRE20D5D530010000	

S50TR02 - (r2967)

Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
ERE	1	16 8	24 20	IN IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBRE20D5D530030000	
ESN	1	2 .75	2 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N Galv. as per ASTM A153, BE/PE, -, -,	DFSEI0D5CP300000	
TEE	1	.5	3	IN	Flanged Equal Tee, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGTE20D5D802L1010000	
TEE	1	4	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBTE20D5D530010000	
TEE	1	16	24	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, -,	DBTE20D5D530030000	
TEER	1	.75 .5	3 2	IN IN	Flanged Reducing Tee, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, -, -,	DGTR20D5D802L1010000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	24 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N Galv. as per ASTM A153, 3000 Lbs, SW Ends, -, -,	LTLSI0D5CPL0LE0000	
SOL	1	2 .5	24 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N Galv. as per ASTM A153, 6000 Lbs, SW Ends, -, -,	LTLSI0D5CPL0LG0000	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	3	IN	Blind Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, -, -, -,	FGBL25D5CP02L10000	
BLF	1	4	24	IN	Blind Flange, ASME B16.5, ASTM A105N Epoxy Coated, 150 Lbs, RF, -, -, -,	FGBL25D5CN02L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF/SW End, -, -, -,	FGSW25D5CP07L10000	
FLG	1	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF/BW End, -, -, -,	FGWN25D5CP06L10000	
FLG	1	4	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N Epoxy Coated, 150 Lbs, RF/BW End, -, -, -,	FGWN25D5CN06L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N Galv. as per ASTM A153, RF/BW End, -, 300 Lbs, -, -,	FGWL25D5CP06L5050000	
ORI	1	2	3	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N Galv. as per ASTM A153, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120D5CP06L50900	

S50TR02 - (r2967)

Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
ORI	1	4	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N Epoxy Coated, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120D5CN06L50900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Flanged Ends, -, API 602, ASTM A105N Galv. as per ASTM A153, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, -, Renewable Seats, Seats: -, Bronze, -, -, -, -, -, -,	VCLA23D5CP0AL15T0B00	
CHE	1	4	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, Internally Epoxy Coated	VCDA20C4000AL14Y0911	
CHE1	1	2	3	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, Installation: Horizontal, RF, Ends as per ASME B16.5, -, Bolted Cover, -, -, -, -, Renewable Seats, Seats: -, Bronze, -, -, -, -, -, -,	VCGAN0D4080AL1230I00	
CHE1	1	4	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, Internally Epoxy Coated	VCGAN0C4000AL10K0B11	
GAT	1	.5	1.5	IN	Gate Valve Flanged Ends, -, API 602, -, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI24D5CP0AL11Z052600	
GAT	1	2	3	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22D4080AL1B8052600	
GAT	1	4	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Internally Epoxy Coated	VGGI22C4000AL101050311	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, Internally Epoxy Coated	VGGI22C4000AL101040311	

BUT	12”	24"	
Butterfly Valve Wafer Ends, API 609 Category A, ASTM A216 Grade WCB, Lug-type Raised Faces, 150 Lbs, EPDM Sleeve Seats, Concentric Disc, AISI 316 Disc, 13Cr Shaft, Seat Leakage as per API 598, Bearing: AISI 316, Gear Operated, Ends as per ASME B16.5, Packing: Graphite.			

* Added or modified

S50TR02 - (12967)

Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	.5	1.5	IN	Globe Valve Flanged Ends, -, API 602, -, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGI21D5CP0AL119050200	
GLO	1	2	3	IN	Globe Valve Flanged Ends, -, BS 1873, -, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2D4080AL119050200	
GLO	1	4	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, Internally Epoxy Coated	VLGIN2C4000AL107050411	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, Internally Epoxy Coated	VLGIN2C4000AL107040411	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	3	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 Galv. as per ASTM A153, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820D6OR01L10100	
F8S	1	4	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 Epoxy Coated, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820D6OP01L10100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70 Epoxy Coated, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20D6OP01L10100	
TST	1	2	3	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Galv. as per ASTM A153, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMD5D830L10A010103	
TST	1	4	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Epoxy Coated, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMD5D530L10A010103	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Epoxy Coated, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMD5D530L10A010104	

Gaskets

S50TR02 - (r2967)

Specification	A29A	Carbon Steel(Int Phenolic baked Epoxy)-150#-Raised Face-CA=3mm

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	3	3	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B Galv. as per ASTM A153, BE, -,	BRPPP0D41F3000	
		2	2	IN			
BRAN	1	4	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B Phenolic Epoxy Coated, BE, -,	BRPPP0D41D3000	
		2	12	IN			
BRAN	1	16	16	IN	Pipe to Pipe 90 Degree, Prj Std, API 5L Gr.B PSL2 Phenolic Epoxy Coated, BE, -,	BRPPP0D4423000	
		2	2	IN			
PAD	1	16	24	IN	Reinforcing Pad 90 Degree, Prj Std, API 5L Gr.B PSL2 Phenolic Epoxy Coated, BE, -,	BRRPP0D4423000	
		2	20	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	24	IN	bolt assembly 150 RF		
B1F2	1	.5	24	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	24	IN	bolt for F8S assembly 150 RF		
B3F6	1	.5	24	IN	bolt ORIFICE 300 RF		
REIN	1	16	24	IN	90° Branch to header with reinforcing pad		
		2	20	IN			

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Detailed Piping Class

Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR	
Basic Material	Carbon steel	Standard Pipe	ASME B31.1 edition 2016
Rating	150 lbs	Standard Test	ASME B31.1
Corrosion Allowance	1.5 MM	Branch Table	A2A
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @240 Deg. C

Refer to JSS corresponding to each component for IBR specific requirements

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)							
DBB (1)	CPL (1)	NIP (731)	SOL (1)	FLW (173)	PADL (1)	YST (1)
F8S (1)	CPLR (1)	CRE (1)	FX6 (781)	GX3 (1)	DBB (2)	90E (1)
FX3 (773)	GAS (1)	B1F3 (1)	CHE (1)	CHE1 (1)	TEER (1)	STR (1)
TST (1)	B3F6 (1)	CSN (1)	ERE (1)	ESN (1)	TEE (1)	FLG (1)
ORI (1)	GX6 (1)	BRAN (1)	B1F2 (1)	B6F (1)	GAT (1)	PIP (1)
CAP (1)	B1F (1)	GLO (1)	45E (1)	NIP (1)	BLF (1)	B3F (1)

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD

S50TR02 - (2967)

* Added or modified

Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	
PIP	1	16	18	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, IBR -, -,	PPPP20C40N30030002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE420C5C4L0LE0002	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
45E	1	16	18	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830030002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE920C5C4L0LE0002	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
90E	1	16	18	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830030002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, IBR	DFCP20C5C4L0LE0002	
CAP	1	2	18	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCF20C5C4L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCR20C5C4L0LE0002	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CRE	1	16 8	18 16	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830030002	

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Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
		2	12	IN			
ERE	1	16	18	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830030002	
		8	16	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTE20C5C4L0LE0002	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEE	1	16	18	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830030002	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTR20C5C4L0LE0002	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	
		2	12	IN			
TEER	1	16	18	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830030002	
		12	16	IN			

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	18	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	
		.5	.75	IN			
SOL	1	2	18	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LE0002	
		1	1.5	IN			

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	18	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, IBR	FGBL25C5C402L10002	

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Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Flanges

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L10002	
FLG	1	2	18	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L10002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, IBR	FGWL25C5C406L5050002	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L50002	
FX3	773	2	18	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L50002	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FX6	781	2	18	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	
ORI	1	2	18	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L50902	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	18	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL1100904	
CHE1	1	2	18	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL10T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L10B050F04	

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Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L10B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL102050304	
GAT	1	12	18	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL102040304	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL108050404	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL108040404	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, IBR	MMF820C6OI01L10102	

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Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PADL	1	10	18	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, IBR	MMFR20C6OI01L10102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 150 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L150070207	01
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR, Seamless body	MMSDMMC5C830L10A010105	
TST	1	16	18	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR, Welded body	MMSDMMC5C830L10A010106	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	
YST	1	2	4	IN	Strainer Y type Flanged Ends, Mnf Std, ASTM A216 Gr.WCB, 150 Lbs, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSIMMC40002L10A011T02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	18	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	18	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	18	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.625	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code

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* Added or modified

Specification	A2A	Carbon Steel-150#-Raised Face-CA=1.5mm-IBR

Branches

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	8	IN			
BRAN	1	16	18	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRPPP0C40N3000	
		2	12	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	18	IN	bolt assembly 150 RF		
B1F2	1	.5	18	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	18	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	18	IN	bolt assembly 300 RF		
B3F6	1	.5	18	IN	bolt ORIFICE 300 RF		
B6F	1	.5	18	IN	bolt assembly 600 RF		

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Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A30A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	UG

Notes: The wall thickness specified in this calculation are based on internal pressure only. For additonal external Civil loads for buried Piping shall be taken care by Civil

Temperature	DEG C	-29	0	38	50	65
Pressure	KG/CM2G	16	16	16	16	16

Schedule / Thickness

Short Code (Opt.)							
TST (1)	45E (1)	GAS (1)	BRAN (1)	CHE1 (1)	FLG (1)	PAD (1)	
GAT (1)	TEE (1)	TEER (1)	GLO (1)	BUT (1)	PIP (1)	CRE (1)	
REIN (1)	CHE (1)	90E (1)	ERE (1)	B1F (1)	BLF (1)		

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
20 IN S-STD	24 IN S-STD					

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Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	3	IN	Flanged Pipes, Seamless, ASME B36.10, ASTM A106 Gr.B Galv. as per ASTM A153, -, -, RF, as per ASME B16.5, 150 Lbs, -, Externally 3LPE Coated, Underground Service -,	PPFP20D41F02L1000107	
PIP	1	4	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B Phenolic Epoxy Lined & PE Coated, BE, Underground Service -, -,	PPPP20D44330000005	
PIP	1	16	24	IN	EFW, Pipes, ASME B36.10, API 5L Gr.B PSL2 Phenolic Epoxy Lined & PE Coated, BE, Underground Service -, -,	PPPP20D44430010005	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	3	IN	Flanged 45 Degree elbow, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGE420D5D802L1010001	
45E	1	4	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBE420D5D530010005	
45E	1	16	24	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBE420D5D530030005	
90E	1	.5	3	IN	Flanged 90 Degree elbow, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGE920D5D802L1010001	
90E	1	4	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBE920D5D530010005	
90E	1	16	24	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBE920D5D530030005	
CRE	1	3 1.5	3 2	IN IN	Flanged Concentric reducer, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGRC20D5D802L1010001	
CRE	1	4 1.5	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBRC20D5D530010005	
CRE	1	16 8	24 20	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBRC20D5D530030005	
ERE	1	3 1.5	3 2	IN IN	Flanged Eccentric reducer, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGRE20D5D802L1010001	
ERE	1	4 1.5	14 12	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBRE20D5D530010005	
ERE	1	16 8	24 20	IN IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBRE20D5D530030005	
TEE	1	.5	3	IN	Flanged Equal Tee, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGTE20D5D802L1010001	
TEE	1	4	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBTE20D5D530010005	

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Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TEE	1	16	24	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB Epoxy Coated, BW Ends, -, Externally 3LPE Coated	DBTE20D5D530030005	
TEER	1	.75 .5	3 2	IN IN	Flanged Reducing Tee, Seamless, ASME B16.5, ASTM A234 Gr.WPB Galv. as per ASTM A153, -, -, RF, -, 150 Lbs, -, Externally 3LPE Coated -,	DGTR20D5D802L1010001	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	3	IN	Blind Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, -, -, -,	FGBL25D5CP02L10000	
BLF	1	4	24	IN	Blind Flange, ASME B16.5, ASTM A105N Epoxy Coated, 150 Lbs, RF, -, -, -,	FGBL25D5CN02L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF/SW End, -, -, -,	FGSW25D5CP07L10000	
FLG	1	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF/BW End, -, -, -,	FGWN25D5CP06L10000	
FLG	1	4	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N Epoxy Coated, 150 Lbs, RF/BW End, -, -, -,	FGWN25D5CN06L10000	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	3	3	IN	Butterfly Valve Wafer Ends, API 609 Cat.A, -, Seat Leakage as per API 598, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, Lug-type RF, Ends as per ASME B16.5, -, Concentric Disc, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: EPDM Sleeve, -, -, LO, -, -, -, Externally 3LPE Coated	VYAD21D40805L10K070110	
BUT	1	4	8	IN	Butterfly Valve Wafer Ends, API 609 Cat.A, -, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, Lug-type RF, Ends as per ASME B16.5, -, Concentric Disc, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: EPDM Sleeve, -, -, LO, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VYAD21C40005L10K070111	
BUT	1	10	24	IN	Butterfly Valve Wafer Ends, API 609 Cat.A, -, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, Lug-type RF, Ends as per ASME B16.5, -, Concentric Disc, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: EPDM Sleeve, -, -, GO, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VYAD21C40005L10K040111	
CHE	1	.5	1.5	IN	Lift Check Valve Flanged Ends, -, API 602, ASTM A105N Galv. as per ASTM A153, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, -, Renewable Seats, Seats: -, Bronze, -, -, -, -, -, Externally 3LPE Coated	VCLA23D5CP0AL15T0B13	

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Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	4	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VCDA20C4000AL14Y0912	
CHE1	1	2	3	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, Installation: Horizontal, RF, Ends as per ASME B16.5, -, Bolted Cover, -, -, -, -, Renewable Seats, Seats: -, Bronze, -, -, -, -, -, Externally 3LPE Coated	VCGAN0D4080AL1230I13	
CHE1	1	4	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VCGAN0C4000AL10K0B12	
GAT	1	.5	1.5	IN	Gate Valve Flanged Ends, -, API 602, -, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Externally 3LPE coated	VGGI24D5CP0AL11Z052614	
GAT	1	2	3	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Externally 3LPE coated	VGGI22D4080AL1B8052614	
GAT	1	4	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Internally Epoxy Coated + Externally 3LPE coated	VGGI22C4000AL101050313	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, Internally Epoxy Coated + Externally 3LPE coated	VGGI22C4000AL101040313	
GLO	1	.5	1.5	IN	Globe Valve Flanged Ends, -, API 602, -, ASTM A105N Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, Externally 3LPE Coated	VLGI21D5CP0AL119050213	
GLO	1	2	3	IN	Globe Valve Flanged Ends, -, BS 1873, -, ASTM A216 Gr.WCB Galv. as per ASTM A153, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, Externally 3LPE Coated	VLGIN2D4080AL119050213	

S50TR02 - (2967)

Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	4	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VLGIN2C4000AL107050414	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, Internally Epoxy Coated + Externally 3LPE Coated	VLGIN2C4000AL107040414	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TST	1	2	3	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Galv. as per ASTM A153, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Externally 3LPE Coated	MMSDMMD5D830L10A010111	
TST	1	4	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Epoxy Coated, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Externally 3LPE Coated, Seamless body	MMSDMMD5D530L10A010109	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Epoxy Coated, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Externally 3LPE Coated, Welded body	MMSDMMD5D530L10A010110	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes

S50TR02 - (r2967)

Specification	A30A	Carbon Steel(Int Phenolic baked Epoxy + Ext 3LPE Lined)-150#-Raised Face-CA=3mm

Bolts

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	4	14	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B Phenolic Epoxy Coated, BE, Underground Service	BRPPP0D41D3001	
		2	12	IN			
BRAN	1	16	16	IN	Pipe to Pipe 90 Degree, Prj Std, API 5L Gr.B PSL2 Phenolic Epoxy Coated, BE, Underground Service	BRPPP0D4423001	
		2	2	IN			
PAD	1	16	24	IN	Reinforcing Pad 90 Degree, Prj Std, API 5L Gr.B PSL2 Phenolic Epoxy Coated, BE, Underground Service	BRRPP0D4423001	
		2	20	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	24	IN	bolt assembly 150 RF		
REIN	1	16	24	IN	90° Branch to header with reinforcing pad		
		2	20	IN			

S50TR02 - (r2967)

Detailed Piping Class

Specification	A31A	Carbon Steel-150#-Raised Face-CA=3mm-IBR	
Basic Material	Carbon steel	Standard Pipe	ASME B31.1 edition 2016
Rating	150 lbs	Standard Test	ASME B31.1
Corrosion Allowance	3 MM	Branch Table	A31A
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for IBR specific requirements

Wall Thickness have been verified for Full Vacuum @175 Deg. C

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)	DBB (2)	GAT (1)	ERE (1)	FX6 (781)	YST (1)	GX3 (1)	B1F3 (1)
	B6F (1)	DBB (1)	CPL (1)	PIP (1)	ESN (1)	ORI (1)	CHE (1)
	NIP (731)	FX3 (773)	B1F2 (1)	B3F (1)	BRAN (1)	CRE (1)	TEER (1)
	BLF (1)	PADL (1)	GLO (1)	CAP (1)	CPLR (1)	NIP (1)	TEE (1)
	FLG (1)	FLW (173)	STR (1)	GAS (1)	B1F (1)	90E (1)	TST (1)
	GX6 (1)	CHE1 (1)	45E (1)	CSN (1)	SOL (1)	F8S (1)	B3F6 (1)

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD			

S50TR02 - (2967)

* Added or modified

Specification	A31A	Carbon Steel-150#-Raised Face-CA=3mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	12	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE420C5C4L0LE0002	
45E	1	2	12	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE920C5C4L0LE0002	
90E	1	2	12	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, IBR	DFCP20C5C4L0LE0002	
CAP	1	2	12	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCF20C5C4L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCR20C5C4L0LE0002	
CRE	1	3 2	12 10	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
ERE	1	3 2	12 10	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	

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Specification	A31A	Carbon Steel-150#-Raised Face-CA=3mm-IBR

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTE20C5C4L0LE0002	
TEE	1	2	12	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTR20C5C4L0LE0002	
TEER	1	3 2	12 10	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 .5	12 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	
SOL	1	2 1	12 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LE0002	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	12	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, IBR	FGBL25C5C402L10002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L10002	
FLG	1	2	12	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L10002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, IBR	FGWL25C5C406L5050002	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L50002	
FX3	773	2	12	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L50002	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FX6	781	2	12	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	

S50TR02 - (r2967)

* Added or modified

Specification	A31A	Carbon Steel-150#-Raised Face-CA=3mm-IBR

Flanges

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
ORI	1	2	12	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L50902	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	12	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL1100904	
CHE1	1	2	12	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL10T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L10B050F04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L10B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL102050304	

S50TR02 - (r2967)

Specification	A31A	Carbon Steel-150#-Raised Face-CA=3mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	12	12	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL102040304	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL108050404	
GLO	1	12	12	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL108040404	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, IBR	MMF820C6OI01L10102	
PADL	1	10	12	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, IBR	MMFR20C6OI01L10102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 150 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L150070207	01
TST	1	2	12	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMC5C830L10A010102	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	

Gaskets

S50TR02 - (r2967)

Specification		A31A			Carbon Steel-150#-Raised Face-CA=3mm-IBR		
Gaskets							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	12	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	12	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	12	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
Bolts							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	
Branches							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BRAN	1	6	12	IN	Pipe to Pipe 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRPPP0C4023000	
		2	6	IN			
Assemblies							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	12	IN	bolt assembly 150 RF		
B1F2	1	.5	12	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	12	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	12	IN	bolt assembly 300 RF		
B3F6	1	.5	12	IN	bolt ORIFICE 300 RF		
B6F	1	.5	12	IN	bolt assembly 600 RF		

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Specification	A3A	Carbon Steel-150#-Raised Face-CA=3mm		
Basic Material	Carbon steel		Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs		Standard Test	ASME B31.3
Corrosion Allowance	3 MM		Branch Table	A3A
Facing	RF		Branch Design	ASME B31.3
Fluid Category	CATEGORY D		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)							
CAP (541)	PIP (1)	ESN (1)	NIP (1)	BLF (1)	FLW (173)	GAS (1)
GX3 (1)	CHE1 (1)	TEE (1)	CPL (1)	CSN (1)	PLU (1)	FX3 (773)
GLO (1)	CPLR (1)	SOL (1)	FX6 (781)	ORI (1)	F8S (1)	CHE (1)
B1F2 (1)	B6F (1)	TEER (1)	TST (1)	DBB (2)	B3F6 (1)	GAT (1)
45E (1)	CRE (1)	ERE (1)	FLG (1)	DBB (1)	B1F (1)	B1F3 (1)
B3F (1)	YST (1)	GX6 (1)	BUT (1)	90E (1)	CAP (1)	NIP (731)

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD					

S50TR02 - (2967)

Specification	A3A	Carbon Steel-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	8	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	8 6	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSCI0C5C4300000	
ERE	1	3 2	8 6	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	

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Specification	A3A	Carbon Steel-150#-Raised Face-CA=3mm

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	8	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	6	IN			

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	8	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			
SOL	1	2	8	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	

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Specification	A3A	Carbon Steel-150#-Raised Face-CA=3mm

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	4	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	4	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	3	8	IN	Butterfly Valve Wafer Ends, API 609 Cat.B, -, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, Lug-type RF, Ends as per ASME B16.5, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, -, Fire Safe as per Std from JSS or Datasheet, LO, -, -, -, -,	VYAD23C40005L18D070100	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	8	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y0900	
CHE1	1	2	8	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL10K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L10C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L10C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	

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Specification		A3A			Carbon Steel-150#-Raised Face-CA=3mm		
Valves							
		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22C4000AL101050300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGE21C5C4L0L90D050500	
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2C4000AL107050400	
Miscellaneous Items							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C830L10A010100	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	
Gaskets							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	8	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	8	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
Bolts							

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Specification	A3A	Carbon Steel-150#-Raised Face-CA=3mm

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	4	IN	bolt assembly 150 RF		
B1F2	1	.5	4	IN	bolt for PSV inlet assembly 150 RF		
B1F3	1	.5	4	IN	bolt for F8S assembly 150 RF		
B3F	1	.5	4	IN	bolt assembly 300 RF		
B3F6	1	.5	4	IN	bolt ORIFICE 300 RF		
B6F	1	.5	4	IN	bolt assembly 600 RF		

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Detailed Piping Class

Specification	A49A	Carbon Steel-150#-Raised Face-CA=6mm-Sour Service	
Basic Material	Carbon steel + NACE + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	6 MM	Branch Table	A49A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for Sour service specific requirements

Refer to JSS corresponding to each component for HIC specific requirements

PWHT is required for all weld joints irrespective of thickness

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Requirements of HIC resistant steels shall apply to plate, products made from plate and welded pipe & fittings offered in place of seamless type.
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)	DBB (1)	CRE (1)	ESN (1)	TEE (1)	BOL (1)	GX6 (1)	CHE (1)
	FLG (1)	FX3 (773)	FX6 (781)	ORI (1)	GAT (1)	F8S (1)	PADL (1)
	YST (1)	GAS (1)	45E (1)	TEER (1)	PIP (1)	GX3 (1)	CHE1 (1)
	GLO (1)	CAP (1)	CSN (1)	PLU (1)	DBB (2)	CPLR (1)	NIP (1)
	FLW (173)	TST (1)	90E (1)	CPL (1)	ERE (1)	NIP (731)	WOL (1)
	BLF (1)						

Diameter(s) Sch/Thk.	.5 IN S-XXS	.75 IN S-XXS	1 IN S-XXS	1.5 IN S-XXS	2 IN S-160	3 IN S-160	4 IN S-XS
	6 IN S-XS	8 IN S-XS	10 IN S-XS				

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* Added or modified

Specification	A49A	Carbon Steel-150#-Raised Face-CA=6mm-Sour Service

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -, -	PPPP20C403I0000000	
PIP	1	2	10	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, BE, -, -, -	PPPP20C40330000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFE420C5C3L0LH0000	
45E	1	2	10	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE420C5C730010000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFE920C5C3L0LH0000	
90E	1	2	10	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE920C5C730010000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 9000 Lbs, -	DFCP20C5C3L0LH0000	
CAP	1	2	10	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBCP20C5C730010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFCF20C5C3L0LH0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFCR20C5C3L0LH0000	
CRE	1	3 2	10 8	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRC20C5C730010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSCI0C5C3300000	
ERE	1	3 2	10 8	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRE20C5C730010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSEI0C5C3300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -	DFNP20C403I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE/NPTM End, -, -	DFNP20C403I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N + Sour Service, NPTM End, -, -	DFPL20C5C3R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFTE20C5C3L0LH0000	
TEE	1	2	10	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTE20C5C730010000	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFTR20C5C3L0LH0000	

S50TR02 - (r2967)

Specification	A49A	Carbon Steel-150#-Raised Face-CA=6mm-Sour Service

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
TEER	1	3	10	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -,	DBTR20C5C730010000	
		2	8	IN			

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2	10	IN	Weldolet, MSS SP-97, ASTM A105N + PWHT + Sour Service, BW Ends, as per ASME B16.25, -,	LTLWI0C5DA300100	
		.5	1.5	IN			

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	10	IN	Blind Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF, -, -, -,	FGBL25C5C302L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L10000	
FLG	1	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N + Sour Service, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C306L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L50000	
FX3	773	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L80000	
FX6	781	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L80000	
ORI	1	2	10	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7M/A194 Gr.2HM, -, ASME B16.36, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs ASTM A105N + Sour Service, -, -,	FFF120C5C306L53E00	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes

S50TR02 - (r2967)

Specification	A49A	Carbon Steel-150#-Raised Face-CA=6mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N + Sour Service, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCLD23C5C3L0L9283808	
CHE	1	2	10	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCDA20C4030AL15C0908	
CHE1	1	2	10	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCGAN0C4030AL1021E08	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C301L102050I08	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C303L102050I08	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGGE24C5C3L0L90H050R08	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGGI22C4030AL104050R08	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VLGE21C5C3L0L909050K08	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VLGIN2C4030AL104050J08	

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Specification	A49A	Carbon Steel-150#-Raised Face-CA=6mm-Sour Service

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, C.A. = 6 mm	MMF820C6OG01L10108	
PADL	1	10	10	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, C.A. = 6 mm	MMFR20C6OG01L10108	
TST	1	2	10	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + Sour Service, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSDMMC5C730L10A010D08	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N + Sour Service, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSJMMC5C3X0L90A011W08	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	10	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7M/A194 Gr.2HM, -, -,	BTS222A007010000	

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Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm		
Basic Material	Carbon steel		Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs		Standard Test	ASME B31.3
Corrosion Allowance	3 MM		Branch Table	A52A
Facing	RF		Branch Design	ASME B31.3
Fluid Category	NORMAL		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes: Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	65	100
Pressure	KG/CM2G	20.04	20.04	20.04	19.16	18.01

Schedule / Thickness

Short Code (Opt.)							
BAL (1)	CSN (1)	BOL (1)	DBB (1)	DBB (2)	CPL (1)	SOL (1)	
FLW (173)	BAL1 (24)	NIP (731)	FX3 (773)	GAS (1)	GX3 (1)	CAP (1)	
CPLR (1)	FLG (1)	BLF (1)	45E (1)	90E (1)	CRE (1)	ORI (1)	
CHE1 (1)	GLO (1)	TEE (1)	TST (1)	ERE (1)	ESN (1)	PLU (1)	
TEER (1)	FX6 (781)	YST (1)	CHE (1)	GAT (1)	PIP (1)	NIP (1)	
F8S (1)	GX6 (1)						
Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN
Sch/Thk.	S-160	S-160	S-XS	S-XS	S-XS	S-STD	S-STD

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Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	4	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	4	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	4	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	4	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	4 3	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSCI0C5C4300000	
ERE	1	3 2	4 3	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	

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Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	4	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
TEER	1	3 2	4 3	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	4 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
SOL	1	2 .5	4 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	4	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	4	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	4	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	

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Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
FX6	781	2	4	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	4	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BAL	1	.5	1.5	IN	Ball Valve Flanged Ends, Reduced Bore, Long Pattern, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, ASTM A182 Gr.F316 Ball, AISI 316 Stem, 2 or 3 Pcs Split Body Side Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, -, -, -, -,	VBAG20C5C40AL105070L00	
BAL	1	2	4	IN	Ball Valve Flanged Ends, Reduced Bore, Long Pattern, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, 2 or 3 Pcs Split Body Side Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, -, -, -, -,	VBAG20C4000AL1KZ070L00	
BAL1	24	.5	1.5	IN	Ball Valve Flanged Ends, Full Bore, Long Pattern, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, ASTM A182 Gr.F316 Ball, AISI 316 Stem, 2 or 3 Pcs Split Body Side Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, -, -, -, -,	VBAH20C5C40AL105070L00	
BAL1	24	2	4	IN	Ball Valve Flanged Ends, Full Bore, Long Pattern, Floating Ball, API 608, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, AISI 316 Ball, AISI 316 Stem, 2 or 3 Pcs Split Body Side Entry, Bolted Connection, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Stem Seal: Graphite, -, Seat Rings: RPTFE, Seat Inserts: -, -, Fire Safe as per API 607, LO, -, -, -, -, -, -,	VBAH20C4000AL1KZ070L00	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	4	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL14Y0900	

S50TR02 - (r2967)

Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE1	1	2	4	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL10K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C401L10C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105N, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C403L10C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	
GAT	1	2	4	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4000AL101050300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L90D050500	
GLO	1	2	4	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4000AL107050400	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	4	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
TST	1	2	4	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C830L10A010100	

S50TR02 - (r2967)

Specification	A52A	Carbon Steel-150#-Raised Face-CA=3mm

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	4	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	4	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	4	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

S50TR02 - (r2967)

Specification	A53G	Carbon Steel(Galvanised)-150#-Flat Face-CA=1.5mm

Basic Material	Carbon steel / Galvanized carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM	Branch Table	A53G
Facing	FF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Surfaces where Galvanizing has been burnt off shall be wire brushed and Cold Galvanized with Zinc Coating Compound

Temperature	DEG C	0	38	65
Pressure	KG/CM2G	16	16	16

Schedule / Thickness

Short Code (Opt.)	GAT (1)	45E (1)	CRE (1)	GLO (1)	CSN (1)	ESN (1)	FLG (1)
	FLW (173)	TOL (1)	TEER (1)	GAS (1)	CHE (1)	B1F (1)	TST (1)
	CAP (1)	90E (1)	CPLR (1)	ERE (1)	F8S (1)	CHE1 (1)	PIP (1)
	TEE (1)	BLF (1)					

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD					

S50TR02 - (2967)

Specification	A53G	Carbon Steel(Galvanised)-150#-Flat Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B Galv. as per ASTM A153, NPTM Ends, -, -, -,	PPPP20D41FR1000000	
PIP	1	2	8	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B Galv. as per ASTM A153, BE, -, -, -,	PPPP20D41F30000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 3000 Lbs, -,	DFE420D5CPR4LE0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 2000 Lbs, -,	DFE420D5CPR4LC0000	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBE420D5D830010000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 3000 Lbs, -,	DFE920D5CPR4LE0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 2000 Lbs, -,	DFE920D5CPR4LC0000	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBE920D5D830010000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF End, -, 3000 Lbs, -,	DFCP20D5CPR1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF End, -, 2000 Lbs, -,	DFCP20D5CPR1LC0000	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBCP20D5D830010000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 3000 Lbs, -,	DFCR20D5CPR6LE0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 2000 Lbs, -,	DFCR20D5CPR6LC0000	
CRE	1	3 2	8 6	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBRC20D5D830010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N Galv. as per ASTM A153, PE/NPTF End, -, -,	DFSCI0D5CPI20000	
ERE	1	3 2	8 6	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBRE20D5D830010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N Galv. as per ASTM A153, PE/NPTF End, -, -,	DFSEI0D5CPI20000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 3000 Lbs, -,	DFTE20D5CPR6LE0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 2000 Lbs, -,	DFTE20D5CPR6LC0000	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBTE20D5D830010000	

S50TR02 - (r2967)

Specification	A53G	Carbon Steel(Galvanised)-150#-Flat Face-CA=1.5mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 3000 Lbs, -,	DFTR20D5CPR6LE0000	
TEER	1	1 .5	1.5 .75	IN IN	Reducing tee, ASME B16.11, ASTM A105N Galv. as per ASTM A153, NPTF Ends, -, 2000 Lbs, -,	DFTR20D5CPR6LC0000	
TEER	1	3 2	8 6	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB Galv. as per ASTM A153, BW Ends, -, -,	DBTR20D5D830010000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TOL	1	2 .5	8 1.5	IN IN	Threadolet, MSS SP-97, ASTM A105N, 3000 Lbs, NPTF Ends, -, -,	LTLTI0C5C4R0LE0000	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, FF, -, -, -,	FGBL25D5CP01L10000	
FLG	1	.5	1.5	IN	Threaded Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, FF/NPTF End, -, -, -,	FGTH25D5CP03L10000	
FLG	1	2	8	IN	Slip-on Flange, ASME B16.5, ASTM A105N Galv. as per ASTM A153, 150 Lbs, FF/BW End, -, -, -,	FGSL25D5CP01L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N Galv. as per ASTM A153, FF/BW End, -, 300 Lbs, -, -,	FGWL25D5CP01L5050000	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM B62 UNS C83600, 800 Lbs, Installation: Horizontal or Vertical, NPTF Ends, Ends as per ASME B16.11, Bolted Cover, A307 Gr.B/A563 Gr.B, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, Bronze, -, -, -, -, -,	VCLD23U405R0L95Z0600	
CHE	1	2	8	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM B62 UNS C83600, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, -, Seats: -, Aluminium-Bronze, -, -, -, -, Retainerless, -,	VCDA20U4050AL15J0900	

S50TR02 - (r2967)

Specification	A53G	Carbon Steel(Galvanised)-150#-Flat Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE1	1	2	8	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM B62 UNS C83600, 150 Lbs, Installation: Horizontal, FF, Ends as per ASME B16.5, -, Bolted Cover, -, -, -, -, Renewable Seats, Seats: -, Bronze, -, -, -, -, -, -,	VCGAN0U40502L1230I00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM B62 UNS C83600, 800 Lbs, NPTF Ends, Ends as per ASME B16.11, Bolted Bonnet, A307 Gr.B/A563 Gr.B, -, SPW AISI 316/Graphite, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGE24U405R0L93H054W00	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM B62 UNS C83600, 150 Lbs, FF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22U40502L1B8052600	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM B62 UNS C83600, 800 Lbs, NPTF Ends, Ends as per ASME B16.11, Bolted Bonnet, A307 Gr.B/A563 Gr.B, -, SPW AISI 316/Graphite, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGE21U405R0L96P055300	
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, -, ASTM B62 UNS C83600, 150 Lbs, FF, Ends as per ASME B16.5, -, Bolted Bonnet, -, -, -, Packing: Graphite, -, Bronze, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2U40502L119050200	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 Galv. as per ASTM A153, Between FF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820D6OR02L10100	
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB Galv. as per ASTM A153, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A307 Gr.B/A563 Gr.B, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMD5D830L10A012T00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Nonmetallic Flat Gasket, Full Face, ASME B16.21, Synthetic Fiber w / NBR binder, FF as per ASME B16.5, 150 Lbs, Thk=2mm, -,	GKFG20900O06L1020400	

Bolts

S50TR02 - (r2967)

Specification	A53G	Carbon Steel(Galvanised)-150#-Flat Face-CA=1.5mm

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	.625	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, Hot Dip Galv., -,	BTS222A005010D00	

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B1F	1	.5	8	IN	bolt assembly 150 RF		

S50TR02 - (2967)

Detailed Piping Class

Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm	
Basic Material	Carbon steel + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	A8A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	-	Control Level	-
Ped Fl Phase	-	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C

PWHT is required for all weld joints irrespective of thickness
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)							
GAT (1)	PIP (1)	45E (1)	CRE (1)	ESN (1)	SOL (1)	ERE (1)
PLU (1)	FX3 (773)	FX6 (781)	F8S (1)	CHE (1)	CPLR (1)	NIP (1)
TST (1)	NIP (731)	TEE (1)	TEER (1)	GX6 (1)	DBB (2)	PAD (1)
CHE1 (1)	GLO (1)	FLG (1)	DBB (1)	BUT (1)	90E (1)	YST (1)
REIN (1)	CAP (1)	CPL (1)	CSN (1)	BLF (1)	BOL (1)	GAS (1)
GX3 (1)	FLW (173)	ORI (1)	PADL (1)			

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-STD	18 IN S-STD
20 IN S-STD	24 IN S-STD					

S50TR02 - (-2967)

Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	24	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.C65 Cl.32, BE, -, -, -,	PPPP20C41330030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	24	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBE420C5CH30030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	24	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBE920C5CH30030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	24	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CRE	1	16 8	24 20	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBRC20C5CH30030000	

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Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -	DFSCI0C5C4300000	
		.75	1.5	IN	,		
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	24	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -	DBRE20C5CH30030000	
		8	20	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	24	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBTE20C5CH30030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	24	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -	DBTR20C5CH30030000	
		8	20	IN			

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	24	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			
SOL	1	2	24	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes

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Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	3	8	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Eccentric Disc - Triple Offset Type, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: AISI 316 Weld Overlay, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, LO, -, -, -, -,	VYAB23C4040AL16V073400	
BUT	1	10	24	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Eccentric Disc - Triple Offset Type, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: AISI 316 Weld Overlay, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -,	VYAB23C4040AL16V043400	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -,	VCLD23C5C4L0L9280200	
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4040AL15C0900	

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Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0C4040AL1020B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L10D050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L10D050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L90H050B00	
GAT	1	2	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4040AL104050300	
GAT	1	12	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4040AL104040300	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L909050500	
GLO	1	2	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4040AL104050400	
GLO	1	12	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4040AL104040400	

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* Added or modified

Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMF820C6OI01L10100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, -,	MMFR20C6OI01L10100	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L10A010103	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + PWHT, 150 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5CH30L10A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GX3	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	18	24	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.C65 Cl.32, BE, -,	BRRPP0C4133000	
		2	16	IN			

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Specification	A8A	Carbon Steel+PWHT-150#-Raised Face-3mm

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	18	24	IN	90° Branch to header with reinforcing pad		
		2	16	IN			

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Specification	A95A	Carbon Steel-150#-Raised Face-CA=6mm		
Basic Material	Carbon steel		Standard Pipe	ASME B31.3 edition 2016
Rating	150 lbs		Standard Test	ASME B31.3
Corrosion Allowance	6 MM		Branch Table	A95A
Facing	RF		Branch Design	ASME B31.3
Fluid Category	NORMAL		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	20.04	20.04	20.04	18.28	16.17	14.06	11.95	9.84	8.79	7.73	6.68	5.62

Schedule / Thickness

Short Code (Opt.)	BLF (1)	FLW (173)	F8S (1)	CPLR (1)	DBB (1)	WOL (1)	FX6 (781)
	BOL (1)	GAS (1)	NIP (1)	PIP (1)	45E (1)	CPL (1)	NIP (731)
	GX3 (1)	CAP (1)	DBB (2)	FX3 (773)	PADL (1)	YST (1)	GAT (1)
	PLU (1)	TEE (1)	GX6 (1)	GLO (1)	FLG (1)	BUT (1)	TEER (1)
	CHE (1)	90E (1)					

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	36 IN
Sch/Thk.	S-XXS	S-XXS	S-XXS	S-XXS	CALC

S50TR02 - (2967)

Specification	A95A	Carbon Steel-150#-Raised Face-CA=6mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	36	36	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFE420C5C4L0LH0000	
45E	1	36	36	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFE920C5C4L0LH0000	
90E	1	36	36	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 9000 Lbs, -,	DFCP20C5C4L0LH0000	
CAP	1	36	36	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFCF20C5C4L0LH0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFCR20C5C4L0LH0000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFTE20C5C4L0LH0000	
TEE	1	36	36	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 9000 Lbs, -,	DFTR20C5C4L0LH0000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 .5	36 1.5	IN IN	Weldolet, MSS SP-97, ASTM A105, BW Ends, as per ASME B16.25, -,	LTLWI0C5C2300100	

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Specification	A95A	Carbon Steel-150#-Raised Face-CA=6mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	1.5	IN	Blind Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL25C5C402L10000	
BLF	1	36	36	IN	Blind Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF, -, -, -,	FGBL24C5C402L10000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 150 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L10000	
FLG	1	36	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 150 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L10000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX3	773	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FX3	773	36	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L50000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	36	36	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L80000	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	36	36	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Eccentric Disc - Triple Offset Type, AISI 316 Disc, AISI 316 Shaft, -, Packing: Graphite, -, -, Seats: AISI 316 Weld Overlay, SPW AISI 316/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, C.A. = 6 mm	VYAB23C4000AL16V045I08	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCLD23C5C4L0L9280208	
CHE	1	36	36	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 150 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.47 Series B, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCDA20C4000AL15C1T08	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C201L10D050F08	

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Specification		A95A		Carbon Steel-150#-Raised Face-CA=6mm		

Valves

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 150 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C203L10D050F08	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGGE24C5C4L0L90H050B08	
GAT	1	36	36	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 150 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, C.A. = 6 mm	VGGI22C4000AL10404B008	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, C.A. = 6 mm	VLGE21C5C4L0L909050508	

Miscellaneous Items

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	1.5	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 150 Lbs, -, -, -, C.A. = 6 mm	MMF820C6OI01L10108	
PADL	1	36	36	IN	Paddle Blind & Spacer, Prj Std, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.47 Series B, -, 150 Lbs, -, -, -, C.A. = 6 mm	MMFRP0C6OI01L10308	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSJMMC5C4X0L90A011A08	

Gaskets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	1.5	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL101080H00	
GAS	1	36	36	IN	Spiral Wound Gasket , Low Stress, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 150 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL101080H00	

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Specification	A95A	Carbon Steel-150#-Raised Face-CA=6mm

Gaskets

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GX3	1	.5	1.5	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX3	1	36	36	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL500080H00	
GX6	1	.5	1.5	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX6	1	36	36	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

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Detailed Piping Class

Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	300 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	B12A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	52.03	52.03	52.03	47.81	46.05	44.64	42.54	40.07	38.67	37.26	35.51	28.83

Schedule / Thickness

Short Code (Opt.)							
CAP (541)	CRE (1)	TEER (1)	F8S (1)	DBB (1)	CHE (1)	CPLR (1)
CSN (1)	TEE (1)	SOL (1)	B6F (1)	45E (1)	ERE (1)	ESN (1)
FLG (1)	FX6 (781)	BLF (1)	REIN (1)	PAD (1)	GLO (1)	CPL (1)
NIP (731)	PLU (1)	YST (1)	NIP (1)	B3F3 (1)	PLUG (1)	DBB (2)
CHE1 (1)	BUT (1)	PADL (1)	GAS (1)	B3F (1)	CAP (1)	ORI (1)
TST (1)	B3F2 (1)	GAT (1)	PIP (1)	90E (1)	FLW (173)	GX6 (1)
B3F6 (1)						

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-40	14 IN S-40	16 IN S-XS	18 IN S-40
20 IN S-40	24 IN S-40	26 IN 15.88MM				

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Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	26	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	26	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	26	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	26	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	

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Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16	26	IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830030000	
		8	24	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	26	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830030000	
		8	24	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	26	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	26	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830030000	
		12	24	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	26	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			
SOL	1	2	26	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			

Flanges

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Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	24	IN	Blind Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF, -, -, -,	FGBL25C5C402L50000	
BLF	1	26	26	IN	Blind Flange, ASME B16.47 Series B, ASTM A105N, 300 Lbs, RF, -, -, -,	FGBL24C5C402L50000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FLG	1	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FLG	1	26	26	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L50000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	24	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
FX6	781	26	26	IN	Weldneck Flange, ASME B16.47 Series B, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN24C5C406L80000	
ORI	1	2	24	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BUT	1	26	26	IN	Butterfly Valve Flanged Ends, Long Pattern, API 609 Cat.B, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.47 Series B, -, Eccentric Disc - Triple Offset Type, 13Cr Disc, 13Cr Shaft, -, Packing: Graphite, -, -, Seats: Hardfaced, SPW AISI 304/Graphite, Fire Safe as per Std from JSS or Datasheet, GO, -, -, -, -,	VYAB23C4000AL56W041900	
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	24	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL5020900	
CHE	1	26	26	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.47 Series B, -, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL5021T00	

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Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE1	1	2	24	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL50K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L50C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L50C050F00	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGE24C5C4L0L909050B00	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4000AL501050300	
GAT	1	10	14	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -,	VGGI22C4000AL501040300	
GAT	1	16	24	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4000AL50104AV00	
GAT	1	26	26	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4000AL50104B000	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L90D050500	

S50TR02 - (r2967)

Specification	B12A	Carbon Steel-300#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2C4000AL507050400	
GLO	1	10	12	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -,	VLGIN2C4000AL507040400	
PLUG	1	8	8	IN	Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPSB20C4000AL539044500	
PLUG	1	10	24	IN	Plug Valve Flanged Ends, Venturi Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPVB20C4000AL539044500	
PLUG	1	26	26	IN	Plug Valve Flanged Ends, Venturi Pattern, Tapered Plug, Lubricated, API 6D, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.47 Series B, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 304/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -, -,	VPVB24C4000AL539045900	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMF820C6OI01L50100	
PADL	1	10	24	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMFR20C6OI01L50100	
PADL	1	26	26	IN	Paddle Blind & Spacer, Prj Std, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.47 Series B, -, 300 Lbs, -, -, -, -,	MMFRP0C6OI01L50300	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L50A010103	
TST	1	16	24	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5C830L50A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

S50TR02 - (r2967)

Specification		B12A		Carbon Steel-300#-Raised Face-CA=3mm		

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GAS	1	26	26	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL500080H00	
GX6	1	.5	24	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX6	1	26	26	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.47 Series B, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090NL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6	14	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRRPP0C4023000	
		2	8	IN			
PAD	1	16	26	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRRPP0C40N3000	
		2	18	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B3F	1	.5	26	IN	bolt assembly 300 RF		
B3F2	1	.5	26	IN	bolt for PSV inlet assembly 300 RF		
B3F3	1	.5	24	IN	bolt for F8S assembly 300 RF		
B3F6	1	.5	24	IN	bolt ORIFICE 300 RF		
B6F	1	.5	26	IN	bolt assembly 600 RF		
REIN	1	6	26	IN	90° Branch to header with reinforcing pad		
		2	18	IN			

S50TR02 - (r2967)

Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Basic Material	Carbon steel + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	300 lbs	Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM	Branch Table	B19A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C

PWHT is required for all weld joints irrespective of thickness
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	52.03	52.03	52.03	47.81	46.05	44.64	42.54	40.07	38.67	37.26	35.51	28.83

Schedule / Thickness

Short Code (Opt.)	DBB (1)	B3F2 (1)	ERE (1)	NIP (1)	PADL (1)	CHE1 (1)	FLG (1)
	FLW (173)	PAD (1)	45E (1)	ESN (1)	FX6 (781)	ORI (1)	F8S (1)
	TST (1)	GAS (1)	GX6 (1)	GLO (1)	CPLR (1)	TEE (1)	REIN (1)
	B3F (1)	CHE (1)	PIP (1)	CAP (1)	CPL (1)	PLU (1)	BLF (1)
	YST (1)	DBB (2)	B3F6 (1)	90E (1)	CRE (1)	CSN (1)	NIP (731)
	CAP (541)	B3F3 (1)	B6F (1)	GAT (1)	TEER (1)	SOL (1)	
Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
	6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-XS	

S50TR02 - (-2967)

Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	16	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	16	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBE420C5CH30030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	16	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBE920C5CH30030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	16	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	

S50TR02 - (r2967)

Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16	16	IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBRC20C5CH30030000	
		8	14	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, - ,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	16	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBRE20C5CH30030000	
		8	14	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	16	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBTE20C5CH30030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	16	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT, BW Ends, -, -,	DBTR20C5CH30030000	
		12	14	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	16	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			
SOL	1	2	16	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			

Flanges

S50TR02 - (r2967)

Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	16	IN	Blind Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF, -, -, -,	FGBL25C5C402L50000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FLG	1	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	16	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCLD23C5C4L0L9280200	
CHE	1	2	16	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4040AL5180900	
CHE1	1	2	16	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0C4040AL5020B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L50D050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L50D050F00	

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* Added or modified

Specification		B19A		Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm		

Valves

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGE24C5C4L0L90H050B00	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4040AL504050300	
GAT	1	10	14	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4040AL504040300	
GAT	1	16	16	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, -,	VGGI22C4040AL50404AV00	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C4L0L909050500	
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4040AL504050400	
GLO	1	10	12	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4040AL504040400	

Miscellaneous Items

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMF820C6OI01L50100	

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Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PADL	1	10	16	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMFR20C6OI01L50100	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L50A010103	
TST	1	16	16	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + PWHT, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5CH30L50A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.5	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	8	14	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRRPP0C4023000	
		2	8	IN			
PAD	1	16	16	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRRPP0C40N3000	
		2	10	IN			

Assemblies

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Specification	B19A	Carbon Steel+PWHT-300#-Raised Face-CA=1.5mm

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B3F	1	.5	16	IN	bolt assembly 300 RF		
B3F2	1	.5	16	IN	bolt for PSV inlet assembly 300 RF		
B3F3	1	.5	16	IN	bolt for F8S assembly 300 RF		
B3F6	1	.5	16	IN	bolt ORIFICE 300 RF		
B6F	1	.5	16	IN	bolt assembly 600 RF		
REIN	1	8	14	IN	90° Branch to header with reinforcing pad		
		2	8	IN			
REIN	1	16	16	IN	90° Branch to header with reinforcing pad		
		2	10	IN			

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Detailed Piping Class

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	300 lbs	Standard Test	ASME B31.3
Corrosion Allowance	1.5 MM	Branch Table	B1A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	52.03	52.03	52.03	47.81	46.05	44.64	42.54	40.07	38.67	37.26	35.51	28.83

Schedule / Thickness

Short Code (Opt.)							
REIN (1)	CAP (541)	90E (1)	CRE (1)	ERE (1)	FX6 (781)	GAS (1)
GX6 (1)	CHE1 (1)	GAT (1)	PAD (1)	DBB (1)	DBB (2)	CPL (1)
ESN (1)	BLF (1)	PADL (1)	NIP (1)	PLU (1)	FLG (1)	B3F2 (1)
TEE (1)	SOL (1)	FLW (173)	B3F6 (1)	CSN (1)	TEER (1)	TST (1)
YST (1)	CHE (1)	45E (1)	NIP (731)	B3F (1)	PLUG (1)	PIP (1)
CAP (1)	CPLR (1)	ORI (1)	F8S (1)	B3F3 (1)	B6F (1)	GLO (1)

Diameter(s) / Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-STD	4 IN S-STD
6 IN S-STD	8 IN S-STD	10 IN S-STD	12 IN S-STD	14 IN S-STD	16 IN S-XS	

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* Added or modified

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	
PIP	1	16	16	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, -, -, -,	PPPP20C40N30030000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE420C5C4L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
45E	1	16	16	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFE920C5C4L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
90E	1	16	16	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	541	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, NPTF End, -, 3000 Lbs, -,	DFCP20C5C4R1LE0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, -,	DFCP20C5C4L0LE0000	
CAP	1	2	16	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCF20C5C4L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFCR20C5C4L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	

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Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16	16	IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830030000	
		8	14	IN			
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, - ,	DFSCI0C5C4300000	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
		2	12	IN			
ERE	1	16	16	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830030000	
		8	14	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTE20C5C4L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	
TEE	1	16	16	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830030000	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, -,	DFTR20C5C4L0LE0000	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	
		2	12	IN			
TEER	1	16	16	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830030000	
		12	14	IN			

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	16	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LE0000	
		1	1.5	IN			
SOL	1	2	16	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	
		.5	.75	IN			

Flanges

S50TR02 - (r2967)

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	16	IN	Blind Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF, -, -, -,	FGBL25C5C402L50000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L50000	
FLG	1	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L50000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C406L5050000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FX6	781	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
ORI	1	2	16	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L50900	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCLD23C5C4L0L92G0200	
CHE	1	2	16	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCDA20C4000AL5020900	
CHE1	1	2	16	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, -,	VCGAN0C4000AL50K0B00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C201L50C050F00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C203L50C050F00	

S50TR02 - (r2967)

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, - , Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGE24C5C4L0L909050B00	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGI22C4000AL501050300	
GAT	1	10	14	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -,	VGGI22C4000AL501040300	
GAT	1	16	16	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, -,	VGGI22C4000AL50104AV00	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGE21C5C4L0L90D050500	
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -,	VLGIN2C4000AL507050400	
GLO	1	10	12	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -,	VLGIN2C4000AL507040400	
PLUG	1	8	8	IN	Plug Valve Flanged Ends, Short Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPSB20C4000AL539044500	
PLUG	1	10	16	IN	Plug Valve Flanged Ends, Venturi Pattern, Tapered Plug, Lubricated, API 599, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, Seats: Integral Metal Seats, 13Cr Plug, 13Cr Stem, -, GO, -, -, -, -, -,	VPVB20C4000AL539044500	

Miscellaneous Items

S50TR02 - (r2967)

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMF820C6OI01L50100	
PADL	1	10	16	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMFR20C6OI01L50100	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Seamless body	MMSDMMC5C830L50A010103	
TST	1	16	16	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5C830L50A010104	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.5	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	8	14	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRRPP0C4023000	
		2	8	IN			
PAD	1	16	16	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, -,	BRRPP0C40N3000	
		2	10	IN			

Assemblies

S50TR02 - (r2967)

Specification	B1A	Carbon Steel-300#-Raised Face-CA=1.5mm

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
B3F	1	.5	16	IN	bolt assembly 300 RF		
B3F2	1	.5	16	IN	bolt for PSV inlet assembly 300 RF		
B3F3	1	.5	16	IN	bolt for F8S assembly 300 RF		
B3F6	1	.5	16	IN	bolt ORIFICE 300 RF		
B6F	1	.5	16	IN	bolt assembly 600 RF		
REIN	1	8	14	IN	90° Branch to header with reinforcing pad		
		2	8	IN			
REIN	1	16	16	IN	90° Branch to header with reinforcing pad		
		2	10	IN			

S50TR02 - (2967)

Detailed Piping Class

Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service	
Basic Material	Carbon steel + NACE + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	300 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	B28A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for Sour service specific requirements

Refer to JSS corresponding to each component for HIC specific requirements

PWHT is required for all weld joints irrespective of thickness

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Requirements of HIC resistant steels shall apply to plate, products made from plate and welded pipe & fittings offered in place of seamless type.
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	52.03	52.03	47.81	46.05	44.64	42.54	40.07	38.67	37.26	35.51	28.83

Schedule / Thickness

Short Code (Opt.)	REIN (1)	NIP (1)	BOL (1)	GX6 (1)	TEER (1)	BLF (1)	PAD (1)
	CAP (1)	ORI (1)	F8S (1)	CSN (1)	ESN (1)	DBB (2)	90E (1)
	NIP (731)	PLU (1)	TEE (1)	YST (1)	GAT (1)	FX6 (781)	ERE (1)
	PIP (1)	DBB (1)	CHE1 (1)	GLO (1)	45E (1)	WOL (1)	FLG (1)
	CPLR (1)	CHE (1)	CPL (1)	FLW (173)	PADL (1)	CRE (1)	TST (1)
	GAS (1)						
Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN
Sch/Thk.	S-160	S-160	S-XS	S-XS	S-XS	S-STD	S-STD
	6 IN	8 IN	10 IN	12 IN	14 IN	16 IN	
	S-STD	S-STD	S-STD	S-40	S-40	S-XS	

S50TR02 - (2967)

Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -, -	PPPP20C403I0000000	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, BE, -, -, -	PPPP20C40330000000	
PIP	1	16	16	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A671 Gr. CC60 Cl.32 + Sour service + HIC Test, BE, S2, S3 supplementary requirements as per ASTM A 671 -, -,	PPPP20C41P30030001	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE420C5C3L0LG0000	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE420C5C3L0LE0000	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE420C5C730010000	
45E	1	16	16	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBE420C5D830030000	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFE920C5C3L0LG0000	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFE920C5C3L0LE0000	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE920C5C730010000	
90E	1	16	16	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBE920C5D830030000	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 6000 Lbs, -	DFCP20C5C3L0LG0000	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 3000 Lbs, -	DFCP20C5C3L0LE0000	
CAP	1	2	16	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBCP20C5C730010000	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCF20C5C3L0LG0000	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCF20C5C3L0LE0000	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFCR20C5C3L0LG0000	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFCR20C5C3L0LE0000	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRC20C5C730010000	

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Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CRE	1	16 8	16 14	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBRC20C5D830030000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSCI0C5C3300000	
ERE	1	3 2	14 12	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRE20C5C730010000	
ERE	1	16 8	16 14	IN IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBRE20C5D830030000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSEI0C5C3300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -	DFNP20C403I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE/NPTM End, -, -	DFNP20C403I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N + Sour Service, NPTM End, -, -	DFPL20C5C3R2020000	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFTE20C5C3L0LG0000	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFTE20C5C3L0LE0000	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTE20C5C730010000	
TEE	1	16	16	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBTE20C5D830030000	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 6000 Lbs, -	DFTR20C5C3L0LG0000	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 3000 Lbs, -	DFTR20C5C3L0LE0000	
TEER	1	3 2	14 12	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTR20C5C730010000	
TEER	1	16 12	16 14	IN IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, BW Ends, -, -	DBTR20C5D830030000	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 .5	16 1.5	IN IN	Weldolet, MSS SP-97, ASTM A105N + PWHT + Sour Service, BW Ends, as per ASME B16.25, -	LTLWI0C5DA300100	

Flanges

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Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	16	IN	Blind Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF, -, -, -,	FGBL25C5C302L50000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L50000	
FLG	1	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L50000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N + Sour Service, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C306L5050000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L80000	
FX6	781	2	16	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L80000	
ORI	1	2	16	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7M/A194 Gr.2HM, -, ASME B16.36, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs ASTM A105N + Sour Service, -, -,	FFF120C5C306L53E00	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N + Sour Service, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCLD23C5C3L0L9283800	
CHE	1	2	16	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCDA20C4030AL55C0900	
CHE1	1	2	16	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, -,	VCGAN0C4030AL5021E00	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C301L502050I00	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGDEB5C5C303L502050I00	

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Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -,	VGGE24C5C3L0L90H050R00	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, -,	VGGI22C4030AL504050R00	
GAT	1	10	16	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, -,	VGGI22C4030AL504040R00	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGE21C5C3L0L909050K00	
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, -,	VLGIN2C4030AL504050J00	
GLO	1	10	16	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, -,	VLGIN2C4030AL504040J00	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMF820C6OG01L50100	
PADL	1	10	16	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, -,	MMFR20C6OG01L50100	
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + Sour Service, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C730L50A010D00	

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Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
TST	1	16	16	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + PWHT + Sour Service + HIC Test, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, Welded body	MMSDMMC5D830L50A010D04	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N + Sour Service, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -,	MMSJMMC5C3X0L90A011W00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	16	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.125	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7M/A194 Gr.2HM, -, -,	BTS222A007010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6	14	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B + Sour Service, BE, IBR	BRRPP0C4033002	
		2	8	IN			
PAD	1	16	16	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A671 Gr. CC60 Cl.32 + Sour service + HIC Test, BE, -,	BRRPP0C41P3000	
		2	10	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	6	14	IN	90° Branch to header with reinforcing pad		
		2	8	IN			

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Specification	B28A	Carbon Steel-300#-Raised Face-CA=3mm-Sour Service

Assemblies

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	16	16	IN	90° Branch to header with reinforcing pad		
		2	10	IN			

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* Added or modified

Detailed Piping Class

Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR	
Basic Material	Carbon steel	Standard Pipe	ASME B31.1 edition 2016
Rating	300 lbs	Standard Test	ASME B31.1
Corrosion Allowance	1.5 MM	Branch Table	B2A
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for IBR specific requirements

Wall Thickness have been verified for Full Vacuum @305 Deg. C

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	150	350
Pressure	KG/CM2G	40	18

Schedule / Thickness

Short Code (Opt.)	REIN (1)	PAD (1)	TEER (1)	PIP (1)	DBB (1)	TEE (1)	FLW (173)
	YST (1)	CAP (1)	GAS (1)	CHE (1)	BLF (1)	GAT (1)	45E (1)
	90E (1)	CPLR (1)	CSN (1)	FX6 (781)	F8S (1)	BOL (1)	CHE1 (1)
	CPL (1)	ESN (1)	NIP (731)	PADL (1)	FLG (1)	STR (1)	TST (1)
	SOL (1)	CRE (1)	NIP (1)	GX6 (1)	DBB (2)	ORI (1)	GLO (1)
	ERE (1)						

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN	4 IN
Sch/Thk.	S-160	S-160	S-XS	S-XS	S-XS	S-STD	S-STD
	6 IN	8 IN	10 IN				
	S-STD	S-STD	S-STD				

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* Added or modified

Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	10	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE420C5C4L0LE0002	
45E	1	2	10	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE920C5C4L0LE0002	
90E	1	2	10	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, IBR	DFCP20C5C4L0LE0002	
CAP	1	2	10	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCF20C5C4L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCR20C5C4L0LE0002	
CRE	1	3 2	10 8	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
ERE	1	3 2	10 8	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	

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* Added or modified

Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTE20C5C4L0LE0002	
TEE	1	2	10	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTR20C5C4L0LE0002	
TEER	1	3 2	10 8	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	10 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LE0002	
SOL	1	2 .5	10 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	10	IN	Blind Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF, -, -, IBR	FGBL25C5C402L50002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L50002	
FLG	1	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L50002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, IBR	FGWL25C5C406L5050002	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FX6	781	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	
ORI	1	2	10	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L50902	

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Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	10	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL5100904	
CHE1	1	2	6	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL50T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L50B050F04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L50B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	
GAT	1	2	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL502050304	
GAT	1	10	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL502040304	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	

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Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GLO	1	2	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL508050404	
GLO	1	10	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL508040404	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, IBR	MMF820C6OI01L50102	
PADL	1	10	10	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, IBR	MMFR20C6OI01L50102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 300 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L550070207	01
TST	1	2	10	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMC5C830L50A010102	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

S50TR02 - (r2967)

Specification	B2A	Carbon Steel-300#-Raised Face-CA=1.5mm-IBR

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6	10	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, IBR	BRRPP0C4023002	
		2	4	IN			

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	6	10	IN	90° Branch to header with reinforcing pad		
		2	4	IN			

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Detailed Piping Class

Specification	B31A	Carbon Steel-300#-Raised Face-CA=3mm-IBR	
Basic Material	Carbon steel	Standard Pipe	ASME B31.1 edition 2016
Rating	300 lbs	Standard Test	ASME B31.1
Corrosion Allowance	3 MM	Branch Table	B31A
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for IBR specific requirements

Wall Thickness have been verified for Full Vacuum @194 Deg. C

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	150	225
Pressure	KG/CM2G	40	18

Schedule / Thickness

Short Code (Opt.)							
	GAT (1)	CPL (1)	CRE (1)	F8S (1)	PIP (1)	DBB (1)	CAP (1)
	ORI (1)	TST (1)	GLO (1)	45E (1)	90E (1)	ERE (1)	TEE (1)
	FLG (1)	FX6 (781)	GX6 (1)	DBB (2)	CHE1 (1)	BLF (1)	FLW (173)
	BOL (1)	CHE (1)	NIP (1)	YST (1)	ESN (1)	NIP (731)	SOL (1)
	GAS (1)	CPLR (1)	CSN (1)	TEER (1)	STR (1)		

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN
Sch/Thk.	S-160	S-160	S-XS	S-XS	S-XS	S-XS

S50TR02 - (2967)

* Added or modified

Specification	B31A	Carbon Steel-300#-Raised Face-CA=3mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	3	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE420C5C4L0LE0002	
45E	1	2	3	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE920C5C4L0LE0002	
90E	1	2	3	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, IBR	DFCP20C5C4L0LE0002	
CAP	1	2	3	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCF20C5C4L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCR20C5C4L0LE0002	
CRE	1	3 2	3 2	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
ERE	1	3 2	3 2	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	

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Specification	B31A	Carbon Steel-300#-Raised Face-CA=3mm-IBR

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTE20C5C4L0LE0002	
TEE	1	2	3	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTR20C5C4L0LE0002	
TEER	1	3 2	3 2	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	3 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LE0002	
SOL	1	2 .5	3 .75	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	3	IN	Blind Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF, -, -, IBR	FGBL25C5C402L50002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L50002	
FLG	1	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 300 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L50002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 300 Lbs, -, IBR	FGWL25C5C406L5050002	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FX6	781	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	
ORI	1	2	3	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L50902	

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Specification	B31A	Carbon Steel-300#-Raised Face-CA=3mm-IBR

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	3	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL5100904	
CHE1	1	2	3	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL50T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L50B050F04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L50B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	
GAT	1	2	3	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL502050304	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	
GLO	1	2	3	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL508050404	

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Specification	B31A	Carbon Steel-300#-Raised Face-CA=3mm-IBR

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	3	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, IBR	MMF820C6OI01L50102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 300 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L550070207	01
TST	1	2	3	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMC5C830L50A010102	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	3	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	3	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

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Detailed Piping Class

Specification	B49A	Carbon Steel-300#-Raised Face-CA=6mm-Sour Service	
Basic Material	Carbon steel + NACE + PWHT	Standard Pipe	ASME B31.3 edition 2016
Rating	300 lbs	Standard Test	ASME B31.3
Corrosion Allowance	6 MM	Branch Table	B49A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for Sour service specific requirements

Refer to JSS corresponding to each component for HIC specific requirements

PWHT is required for all weld joints irrespective of thickness

Wall Thickness have been verified for Full Vacuum @175 Deg. C
Requirements of HIC resistant steels shall apply to plate, products made from plate and welded pipe & fittings offered in place of seamless type.
Valves in this piping class shall meet the minimum design requirements for hydrocarbon services as mentioned in JSS.

Temperature	DEG C	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	52.03	52.03	47.81	46.05	44.64	42.54	40.07	38.67	37.26	35.51	28.83

Schedule / Thickness

Short Code (Opt.)							
CHE (1)	CHE1 (1)	CAP (1)	NIP (1)	BLF (1)	CSN (1)	ERE (1)
ESN (1)	NIP (731)	PLU (1)	DBB (2)	PIP (1)	45E (1)	YST (1)
GAS (1)	GAT (1)	TEER (1)	FX6 (781)	FLW (173)	GX6 (1)	GLO (1)
WOL (1)	DBB (1)	TEE (1)	TST (1)	90E (1)	CRE (1)	BOL (1)
CPL (1)	CPLR (1)	FLG (1)	ORI (1)	F8S (1)		

Diameter(s)	.5 IN	.75 IN	1 IN	1.5 IN	2 IN	3 IN
Sch/Thk.	S-XXS	S-XXS	S-XXS	S-XXS	S-160	S-160

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Specification	B49A	Carbon Steel-300#-Raised Face-CA=6mm-Sour Service

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -, -	PPPP20C403I0000000	
PIP	1	2	3	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B + Sour Service, BE, -, -, -	PPPP20C40330000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFE420C5C3L0LH0000	
45E	1	2	3	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE420C5C730010000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFE920C5C3L0LH0000	
90E	1	2	3	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBE920C5C730010000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N + Sour Service, SW End, -, 9000 Lbs, -	DFCP20C5C3L0LH0000	
CAP	1	2	3	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBCP20C5C730010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFCF20C5C3L0LH0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFCR20C5C3L0LH0000	
CRE	1	3 2	3 2	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRC20C5C730010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSCI0C5C3300000	
ERE	1	3 2	3 2	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBRE20C5C730010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N + Sour Service, BE/PE, -, -	DFSEI0C5C3300000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE, -, -	DFNP20C403I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B + Sour Service, PE/NPTM End, -, -	DFNP20C403I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N + Sour Service, NPTM End, -, -	DFPL20C5C3R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFTE20C5C3L0LH0000	
TEE	1	2	3	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -	DBTE20C5C730010000	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N + Sour Service, SW Ends, -, 9000 Lbs, -	DFTR20C5C3L0LH0000	

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* Added or modified

Specification	B49A	Carbon Steel-300#-Raised Face-CA=6mm-Sour Service

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
TEER	1	3 2	3 2	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB + Sour Service, BW Ends, -, -,	DBTR20C5C730010000	

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 .5	3 1.5	IN IN	Weldolet, MSS SP-97, ASTM A105N + PWHT + Sour Service, BW Ends, as per ASME B16.25, -,	LTLWI0C5DA300100	

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	3	IN	Blind Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF, -, -, -,	FGBL25C5C302L50000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L50000	
FLG	1	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L50000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N + Sour Service, RF/BW End, -, 300 Lbs, -, -,	FGWL25C5C306L5050000	
FX6	781	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C307L80000	
FX6	781	2	3	IN	Weldneck Flange, ASME B16.5, ASTM A105N + Sour Service, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C306L80000	
ORI	1	2	3	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7M/A194 Gr.2HM, -, ASME B16.36, ASTM A105N + Sour Service, 300 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs ASTM A105N + Sour Service, -, -,	FFF120C5C306L53E00	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N + Sour Service, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCLD23C5C3L0L9283808	

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* Added or modified

Specification	B49A	Carbon Steel-300#-Raised Face-CA=6mm-Sour Service

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	2	3	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCDA20C4030AL55C0908	
CHE1	1	2	3	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 12, -, -, -, -, -, C.A. = 6 mm	VCGAN0C4030AL5021E08	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C301L502050I08	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, -, ASTM A105N + Sour Service, 300 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316L/Graphite, Packing: Graphite, -, ASTM A182 Gr.F316 Hardfaced Trim, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGDEB5C5C303L502050I08	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGGE24C5C3L0L90H050R08	
GAT	1	2	3	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VGGI22C4030AL504050R08	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N + Sour Service, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VLGE21C5C3L0L909050K08	
GLO	1	2	3	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB + PWHT + Sour Service, 300 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 12, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, C.A. = 6 mm	VLGIN2C4030AL504050J08	

Miscellaneous Items

Short Code

S50TR02 - (r2967)

Specification	B49A	Carbon Steel-300#-Raised Face-CA=6mm-Sour Service

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	3	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70 + Sour Service + HIC Test, Between RF Flanges, as per ASME B16.5, -, 300 Lbs, -, -, -, C.A. = 6 mm	MMF820C6OG01L50108	
TST	1	2	3	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB + Sour Service, 300 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSDMMC5C730L50A010D08	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N + Sour Service, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7M/A194 Gr.2HM, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, C.A. = 6 mm	MMSJMMC5C3X0L90A011W08	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	3	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 300 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL500080H00	
GX6	1	.5	3	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	1.875	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7M/A194 Gr.2HM, -, -,	BTS222A007010000	

S50TR02 - (r2967)

Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR		
Basic Material	Carbon steel		Standard Pipe	ASME B31.1 edition 2016
Rating	600 lbs		Standard Test	ASME B31.1
Corrosion Allowance	1.5 MM		Branch Table	D2A
Facing	RF		Branch Design	ASME B31.1
Fluid Category	NORMAL		Control Level	-
Ped Fl Phase	LIQUID or GAS		Process PWHT	NO
Ped Fluid Group	-		Code PWHT	NO
Ped Fluid Category	-		Welding Spec.	-
			Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @425 Deg. C

Refer to JSS corresponding to each component for IBR specific requirements

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	150	287	427
Pressure	KG/CM2G	79	52	46

Schedule / Thickness

Short Code (Opt.)							
	CAP (1)	BOL (1)	PAD (1)	CHE1 (1)	CPL (1)	CPLR (1)	BLF (1)
	CHE (1)	CSN (1)	NIP (731)	45E (1)	CRE (1)	ORI (1)	F8S (1)
	YST (1)	DBB (1)	GAT (1)	90E (1)	ERE (1)	ESN (1)	NIP (1)
	SOL (1)	GLO (1)	PIP (1)	TEER (1)	FLG (1)	PADL (1)	STR (1)
	TEE (1)	FLW (173)	REIN (1)	DBB (2)	TST (1)	GAS (1)	

Diameter(s) Sch/Thk.							
	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-XS	4 IN S-XS
	6 IN S-XS	8 IN S-XS	10 IN CALC	12 IN CALC	14 IN CALC	16 IN CALC	18 IN CALC

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Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	14	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	
PIP	1	16	18	IN	EFW + 100% RT, Pipes, ASME B36.10, ASTM A672 Gr.B60 Cl.32, BE, IBR -, -,	PPPP20C40N30030002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE420C5C4L0LE0002	
45E	1	2	14	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
45E	1	16	18	IN	45 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830030002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFE920C5C4L0LE0002	
90E	1	2	14	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
90E	1	16	18	IN	90 Degree elbow Long Radius (R=1.5D), Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830030002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 3000 Lbs, IBR	DFCP20C5C4L0LE0002	
CAP	1	2	18	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCF20C5C4L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFCR20C5C4L0LE0002	
CRE	1	3 2	14 12	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CRE	1	16 8	18 16	IN IN	Concentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830030002	

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Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CSN	1	2	3	IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
		.75	1.5	IN			
ERE	1	3	14	IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
		2	12	IN			
ERE	1	16	18	IN	Eccentric reducer, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830030002	
		8	16	IN			
ESN	1	2	3	IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
		.75	1.5	IN			
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTE20C5C4L0LE0002	
TEE	1	2	14	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEE	1	16	18	IN	Equal tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830030002	
TEER	1	.75	.75	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
		.5	.5	IN			
TEER	1	1	1.5	IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 3000 Lbs, IBR	DFTR20C5C4L0LE0002	
		.5	1	IN			
TEER	1	3	14	IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	
		2	12	IN			
TEER	1	16	18	IN	Reducing tee, Welded + 100% RT, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830030002	
		12	16	IN			

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	18	IN	Sockolet, MSS SP-97, ASTM A105N, 3000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LE0002	
		1	1.5	IN			
SOL	1	2	18	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	
		.5	.75	IN			

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	18	IN	Blind Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF, -, -, IBR	FGBL25C5C402L80002	

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* Added or modified

Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR

Flanges

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FLG	1	2	18	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 600 Lbs, -, IBR	FGWL25C5C406L8050002	
ORI	1	2	18	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 600 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L80902	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	18	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL8100904	
CHE1	1	2	18	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL80T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L80B050F04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L80B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	

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Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	2	4	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL802050304	
GAT	1	6	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, IBR+Full vacuum service	VGGI22C4000AL80205AV04	
GAT	1	8	18	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, IBR+Full vacuum service	VGGI22C4000AL80204AV04	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL808050404	
GLO	1	8	12	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL808040404	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMF820C6OI01L80102	
PADL	1	10	18	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMFR20C6OI01L80102	

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Specification		D2A			Carbon Steel-600#-Raised Face-CA=1.5mm-IBR		
Miscellaneous Items							
		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 600 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L850070207	01
TST	1	2	14	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR, Seamless body	MMSDMMC5C830L80A010105	
TST	1	16	18	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR, Welded body	MMSDMMC5C830L80A010106	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	
Gaskets							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	18	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
Bolts							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	
Branches							
		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6	14	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, IBR	BRRPP0C4023002	
		2	8	IN			
PAD	1	16	18	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A672 Gr.B60 Cl.32, BE, IBR	BRRPP0C40N3002	
		2	12	IN			
Assemblies							

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Specification	D2A	Carbon Steel-600#-Raised Face-CA=1.5mm-IBR

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	6	14	IN	90° Branch to header with reinforcing pad		
		2	8	IN			
REIN	1	16	18	IN	90° Branch to header with reinforcing pad		
		2	12	IN			

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Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR	
Basic Material	Carbon steel	Standard Pipe	ASME B31.1 edition 2016
Rating	600 lbs	Standard Test	ASME B31.1
Corrosion Allowance	3 MM	Branch Table	D31A
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	LIQUID or GAS	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @280 Deg. C

Refer to JSS corresponding to each component for IBR specific requirements

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	150	280
Pressure	KG/CM2G	82	46

Schedule / Thickness

Short Code (Opt.)	TEE (1)	FLW (173)	CHE (1)	BOL (1)	PAD (1)	CHE1 (1)	45E (1)
	CAP (1)	CSN (1)	BLF (1)	STR (1)	GAS (1)	GAT (1)	CPLR (1)
	ERE (1)	YST (1)	DBB (1)	90E (1)	NIP (731)	TEER (1)	FLG (1)
	PADL (1)	TST (1)	SOL (1)	REIN (1)	CPL (1)	ESN (1)	NIP (1)
	F8S (1)	DBB (2)	GLO (1)	PIP (1)	CRE (1)	ORI (1)	
Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-160	1.5 IN S-160	2 IN S-160	3 IN S-160	4 IN S-120
	6 IN S-120	8 IN S-100	10 IN CALC				

S50TR02 - (-2967)

Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, IBR -, -,	PPPP20C402I0000002	
PIP	1	2	10	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, IBR -, -,	PPPP20C40230000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE420C5C4L0LG0002	
45E	1	2	10	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE420C5C830010002	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFE920C5C4L0LG0002	
90E	1	2	10	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBE920C5C830010002	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, IBR	DFCP20C5C4L0LG0002	
CAP	1	2	10	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBCP20C5C830010002	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCF20C5C4L0LG0002	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFCR20C5C4L0LG0002	
CRE	1	3 2	10 8	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRC20C5C830010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSCI0C5C4300002	
ERE	1	3 2	10 8	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBRE20C5C830010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, IBR	DFSEI0C5C4300002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, IBR	DFNP20C402I001040002	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, IBR	DFNP20C402I101040002	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTE20C5C4L0LG0002	
TEE	1	2	10	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTE20C5C830010002	
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, IBR	DFTR20C5C4L0LG0002	
TEER	1	3 2	10 8	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, IBR	DBTR20C5C830010002	

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Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2	10	IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, IBR	LTLSI0C5C4L0LG0002	
		.5	1.5	IN			

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	10	IN	Blind Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF, -, -, IBR	FGBL25C5C402L80002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, IBR	FGSW25C5C407L80002	
FLG	1	2	10	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, IBR	FGWN25C5C406L80002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 600 Lbs, -, IBR	FGWL25C5C406L8050002	
ORI	1	2	10	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 600 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, IBR -,	FFF120C5C406L80902	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23C5C4L0L92K0204	
CHE	1	2	10	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20C4000AL8100904	
CHE1	1	2	10	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0C4000AL80T0B04	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C201L80B050F04	

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Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, - , API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5C5C203L80B050F04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, - , Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24C5C4L0L90C050B04	
GAT	1	2	4	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22C4000AL802050304	
GAT	1	6	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, IBR+Full vacuum service	VGGI22C4000AL80205AV04	
GAT	1	8	10	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, IBR+Full vacuum service	VGGI22C4000AL80204AV04	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21C5C4L0L90E050504	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL808050404	
GLO	1	8	10	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2C4000AL808040404	

Miscellaneous Items

S50TR02 - (r2967)

Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMF820C6OI01L80102	
PADL	1	10	10	IN	Paddle Blind & Spacer, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMFR20C6OI01L80102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A105N, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 600 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMC5C402L850070207	01
TST	1	2	10	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMC5C830L80A010102	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMC5C4X0L90A011A02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	10	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6 2	10 4	IN IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, IBR	BRRPP0C4023002	

Assemblies

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Specification	D31A	Carbon Steel-600#-Raised Face-CA=3mm-IBR

Assemblies

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	6	10	IN	90° Branch to header with reinforcing pad		
		2	4	IN			

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Detailed Piping Class

Specification	D3A	Carbon Steel-600#-Raised Face-CA=3mm	
Basic Material	Carbon steel	Standard Pipe	ASME B31.3 edition 2016
Rating	600 lbs	Standard Test	ASME B31.3
Corrosion Allowance	3 MM	Branch Table	D3A
Facing	RF	Branch Design	ASME B31.3
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	-	Process PWHT	NO
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Wall Thickness have been verified for Full Vacuum @425 Deg. C

Temperature	DEG C	-29	0	38	93	149	204	260	316	343	371	399	427
Pressure	KG/CM2G	104.05	104.05	104.05	95.62	92.1	88.94	84.72	79.8	77.34	74.53	71.36	58

Schedule / Thickness

Short Code (Opt.)							
GX9J (1)	90E (1)	CSN (1)	ERE (1)	TEE (1)	PAD (1)	CAP (1)
NIP (731)	GAS (1)	45E (1)	NIP (1)	FXAJ (797)	FLW (173)	BOL (1)
GLO (1)	PLU (1)	FLG (1)	BLF (1)	YST (1)	GXAJ (1)	CPL (1)
CRE (1)	FX9J (789)	DBB (1)	GAT (1)	PIP (1)	REIN (1)	CHE1 (1)
ESN (1)	HCP (1)	TEER (1)	SOL (1)	F8S (1)	TST (1)	DBB (2)
CHE (1)	CPLR (1)	ORI (1)				

Diameter(s) Sch/Thk.						
.5 IN S-160	.75 IN S-160	1 IN S-160	1.5 IN S-160	2 IN S-160	3 IN S-XS	4 IN S-XS
6 IN S-XS	8 IN S-XS					

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* Added or modified

Specification	D3A	Carbon Steel-600#-Raised Face-CA=3mm

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, PE, -, -, -,	PPPP20C402I0000000	
PIP	1	2	8	IN	Seamless, Pipes, ASME B36.10, ASTM A106 Gr.B, BE, -, -, -,	PPPP20C40230000000	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE420C5C4L0LG0000	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE420C5C830010000	
90E	1	.5	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFE920C5C4L0LG0000	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBE920C5C830010000	
CAP	1	.5	1.5	IN	Cap, ASME B16.11, ASTM A105N, SW End, -, 6000 Lbs, -,	DFCP20C5C4L0LG0000	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBCP20C5C830010000	
CPL	1	.5	1.5	IN	Full coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCF20C5C4L0LG0000	
CPLR	1	.75 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFCR20C5C4L0LG0000	
CRE	1	3 2	8 6	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRC20C5C830010000	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSCI0C5C4300000	
ERE	1	3 2	8 6	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBRE20C5C830010000	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A105N, BE/PE, -, -,	DFSEI0C5C4300000	
HCP	1	.5	1.5	IN	Half Coupling, -, ASME B16.11, 6000 Lbs, ASTM A105N, SW End, -, -,	DFCH20C5C4L0LG000000	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE, -, -,	DFNP20C402I001040000	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A106 Gr.B, PE/NPTM End, -, -,	DFNP20C402I101040000	
PLU	1	.5	1.5	IN	Plug, Hexagonal Type, ASME B16.11, ASTM A105N, NPTM End, -, -,	DFPL20C5C4R2020000	
TEE	1	.5	1.5	IN	Equal tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTE20C5C4L0LG0000	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTE20C5C830010000	

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Specification		D3A			Carbon Steel-600#-Raised Face-CA=3mm		

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
TEER	1	.75 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A105N, SW Ends, -, 6000 Lbs, -,	DFTR20C5C4L0LG0000	
TEER	1	3 2	8 6	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WPB, BW Ends, -, -,	DBTR20C5C830010000	

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 .5	8 1.5	IN IN	Sockolet, MSS SP-97, ASTM A105N, 6000 Lbs, SW Ends, -, -,	LTLSI0C5C4L0LG0000	

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF, -, -, -,	FGBL25C5C402L80000	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/SW End, -, -, -,	FGSW25C5C407L80000	
FLG	1	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 600 Lbs, RF/BW End, -, -, -,	FGWN25C5C406L80000	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A105N, RF/BW End, -, 600 Lbs, -, -,	FGWL25C5C406L8050000	
FX9J	789	3	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 900 Lbs, RTJ Face/BW End, -, -, -,	FGWN25C5C409LA0000	
FXAJ	797	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A105N, 1500 Lbs, RTJ Face/SW End, -, -, -,	FGSW25C5C40ALB0000	
FXAJ	797	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A105N, 1500 Lbs, RTJ Face/BW End, -, -, -,	FGWN25C5C409LB0000	
ORI	1	2	8	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B7/A194 Gr.2H, -, ASME B16.36, ASTM A105N, 600 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A105N, -, -,	FFF120C5C406L80900	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes

S50TR02 - (r2967)

Specification	D3A	Carbon Steel-600#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A105N, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, Full vacuum service	VCLD23C5C4L0L92G0202	
CHE	1	2	8	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 8, -, -, -, -, -, Full vacuum service	VCDA20C4000AL84Y0902	
CHE1	1	2	8	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A216 Gr.WCB, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 8, -, -, -, -, -, Full vacuum service	VCGAN0C4000AL80K0B02	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Full vacuum service	VGDEB5C5C201L80C050F02	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A105, 600 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Full vacuum service	VGDEB5C5C203L80C050F02	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Full vacuum service	VGGE24C5C4L0L909050B02	
GAT	1	2	4	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, Full vacuum service	VGGI22C4000AL801050302	
GAT	1	6	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, Full vacuum service	VGGI22C4000AL80105AV02	

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Specification	D3A	Carbon Steel-600#-Raised Face-CA=3mm

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	8	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve - , -, -, Full vacuum service	VGGI22C4000AL80104AV02	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A105N, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, Full vacuum service	VLGE21C5C4L0L90D050502	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, Full vacuum service	VLGIN2C4000AL807050402	
GLO	1	8	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A216 Gr.WCB, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 8, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, Full vacuum service	VLGIN2C4000AL807040402	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A516N Gr.70, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, -,	MMF820C6OI01L80100	
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WPB, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSDMMC5C830L80A010100	
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A105N, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B7/A194 Gr.2H, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, -,	MMSJMMC5C4X0L90A011A00	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	

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Specification		D3A			Carbon Steel-600#-Raised Face-CA=3mm		

Gaskets

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
GX9J	1	3	8	IN	Ring joint Gasket, -, ASME B16.20, Soft Iron, RTJ Faces as per ASME B16.5, 900 Lbs, 90 BHN Max, -,	GKRJ21000O10LA000100	
GXAJ	1	.5	8	IN	Ring joint Gasket, -, ASME B16.20, Soft Iron, RTJ Faces as per ASME B16.5, 1500 Lbs, 90 BHN Max, -,	GKRJ21000O10LB000100	

Bolts

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B7/A194 Gr.2H, -, -,	BTS222A005010000	

Branches

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
PAD	1	6	8	IN	Reinforcing Pad 90 Degree, Prj Std, ASTM A106 Gr.B, BE, -,	BRRPP0C4023000	
		2	3	IN			

Assemblies

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
REIN	1	6	8	IN	90° Branch to header with reinforcing pad		
		2	3	IN			

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Detailed Piping Class

Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Basic Material	Alloy steel 1.25 Cr - 0.5 Mo	Standard Pipe	ASME B31.1 edition 2016
Rating	600 lbs	Standard Test	ASME B31.1
Corrosion Allowance	1.5 MM	Branch Table	D9D
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	-	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	NO
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Wall Thickness have been verified for Full Vacuum @435 Deg. C

Refer to JSS corresponding to each component for IBR specific requirements

PWHT is required for all weld joints irrespective of thickness

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	435
Pressure	KG/CM2G	52

Schedule / Thickness

Short Code (Opt.)	CRE (1)	HCP (1)	FLW (173)	F8S (1)	GAT (1)	90E (1)	SOL (1)
	GX9J (1)	GLO (1)	CHE1 (1)	CPL (1)	NIP (1)	STR (1)	DBB (2)
	PIP (1)	45E (1)	NIP (731)	TEE (1)	GAS (1)	GXAJ (1)	CSN (1)
	FLG (1)	FX9J (789)	FXAJ (797)	BLF (1)	YST (1)	BOL (1)	DBB (1)
	TEER (1)	CAP (1)	ESN (1)	TST (1)	CHE (1)	CPLR (1)	ERE (1)
	ORI (1)						

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-XS	4 IN S-XS
	6 IN S-XS	8 IN S-XS					

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* Added or modified

Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A335 Gr.P11, PE, IBR -, -,	PPPP20A400I0000002	
PIP	1	2	8	IN	Seamless, Pipes, ASME B36.10, ASTM A335 Gr.P11, BE, IBR -, -,	PPPP20A40030000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFE420A5C2L0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFE420A5C2L0LE0002	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBE420A5C830010002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFE920A5C2L0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFE920A5C2L0LE0002	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBE920A5C830010002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW End, -, 6000 Lbs, IBR	DFCP20A5C2L0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW End, -, 3000 Lbs, IBR	DFCP20A5C2L0LE0002	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBCP20A5C830010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFCF20A5C2L0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFCF20A5C2L0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFCR20A5C2L0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFCR20A5C2L0LE0002	
CRE	1	3 2	8 6	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBRC20A5C830010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A182 Gr.F11 Cl.2, BE/PE, -, IBR	DFSCI0A5C2300002	
ERE	1	3 2	8 6	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBRE20A5C830010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A182 Gr.F11 Cl.2, BE/PE, -, IBR	DFSEI0A5C2300002	
HCP	1	.5	.75	IN	Half Coupling, -, ASME B16.11, 6000 Lbs, ASTM A182 Gr.F11 Cl.2, SW End, -, IBR	DFCH20A5C2L0LG000002	

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* Added or modified

Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Fittings

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
HCP	1	1	1.5	IN	Half Coupling, -, ASME B16.11, 3000 Lbs, ASTM A182 Gr.F11 Cl.2, SW End, -, IBR	DFCH20A5C2L0LE000002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P11, PE, -, IBR	DFNP20A400I001040002	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P11, PE/NPTM End, -, IBR	DFNP20A400I101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFTE20A5C2L0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFTE20A5C2L0LE0002	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBTE20A5C830010002	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 6000 Lbs, IBR	DFTR20A5C2L0LG0002	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F11 Cl.2, SW Ends, -, 3000 Lbs, IBR	DFTR20A5C2L0LE0002	
TEER	1	3 2	8 6	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WP11 Cl.1, BW Ends, -, IBR	DBTR20A5C830010002	

Olets

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
SOL	1	2 1	8 1.5	IN IN	Sockolet, MSS SP-97, ASTM A182 Gr.F11 Cl.2, 3000 Lbs, SW Ends, -, IBR	LTLSI0A5C2L0LE0002	
SOL	1	2 .5	8 .75	IN IN	Sockolet, MSS SP-97, ASTM A182 Gr.F11 Cl.2, 6000 Lbs, SW Ends, -, IBR	LTLSI0A5C2L0LG0002	

Flanges

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF, -, -, IBR	FGBL25A5C202L80002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF/SW End, -, -, IBR	FGSW25A5C207L80002	
FLG	1	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF/BW End, -, -, IBR	FGWN25A5C206L80002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A182 Gr.F11 Cl.2, RF/BW End, -, 600 Lbs, -, IBR	FGWL25A5C206L8050002	
FX9J	789	3	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 900 Lbs, RTJ Face/BW End, -, -, IBR	FGWN25A5C209LA0002	
FXAJ	797	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 1500 Lbs, RTJ Face/SW End, -, -, IBR	FGSW25A5C20ALB0002	

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Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Flanges

		Diameter(s)					
	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
FXAJ	797	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F11 Cl.2, 1500 Lbs, RTJ Face/BW End, -, -, IBR	FGWN25A5C209LB0002	
ORI	1	2	8	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B16/A194 Gr.4, -, ASME B16.36, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF/BW End, -, 2 Holes per Flange, Hexagonal Head Plugs A182 Gr.F11 Cl.2, IBR -,	FFF120A5C206L80402	

Valves

		Diameter(s)					
Short Code	Opt	From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A182 Gr.F11 Cl.2, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23A5C2L0L92K0104	
CHE	1	2	8	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20A40B0AL85F0904	
CHE1	1	2	8	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0A40B0AL80T1004	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5A5C201L80B050J04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A182 Gr.F11 Cl.2, 600 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5A5C203L80B050J04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F11 Cl.2, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24A5C2L0L90C050504	

S50TR02 - (r2967)

Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	2	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22A40B0AL802050A04	
GAT	1	8	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VGGI22A40B0AL802040A04	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F11 Cl.2, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21A5C2L0L90E050304	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2A40B0AL808050304	
GLO	1	8	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A217 Gr. WC6 + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2A40B0AL808040304	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A387 Gr.11 Cl.2, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMF820A6O101L80102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A182 Gr.F11 Cl.2, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 600 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMA5C202L850070207	01
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WP11 Cl.1, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMA5C830L80A010I02	

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Specification	D9D	Alloy Steel 1.25Cr-600#-Raised Face-CA=1.5mm-IBR

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A182 Gr.F11 Cl.2, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMA5C2X0L90A011T02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX9J	1	3	8	IN	Ring joint Gasket, -, ASME B16.20, 1.25 Cr-0.5 Mo, RTJ Faces as per ASME B16.5, 900 Lbs, -, -,	GKRJ21001M10LA000000	
GXAJ	1	.5	2	IN	Ring joint Gasket, -, ASME B16.20, 1.25 Cr-0.5 Mo, RTJ Faces as per ASME B16.5, 1500 Lbs, -, -,	GKRJ21001M10LB000000	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B16/A194 Gr.4, -, -,	BTS222A001010000	

S50TR02 - (r2967)

Detailed Piping Class

Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR	
Basic Material	Alloy steel 9 Cr - 1 Mo	Standard Pipe	ASME B31.1 edition 2016
Rating	600 lbs	Standard Test	ASME B31.1
Corrosion Allowance	1.5 MM	Branch Table	D9L
Facing	RF	Branch Design	ASME B31.1
Fluid Category	NORMAL	Control Level	-
Ped Fl Phase	-	Process PWHT	YES
Ped Fluid Group	-	Code PWHT	YES
Ped Fluid Category	-	Welding Spec.	-
		Location	AG

Notes

Refer to JSS corresponding to each component for IBR specific requirements

PWHT is required for all weld joints irrespective of thickness

Valves to be tested for full vacuum in accordance with ASME Section V, Article.10 (HOOD METHOD)

Temperature	DEG C	438
Pressure	KG/CM2G	46

Schedule / Thickness

Short Code (Opt.)	DBB (1)	45E (1)	CHE (1)	F8S (1)	YST (1)	GXAJ (1)	CAP (1)
	NIP (731)	CRE (1)	ERE (1)	NIP (1)	FLG (1)	BLF (1)	BOL (1)
	DBB (2)	CPLR (1)	CPL (1)	CSN (1)	WOL (1)	FXAJ (797)	GAS (1)
	GLO (1)	PIP (1)	ESN (1)	TEER (1)	STR (1)	90E (1)	GAT (1)
	TEE (1)	FX9J (789)	FLW (173)	GX9J (1)	CHE1 (1)	HCP (1)	ORI (1)
	TST (1)						

Diameter(s) Sch/Thk.	.5 IN S-160	.75 IN S-160	1 IN S-XS	1.5 IN S-XS	2 IN S-XS	3 IN S-XS	4 IN S-XS
	6 IN S-XS	8 IN S-XS					

S50TR02 - (-2967)

* Added or modified

Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR

Pipes

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
PIP	1	.5	1.5	IN	Seamless, Pipes, ASME B36.10, ASTM A335 Gr.P91, PE, IBR -, -,	PPPP20A41GI0000002	
PIP	1	2	8	IN	Seamless, Pipes, ASME B36.10, ASTM A335 Gr.P91, BE, IBR -, -,	PPPP20A41G30000002	

Fittings

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
45E	1	.5	.75	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFE420A5CHL0LG0002	
45E	1	1	1.5	IN	45 Degree elbow, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFE420A5CHL0LE0002	
45E	1	2	8	IN	45 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBE420A5CJ30010002	
90E	1	.5	.75	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFE920A5CHL0LG0002	
90E	1	1	1.5	IN	90 Degree elbow, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFE920A5CHL0LE0002	
90E	1	2	8	IN	90 Degree elbow Long Radius (R=1.5D), Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBE920A5CJ30010002	
CAP	1	.5	.75	IN	Cap, ASME B16.11, ASTM A182 Gr.F91, SW End, -, 6000 Lbs, IBR	DFCP20A5CHL0LG0002	
CAP	1	1	1.5	IN	Cap, ASME B16.11, ASTM A182 Gr.F91, SW End, -, 3000 Lbs, IBR	DFCP20A5CHL0LE0002	
CAP	1	2	8	IN	Cap, Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBCP20A5CJ30010002	
CPL	1	.5	.75	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFCF20A5CHL0LG0002	
CPL	1	1	1.5	IN	Full coupling, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFCF20A5CHL0LE0002	
CPLR	1	.75 .5	.75 .5	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFCR20A5CHL0LG0002	
CPLR	1	1 .5	1.5 1	IN IN	Reducing coupling, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFCR20A5CHL0LE0002	
CRE	1	3 2	8 6	IN IN	Concentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBRC20A5CJ30010002	
CSN	1	2 .75	3 1.5	IN IN	Concentric swage, MSS SP-95, ASTM A182 Gr.F91, BE/PE, -, IBR	DFSCI0A5CH300002	
ERE	1	3 2	8 6	IN IN	Eccentric reducer, Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBRE20A5CJ30010002	
ESN	1	2 .75	3 1.5	IN IN	Eccentric swage, MSS SP-95, ASTM A182 Gr.F91, BE/PE, -, IBR	DFSEI0A5CH300002	
HCP	1	.5	.75	IN	Half Coupling, -, ASME B16.11, 6000 Lbs, ASTM A182 Gr.F91, SW End, -, IBR	DFCH20A5CHL0LG000002	

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Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR

Fittings

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
HCP	1	1	1.5	IN	Half Coupling, -, ASME B16.11, 3000 Lbs, ASTM A182 Gr.F91, SW End, -, IBR	DFCH20A5CHL0LE000002	
NIP	1	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P91, PE, -, IBR	DFNP20A41GI001040002	
NIP	731	.5	1.5	IN	Seamless, Nipple, L = 100mm, ASME B36.10, ASTM A335 Gr.P91, PE/NPTM End, -, IBR	DFNP20A41GI101040002	
TEE	1	.5	.75	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFTE20A5CHL0LG0002	
TEE	1	1	1.5	IN	Equal tee, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFTE20A5CHL0LE0002	
TEE	1	2	8	IN	Equal tee, Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBTE20A5CJ30010002	
TEER	1	.75 .5	.75 .5	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 6000 Lbs, IBR	DFTR20A5CHL0LG0002	
TEER	1	1 .5	1.5 1	IN IN	Reducing tee, ASME B16.11, ASTM A182 Gr.F91, SW Ends, -, 3000 Lbs, IBR	DFTR20A5CHL0LE0002	
TEER	1	3 2	8 6	IN IN	Reducing tee, Seamless, ASME B16.9, ASTM A234 Gr.WP91, BW Ends, -, IBR	DBTR20A5CJ30010002	

Olets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
WOL	1	2 .5	8 1.5	IN IN	Weldolet, MSS SP-97, ASTM A182 Gr.F91, BW Ends, as per ASME B16.25, IBR	LTLWI0A5CH300102	

Flanges

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BLF	1	.5	8	IN	Blind Flange, ASME B16.5, ASTM A182 Gr.F91, 600 Lbs, RF, -, -, IBR	FGBL25A5CH02L80002	
FLG	1	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F91, 600 Lbs, RF/SW End, -, -, IBR	FGSW25A5CH07L80002	
FLG	1	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F91, 600 Lbs, RF/BW End, -, -, IBR	FGWN25A5CH06L80002	
FLW	173	1.5	1.5	IN	Long weldneck Flange, L=200mm, ASME B16.5, ASTM A182 Gr.F91, RF/BW End, -, 600 Lbs, -, IBR	FGWL25A5CH06L8050002	
FX9J	789	3	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F91, 900 Lbs, RTJ Face/BW End, -, -, IBR	FGWN25A5CH09LA0002	
FXAJ	797	.5	1.5	IN	Socketweld Flange, ASME B16.5, ASTM A182 Gr.F91, 1500 Lbs, RTJ Face/SW End, -, -, IBR	FGSW25A5CH0ALB0002	
FXAJ	797	2	8	IN	Weldneck Flange, ASME B16.5, ASTM A182 Gr.F91, 1500 Lbs, RTJ Face/BW End, -, -, IBR	FGWN25A5CH09LB0002	

S50TR02 - (r2967)

Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR

Flanges

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
ORI	1	2	8	IN	Couple of Orifice weldneck Flange w/ 0.5" THD taps, With Jack & Bolt A193 Gr.B16/A194 Gr.4, -, ASME B16.36, ASTM A182 Gr.F91, 600 Lbs, RF/BW End, -, 4 Holes per Flange, Hexagonal Head Plugs A182 Gr.F91, IBR -,	FFF120A5CH06L84D02	

Valves

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
CHE	1	.5	1.5	IN	Lift Check Valve Female Ends, -, API 602, ASTM A182 Gr.F91, 800 Lbs, Installation: Horizontal or Vertical, SW Ends, Ends as per ASME B16.11, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Piston Type Obturator, -, Spring: UNS N07750, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCLD23A5CHL0L92K0104	
CHE	1	2	8	IN	Dual Plate Check Valve Flanged Ends, -, API 594, ASTM A217 Gr.C12A + PWHT, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, -, -, -, -, -, Spring: UNS N07750, Integral Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCDA20A40D0AL85F0904	
CHE1	1	2	8	IN	Swing Check Valve Flanged Ends, -, BS 1868, ASTM A217 Gr.C12A + PWHT, 600 Lbs, Installation: Horizontal or Vertical, RF, Ends as per ASME B16.5, -, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, -, Renewable Seats, Seats: -, API Trim No 5, -, -, -, -, -, IBR+Full vacuum service	VCGAN0A40D0AL80T1004	
DBB	1	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A182 Gr.F91, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5A5CH01L80B050J04	
DBB	2	.5	1.5	IN	Double Gate Block & Needle Bleed Valve Flanged Ends, -, API 602 where applicable, Seat Leakage as per API 598, ASTM A182 Gr.F91, 600 Lbs, RF/NPTF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316L/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGDEB5A5CH03L80B050J04	
GAT	1	.5	1.5	IN	Gate Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F91, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Solid Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGE24A5CHL0L90C050504	
GAT	1	2	4	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A217 Gr.C12A + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VGGI22A40D0AL802050A04	

S50TR02 - (r2967)

Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR

Valves

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAT	1	6	6	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A217 Gr.C12A + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, HO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, IBR+Full vacuum service	VGGI22A40D0AL80205AX04	
GAT	1	8	8	IN	Gate Valve Flanged Ends, -, API 600, Seat Leakage as per API 598, ASTM A217 Gr.C12A + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Flexible Wedge, -, Stem: OS & Y/RSNRO, -, GO, -, SW By-Pass 2 Points as per MSS SP-45 Series A w/ SW Globe Valve -, -, -, IBR+Full vacuum service	VGGI22A40D0AL80204AX04	
GLO	1	.5	1.5	IN	Globe Valve Female Ends, -, API 602, Seat Leakage as per API 598, ASTM A182 Gr.F91, 800 Lbs, SW Ends, Ends as per ASME B16.11, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGE21A5CHL0L90E050304	
GLO	1	2	6	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A217 Gr.C12A + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, HO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2A40D0AL808050304	
GLO	1	8	8	IN	Globe Valve Flanged Ends, -, BS 1873, Seat Leakage as per API 598, ASTM A217 Gr.C12A + PWHT, 600 Lbs, RF, Ends as per ASME B16.5, -, Bolted Bonnet, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, Packing: Graphite, -, API Trim No 5, Renewable Seats, Seats: -, Swivel Plug Disc, -, Stem: OS & Y/RSRO, -, GO, -, -, -, -, -, IBR+Full vacuum service	VLGIN2A40D0AL808040304	

Miscellaneous Items

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
F8S	1	.5	8	IN	Spectacle Blind Fig.8, ASME B16.48, ASTM A387 Gr.91 Cl.2, Between RF Flanges, as per ASME B16.5, -, 600 Lbs, -, -, -, IBR	MMF820A6O801L80102	
STR	1	.5	.75	IN	Thermodynamic w/ Integral Strainer, Steam Trap type Flanged Ends, Mnf Std, ASTM A182 Gr.F91, Internals: AISI 316, RF, as per ASME B16.5, -, Bolted Cover, -, -, -, 600 Lbs, AISI 316 Screen, -, -, Compact type Steam trap, (Thermodynamic Steam Trap with inbuilt Strainer, 2 Isolation valves, 1 Drain valve, 1 Test valve), IBR.	MMTAMMA5CH02L850070207	01
TST	1	2	8	IN	Strainer T type BW Ends, Mnf Std, ASTM A234 Gr.WP91, 600 Lbs, BW Ends, as per ASME B16.25, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSDMMA5CJ30L80A010I02	

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Specification	D9L	Alloy Steel 9 Cr-600#-Raised Face-CA=1.5mm, IBR

Miscellaneous Items

	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
YST	1	.5	1.5	IN	Strainer Y type Female Ends, Mnf Std, ASTM A182 Gr.F91, 800 Lbs, SW Ends, as per ASME B16.11, Bolted Cover, A193 Gr.B16/A194 Gr.4, -, SPW AISI 316/Graphite, AISI 316 Screen, Mesh: 20 µm, -, -, -, IBR	MMSJMMA5CHX0L90A011T02	

Gaskets

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
GAS	1	.5	8	IN	Spiral Wound Gasket , -, ASME B16.20, AISI 316/Graphite, RF as per ASME B16.5, 600 Lbs, Thk=4.5mm, Inner AISI 316/Outer CS, -,	GKSW21I0090OL800080H00	
GX9J	1	3	8	IN	Ring joint Gasket, -, ASME B16.20, 9 Cr-1 Mo, RTJ Faces as per ASME B16.5, 900 Lbs, -, -,	GKRJ21000310LA000000	
GXAJ	1	.5	2	IN	Ring joint Gasket, -, ASME B16.20, 9 Cr-1 Mo, RTJ Faces as per ASME B16.5, 1500 Lbs, -, -,	GKRJ21000310LB000000	

Bolts

Short Code	Opt	Diameter(s) From	To	UOM	Commodity Description	Commodity Code	Notes
BOL	1	.5	2.25	IN	Stud bolt with 2 heavy hexagonal nuts, Full Length Threaded, ASME B18.2.1/ASME B18.2.2, A193 Gr.B16/A194 Gr.4, -, -,	BTS222A001010000	

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Notes	
01	Type of steam trap to be validated and updated suitably by the contractor based on mass flow rate.

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APPENDIX C

BRANCH CHART

Note:

Branch Chart attached is preliminary and shall be validated and updated further suitably during detail engineering by CONTRACTOR.

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TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D

A1A_BR90
Legend and Chart

BRANCH SIZE

	38	36	34	32	30	28	26	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
38	DB/TE																						
36	DB/TR	DB/TE																					
34	DB/TR	DB/TR	DB/TE																				
32	AA/RP	DB/TR	DB/TR	DB/TE																			
30	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE																		
28	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE																	
26	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE																
24	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE															
20	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE														
18	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE													
16	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A1K_BR90
Legend and Chart

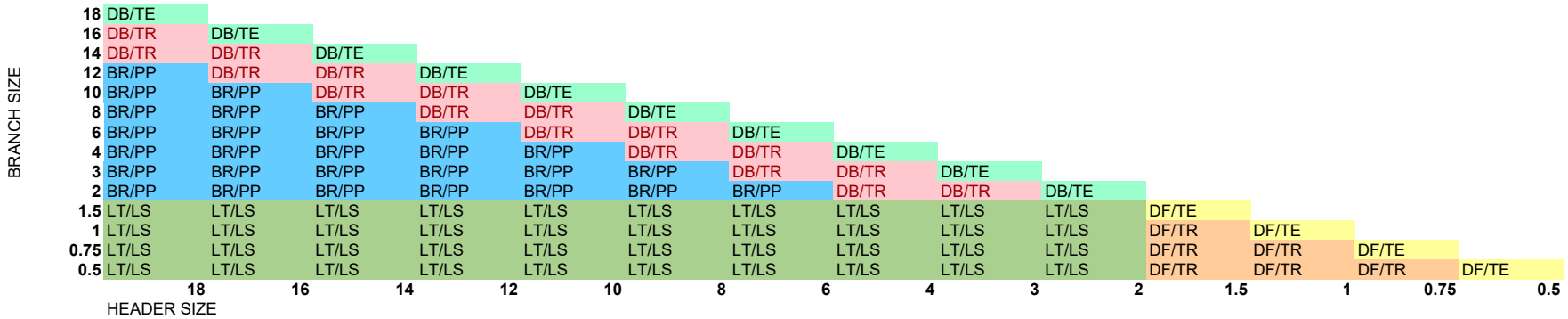
BRANCH SIZE

	2	1.5	1	0.75	0.5
2	DB/TE				
1.5	DB/TR	DF/TE			
1	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A2A_BR90
Legend and Chart



BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A3A_BR90
Legend and Chart

BRANCH SIZE	8	6	4	3	2	1.5	1	0.75	0.5
8	DB/TE								
6	DB/TR	DB/TE							
4	DB/TR	DB/TR	DB/TE						
3	BR/PP	DB/TR	DB/TR	DB/TE					
2	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

A8A_BR90
Legend and Chart

BRANCH SIZE

	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
24	DB/TE															
20	DB/TR	DB/TE														
18	DB/TR	DB/TR	DB/TE													
16	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	BR/PP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D

A12A_BR90
Legend and Chart

BRANCH SIZE

	36	34	32	30	28	26	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
36	DB/TE																					
34	DB/TR	DB/TE																				
32	DB/TR	DB/TR	DB/TE																			
30	AA/RP	DB/TR	DB/TR	DB/TE																		
28	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE																	
26	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE																
24	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE															
20	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE														
18	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE													
16	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A13A_BR90
Legend and Chart

BRANCH SIZE

	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
24	DB/TE															
20	DB/TR	DB/TE														
18	DB/TR	DB/TR	DB/TE													
16	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	BR/PP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

A15A_BR90
Legend and Chart

BRANCH SIZE

	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
16	DB/TE												
14	DB/TR	DB/TE											
12	DB/TR	DB/TR	DB/TE										
10	BR/PP	DB/TR	DB/TR	DB/TE									
8	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A17A_BR90
Legend and Chart

BRANCH SIZE

	8	6	4
8	DB/TE		
6	BR/PP	DB/TE	
4	BR/PP	BR/PP	DB/TE
3	BR/PP	BR/PP	BR/PP
2	BR/PP	BR/PP	BR/PP
1.5	BR/PP	BR/PP	BR/PP
1	BR/PP	BR/PP	BR/PP
0.75	BR/PP	BR/PP	BR/PP
0.5	BR/PP	BR/PP	BR/PP

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,

A21N_BR90
Legend and Chart

BRANCH SIZE

10	DB/TE					
1.5	LT/LS	DF/TE				
1	LT/LS	DF/TR	DF/TE			
0.75	LT/LS	DF/TR	DF/TR	DF/TE		
0.5	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE	
	10	**1.5**	**1**	**0.75**	**0.5**	

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A23A_BR90
Legend and Chart

BRANCH SIZE

	6	4	3	2	1.5	1	0.75	0.5
6	DB/TE							
4	DB/TR	DB/TE						
3	DB/TR	DB/TR	DB/TE					
2	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil		PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
		CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

A28A_BR90
Legend and Chart

BRANCH SIZE

	28	26	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
28	DB/TE																	
26	DB/TR	DB/TE																
24	DB/TR	DB/TR	DB/TE															
20	AA/RP	DB/TR	DB/TR	DB/TE														
18	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE													
16	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

A29A_BR90
Legend and Chart

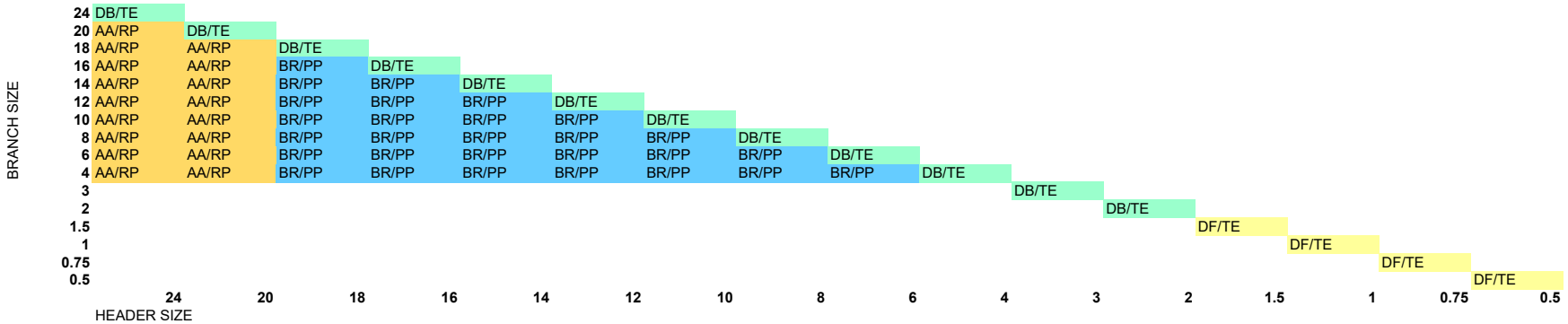
BRANCH SIZE

	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
24	DB/TE															
20	AA/RP	DB/TE														
18	AA/RP	AA/RP	DB/TE													
16	AA/RP	AA/RP	BR/PP	DB/TE												
14	AA/RP	AA/RP	BR/PP	BR/PP	DB/TE											
12	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	DB/TE										
10	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE									
8	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE								
6	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE							
4	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE						
3	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE					
2	AA/RP	AA/RP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	BR/PP	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A30A_BR90
Legend and Chart



AA/RP	Assembly,/Reinforced pipe,
BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DF/TE	Forged Fitting,/Eq Te,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D

A31A_BR90
Legend and Chart

BRANCH SIZE

	12	10	8	6	4	3	2	1.5	1	0.75	0.5
12	DB/TE										
10	DB/TR	DB/TE									
8	DB/TR	DB/TR	DB/TE								
6	BR/PP	DB/TR	DB/TR	DB/TE							
4	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE						
3	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	BR/PP	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A49A_BR90
Legend and Chart

BRANCH SIZE

	10	8	6	4	3	2	1.5	1	0.75	0.5
10	DB/TE									
8	DB/TR	DB/TE								
6	DB/TR	DB/TR	DB/TE							
4	BR/PP	DB/TR	DB/TR	DB/TE						
3	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE					
2	BR/PP	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

A52A_BR90
Legend and Chart

BRANCH SIZE

	4	3	2	1.5	1	0.75	0.5
4	DB/TE						
3	DB/TR	DB/TE					
2	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

A53G_BR90
Legend and Chart

BRANCH SIZE

	8	6	4	3	2	1.5	1	0.75	0.5
8	DB/TE								
6	DB/TR	DB/TE							
4	DB/TR	DB/TR	DB/TE						
3	BR/PP	DB/TR	DB/TR	DB/TE					
2	BR/PP	BR/PP	DB/TR	DB/TR	DB/TE				
1.5	LT/LT	LT/LT	LT/LT	LT/LT	LT/LT	DF/TE			
1	LT/LT	LT/LT	LT/LT	LT/LT	LT/LT	DF/TR	DF/TE		
0.75	LT/LT	LT/LT	LT/LT	LT/LT	LT/LT	DF/TR	DF/TR	DF/TE	
0.5	LT/LT	LT/LT	LT/LT	LT/LT	LT/LT	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/PP	Branch,/90° PiptoPip,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LT	Olet,/Threadolet,

A95A_BR90
Legend and Chart

BRANCH SIZE	36	1.5	1	0.75	0.5
36	DB/TE				
1.5	LT/LW	DF/TE			
1	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

B1A_BR90
Legend and Chart

BRANCH SIZE	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
16	DB/TE												
14	DB/TR	DB/TE											
12	DB/TR	DB/TR	DB/TE										
10	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

B2A_BR90
Legend and Chart

BRANCH SIZE	10	8	6	4	3	2	1.5	1	0.75	0.5
10	DB/TE									
8	DB/TR	DB/TE								
6	DB/TR	DB/TR	DB/TE							
4	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil		PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
		CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

B12A_BR90
Legend and Chart

BRANCH SIZE

	26	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
26	DB/TE																
24	DB/TR	DB/TE															
20	DB/TR	DB/TR	DB/TE														
18	AA/RP	DB/TR	DB/TR	DB/TE													
16	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

B19A_BR90
Legend and Chart

BRANCH SIZE

	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
16	DB/TE												
14	DB/TR	DB/TE											
12	DB/TR	DB/TR	DB/TE										
10	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery		
	CLIENT	INDIAN OIL CORPORATION LIMITED		
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D	

B28A_BR90
Legend and Chart

BRANCH SIZE

	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
16	DB/TE												
14	DB/TR	DB/TE											
12	DB/TR	DB/TR	DB/TE										
10	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

B31A_BR90
Legend and Chart

BRANCH SIZE

	3	2	1.5	1	0.75	0.5
3	DB/TE					
2	DF/TR	DB/TE				
1.5	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	DB/TR	DF/TE		
0.75	LT/LS	LT/LS	DB/TR	DB/TR	DF/TE	
0.5	LT/LS	LT/LS	DB/TR	DB/TR	DB/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

B49A_BR90
Legend and Chart

BRANCH SIZE	3	2	1.5	1	0.75	0.5
3	DB/TE					
2	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

D2A_BR90
Legend and Chart

BRANCH SIZE

	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
18	DB/TE													
16	DB/TR	DB/TE												
14	DB/TR	DB/TR	DB/TE											
12	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D

D3A_BR90
Legend and Chart

BRANCH SIZE

	24	20	18	16	14	12	10	8	6	4	3	2	1.5	1	0.75	0.5
24	DB/TE															
20	DB/TR	DB/TE														
18	DB/TR	DB/TR	DB/TE													
16	AA/RP	DB/TR	DB/TR	DB/TE												
14	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE											
12	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE										
10	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE									
8	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE								
6	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE							
4	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

D9D_BR90
Legend and Chart

BRANCH SIZE	8	6	4	3	2	1.5	1	0.75	0.5
8	DB/TE								
6	DB/TR	DB/TE							
4	DB/TR	DB/TR	DB/TE						
3	BR/RP	DB/TR	DB/TR	DB/TE					
2	BR/RP	BR/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

BR/RP	Branch,/90° RPad,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

D9L_BR90
Legend and Chart

BRANCH SIZE

	8	6	4	3	2	1.5	1	0.75	0.5
8	DB/TE								
6	DB/TR	DB/TE							
4	DB/TR	DB/TR	DB/TE						
3	LT/LW	DB/TR	DB/TR	DB/TE					
2	LT/LW	LT/LW	DB/TR	DB/TR	DB/TE				
1.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TE			
1	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TE		
0.75	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TE	
0.5	LT/LW	LT/LW	LT/LW	LT/LW	LT/LW	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LW	Olet,/Weldolet,

TechnipFMC / IndianOil	PROJECT	Standby SRU & Additional Tanks IOCL Paradip Refinery	
	CLIENT	INDIAN OIL CORPORATION LIMITED	
PIPING MATERIAL SPECIFICATION	**Project No.** 080557C001	**Document No.** 080557C-000-JSD-1300-002	**Rev No.** D

D31A_BR90
Legend and Chart

BRANCH SIZE	10	8	6	4	3	2	1.5	1	0.75	0.5
10	DB/TE									
8	DB/TR	DB/TE								
6	DB/TR	DB/TR	DB/TE							
4	AA/RP	DB/TR	DB/TR	DB/TE						
3	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE					
2	AA/RP	AA/RP	AA/RP	DB/TR	DB/TR	DB/TE				
1.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TE			
1	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TE		
0.75	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TE	
0.5	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	LT/LS	DF/TR	DF/TR	DF/TR	DF/TE

HEADER SIZE

AA/RP	Assembly,/Reinforced pipe,
DB/TE	Buttweld Fitting,/Eq Te,
DB/TR	Buttweld Fitting,/Red Te,
DF/TE	Forged Fitting,/Eq Te,
DF/TR	Forged Fitting,/Red Te,
LT/LS	Olet,/Sockolet,

SPECIFICATION FOR PAINTING

Page modified under this revision: Page number 11

			Written By	Checked By	Approved By	Authorized By
			Karthikeyan Chokkalingam 2020.06.11 15:54:15 +05'30'	Loganathan Sudarsan 2020.06.11 16:14:09 +05'30'	Vaidyasubramaniam V 2020.06.11 16:45:51 +05'30'	Moriachristopher Jesumarian 2020.06.12 00:39:00 +05'30'
C	11-JUNE-2020	ISSUED FOR DESIGN	CK	AS/SL	VV	JMC
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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 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India.

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
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
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related

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SRU	Sulphur Recovery Unit
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

This secification defines the requirements of surface preparation, selection and application of paints and primers for all piping, equipment and structures etc.

The specification is applicable for supply of all paints, coatings, primers and other ancillary items etc. Method of surface preparation, supply and application of paints and primers shall suit given environment, location and temperature. Items requiring painting, field application procedures, inspection and testing of painting shall be governed by this specification.

This specification is suitable for use in normal, corrosive and marine environment of various process, utility and other plants and offsite of refineries, petro-chemicals, onshore terminals and other chemical / industrial plants. Alternative paints / coatings would be specified if necessary for specific or more stringent requirements.

The painting specification covers every type of equipment such as tanks, vessels, drums, heat exchangers/ coolers, air fin coolers, pumps, turbines, compressors, filters, engines, motors, boilers or heaters /furnaces their accessories, fans, stacks / chimney and package units etc.

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The painting specification covers all types of process and utility piping services which can be non-insulated / insulated, jacketed or lined requiring painting. All types of pipe supports, hangers, spring boxes are also covered.

All types of structural steel members, platforms ladders, chequered plates, gratings, walkways, trolleys, monorails, davits, structural steel sheds and buildings are also covered under this painting specification.

The painting of equipment shall conform to equipment data sheets. Painting of piping shall conform to line schedule and piping isometrics etc.

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
MS	Mild Steel
GI.	Galvanized Iron / steel
ITP	Inspection Test Plan
TPI	Third Party Inspection
DFT	Dry Film Thickness
WFT	Wet Film Thickness
TSAC	Thermally Sprayed Aluminium Coating
Micr.	Micron

5. EXCLUSIONS

The following surfaces and materials shall not require painting in general. However, if there is any specific requirement by the owner, the same shall be painted as per the relevant specifications:

- Plastics and or plastic coated surfaces
- Non-ferrous materials like Aluminum, Cu-Ni alloy, Monel, Incoloy
- RCC or cement lined surfaces except those specified
- Gaskets / seals

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- Gauge Glasses
- Meter Faces
- Valve Stem and Threads
- Name Plates
- Insulation or Fireproofing
- Factory Finished Control Panels
- Factory Finished Instrument Cases and Meters

6. 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.

Code /Std. No	Description
IS: 5	Colours for ready mixed paints and enamels
IS: 101	Methods of test for ready mixed paints and enamels
IS: 2379	Indian Standard for Pipe line identification-colour code
ISO 209	Aluminium and aluminium alloys Chemical composition
ISO 8501-01	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness
ISO 8502-3 & 9	Preparation of steel substrates before application of paints and related products - Test for assessment of surface cleanliness : Field method for conductometric determination of water soluble salts
ISO12944	Corrosion Protection of steel Structures by Protective Paint System
ASTM E3	Metallographic Examinations
ASTM VOL 6.01 & 6.03	American standard test methods for Paints and Coatings.
ASTM B833	Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) for the Corrosion Protection of Steel , corrosion protection
ASTM C633	Test Method for Adhesive / Cohesive Strength of Flame Sprayed Coatings.

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ASTM D4285	Method for indicating Oil or Water in Compressed Air.
ASTM D4417	Test Method for Field Measurement of Surface Profile of Blasted Steel.
ASTM D4541	Test method for Pull-Off Strength of Coating using Portable Adhesion Testers.
ASTM D4940	Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives.
ASTM D6677	Standard Test Method for Evaluating Adhesion by Knife1
ANSI A13.1	Scheme for identification of piping systems: American National Standards Institution
ANSI/AWS C2.18	Guide for the Protection of Steel with Thermal Spray Coatings of Aluminium, Zinc and Their Alloys and Composites.
AWS C.2.17	Recommended Practice for Electric Arc Spray.
SSPC-SP	Steel Structures Painting Council
SSPC Publication	The inspection of coatings and linings: A Handbook of Basic practice for Inspectors, Owners, and Specifiers.
SSPC-AB 1	Mineral and Slag Abrasives.
SSPC-AB 3	Ferrous Metallic Abrasives.
SSPC-PA 1	Shop, Field, and Maintenance Painting of Steel.
SSPC-PA 2	Measurement of Dry Coating Thickness with Magnetic Gages.
NACE No. 1 / SSPC-SP 5	White Metal Blast Cleaning.
NACE No. 2 / SSPC-SP 10	Near -White Metal Blast Cleaning.
SSPC-VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
RAL DUTCH	International Standard for color shade (Dutch Standard)
SIS-05 59 00	Pictorial surface preparation standard for painting of steel surfaces
BS1475	Specification for Wrought Aluminium & Aluminium Alloys for General Engineering Purposes.
BS 2569	Specification for Sprayed Metal Coating.
BS 4232	British Standards (Surface Finish of Blast-cleaned Steel for Painting
NACE Std. RP 0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape.

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NACE No.12 / AWS C2.23 M / SSPC-CS 23.00	Specification for the application of thermal spray coatings (Metallizing) of aluminium, zinc, and their alloys and composites for the corrosion protection of steel.
NACE RP 198	The control of corrosion under Thermal Insulation and Fireproofing Materials

ISO 8501-1/ SIS-05 59 00: ISO standard for preparation of steel substrates before application of paints and related products. This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer in charge.

The Contractor shall arrange, at his own cost, to keep a set of latest edition of above standards and codes at site.

The Contractor shall perform the work in accordance with the following reference documents issued to him for execution of painting works.

- Bill of quantities for piping, equipment, machinery and structures etc
- Piping Line List
- Specifications for Painting
- Any Specific requirements from client

7. GENERAL REQUIREMENTS

- This specification shall govern all works covered by the contract, and without prejudice to the provisions of various Indian and international codes of practice, standard specifications etc. The Contractor shall carry out the works in all respects with the best quality of materials and workmanship and in accordance with the best engineering practices and instructions of Owner / Engineer in charge.
- All tools, brushes, rollers, spray guns, blast material, hand power tools for cleaning and all equipment, scaffolding materials, shot / sand blasting equipment and air compressors etc. required to be used shall be suitable for the work and all in good order and shall be arranged by the Contractor at site and in sufficient quantity.
- The compressed air supply used for blasting shall be free of water and oil. Adequate separators and traps shall be provided and these shall be drained continuously. Pressure Gauges fitted to compressor shall be calibrated with necessary certificate.
- Blast cleaning equipment shall be in accordance with all applicable regulations. The spraying equipment to be used shall meet the recommendations and instructions set forth by the paint supplier for each specific paint or coating system.
- All mechanical equipment shall be earthed and all necessary precautions shall be taken to prevent the build-up of static electricity. Especially blasting equipment, its operators and the equipment being blasted shall be properly earthed to prevent the occurrence of electro-

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static discharges

- Mechanical mixing shall be used for paint mixing operations in case of two pack systems except that the Engineer in charge may allow the hand mixing of small quantities at his discretion.
- All painting materials and ancillary materials needed for completion of the contract shall conform to the prescribed specifications. Contractor shall procure these materials from specified manufacturers or their stockiest with proper marking and identification as proof of original materials.
- Any sub-standard or duplicate materials or lower grade/ brand materials shall not be used. Owner / Engineer in charge shall have the right to reject all such materials at any stage. Contractor shall seek prior approval from Owner before actual application to avoid rejection of works carried out with such sub-standard materials.
- The Contractor shall bring to the notice of Owner any discrepancy between this specification and codes specified herein. Contractor may request Owner for clarification of any of the applicable clause of this specification or about applicability of a particular painting system for any service / surface. Any deviation from this specification pertaining to supply or application without written permission of Owner shall be rejected by Engineer in charge.
- The items listed in the paint systems is indicative only, however Engineer in charge may decide about the applicability of the paint system for any of the works.
- The Contractor shall ensure all safety and protective apparatus are fully provided to their staffs.
- The contractor shall be fully responsible for carrying out all the necessary painting, coating and lining on external and internal surfaces as per the tender requirement.
- The paint manufacturer's instructions shall be followed as far as practicable at all times for best results. Particular attention shall be paid to the following:
    - Instructions for storage to avoid exposure as well as extremes of temperature.
    - Surface preparation prior to painting shall be followed as per the specification.
    - Mixing and thinning.
- Paint manufacturers shall furnish the characteristics of all paints materials on original printed literature, along with the test certificate for all specified characteristics given in this specification. All the paint materials shall be of first quality and conform to the general characteristics described in various tables.
- Contractor shall fully comply with the client specification for Colour Coding of Piping, Equipment and Structures issued during EPC stage of the project. This specification covers colour codes, identification marking on piping and equipment, recommended colours for paint systems and painting for “Civil Defence” requirements etc.
- Contractor shall ensure that the paint material supplied are fully within the validity period of the product and not exposed to open atmosphere.

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8. EXTENT OF PAINTING

The following surfaces and materials shall require shop, pre-erection and field painting:

- All Non-insulated carbon steel and alloy steel piping as described under scope Including valves, flanges, fittings, specialty items, in line items, and all supports (including painting of identification marks), flare lines ,furnace ducts and stacks.
- Titanium catalyzed inorganic copolymer can be used commonly for all valves.
- All insulated parts of vessels, boilers, chimneys, stacks, piping and steam piping, and any other insulated items present.
- All items contained in a package unit requiring painting.
- All types of structural steel members, platforms ladders, chequered plates, gratings, walkways, trolleys, monorails, davits, structural steel sheds and buildings are also covered under this painting specification.
- External surfaces of MS chimney with or without refractory lining and internal surfaces of MS chimney without refractory lining. (If present)
- Representation of colour bands on all piping including insulated aluminum clad, galvanized, SS and nonferrous piping.
- Identification lettering / numbering on all painted surfaces of equipment / piping insulated aluminum clad, galvanized SS and non-ferrous piping.
- Marking / identification signs on painted surfaces of equipment / piping including hazardous service.
- Supply of all primers, paints and all other materials required for painting (other than Owner supplied materials)
- Metal Area over which insulation surface of equipment and pipes wherever required.
- Painting under insulation for carbon steel, alloy steel and stainless steel as per relevant NACE RP 198 to prevent corrosion.
- Painting of pre-erection / fabrication and Shop primer.
- Repair work of damaged pre-erection / fabrication and shop primer and weld joints in the field / site before and after erection as required.

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- All CS Piping, equipment, storage tanks and internal surfaces of RCC tanks in ETP plant.
- Quality control, testing and inspection during all stages of work (surface preparation, application of coating and testing of furnished coating).

9. SURFACE PREPARATION

Any one of following methods of surface preparation shall be followed, depending on condition of surface to be painted and as approved or instructed by Engineer in charge.

- Manual or hand tool cleaning
- Mechanical or power tool cleaning
- Dry abrasive blast cleaning

Before blasting salt contamination test to be carried out for metals & Testing for chloride and soluble salt concentrations and the pH level shall be done using a Bresle Sampler according to ISO 8502-6. The chloride and soluble salt concentrations shall be less than 20 mg/ m^2 and the pH shall be neutral (between 6 and 8). When these levels are exceeded, the surfaces shall be either steam cleaned or high pressure water washed as per SSPC SP1 or ISO 12944 before abrasive blasting. The cleaned surface shall be retested to verify that the contaminant levels are within the acceptable range. Checks shall be done on each component at least once per 200 m^2 of blasted surface and a minimum of 3 checks per shift. The test report shall be maintained recording the ambient and substrate temperature, relative humidity, abrasive medium, test obtained valves etc.,Measuring device shall be regularly calibrated.

9.1 Surface Finish Requirements:

- When surface is exposed to normal atmospheric conditions and where other methods cannot be adopted. May also be used for spot cleaning during maintenance.
  - Solvent Cleaning to SSPC - SP1. Remove oil, grease or wax with a suitable solvent/degreasor (Non-Chloride solvent to be used on SS substrate)
  - Manual or hand tool cleaning to: SSPC-SP-2 or ST.2 Level

    Remove loose rust / mill scale / loose paint thoroughly by chipping, scrapping, sanding and or wire brushing. Finished surface shall have a faint metallic

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sheen.

- Mechanical or power tool cleaning to SSPC-SP-3 or ST.3 Level

  Remove loose rust / mill scale / loose paint to degree specified by power tool chipping, de-scaling, sanding, wire brushing and grinding, after removal of dust, surface should have a pronounced metallic sheen.

  Care to be taken where the welding / riveting portion of the joints.

- **Dry abrasive Blast cleaning:**

  There are four different methods of dry abrasive blast cleaning as described below. Each method shall be selected depending on surface finish required for particular paint system. However Engineer in charge may instruct about any of the system to be followed for a particular job / item as deem necessary.

  - White metal to SSPC-SP-5 or SA.3 or NACE #1 Level

    Remove all visible rust / Mill scale / paint and foreign matter 100% to achieve desired surface profile with blast cleaning to white metal cleanliness in order to achieve extremely clean surface for prolonged life of paint system.

  - Near white metal to SSPC-SP-10 or SA.2 ½ or NACE # 2 Level

    Blast clean to near white metal cleanliness until at least 95% of each element of surface area is free of all visible residues with desired surface profile in order to have minimum acceptable clean surface. This is the minimum requirement for chemically resistant paint systems such as epoxy, vinyl, polyurethane based and inorganic zinc silicate paints, also for conventional paint systems used under fairly corrosive conditions to obtain desired life of paint system.

  - Commercial Blast to SSPC-SP-7 or SA.2 or NACE # 3 Level

    Blast clean until at least two-third of each element of surface area is free of all visible residues with desired surface profile. Used for steel required to be painted with conventional paints for exposure to mildly corrosive atmosphere for longer life of the paint systems.

  - Brush-off Blast to SSPC-SP-7 or SA.1 or NACE # 4 Level

    Blast cleaning to white metal cleanliness, removal of all visible rust, mill scale, paint and foreign matter where surface profile is not so important

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9.2 Equipment surface Preparation:

- All tools, brushes, rollers, spray guns, blast material, hand power tools for cleaning and all equipment, scaffolding materials, shot & grit blasting equipment and air compressors etc. required to be used shall be suitable for the work and all in good order and shall be arranged by the Contractor at site and in sufficient quantity. The manufacturer's test certificates & data sheets for all the above items shall be reviewed by Engineer in charge at site before start of work.
- Mechanical mixer shall be used for paint mixing operations in case of two pack systems except that the Engineer in charge may allow the hand mixing of small quantities at his discretion in case of specific requirement for touch up work only.
- Mill scale, rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. The minimum acceptable standard, in case of thermally sprayed metal coatings, in case of mechanical or power tool cleaning it shall be St. 3 or equivalent. In case of blast cleaning it shall be Sa 2-1/2 as per Swedish Standard SIS-055900 or SSPC-SP or ISO 8501-0l. Blast cleaning shall be Sa 3 as per Swedish Standard in case thermally sprayed metal coatings.
- Before surface preparation by blast cleaning, the surface shall be degreased by aromatic solvent to remove all grease, oil etc.

9.3 Use of Dehumidifiers:

- Blast cleaning shall not be performed for internal or external surface, where dust can contaminate surfaces undergoing such cleaning or during humid weather conditions having humidity exceed 85%. In case of internal coating of storage tanks, dehumidifier shall be used, to control humidity level below 60%. Dehumidifier should depress the dew point of air in the enclosed space, enough to maintain it 3°C below the metal substrate temperature during entire period of blasting and coating application. During the interval time between application of primer coat and subsequent intermediate and top coats or between blast cleaning completion and start of application of primer coat,

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dehumidifier unit should be in continuous operation to ensure that no condensation occurs on substrate.

- Dehumidifier should be able to maintain grain drop (moisture removal) at the rate of 25 grains per pound of air per hour. Dehumidifier should have capacity of at least 2 air changes per hour of the enclosed space. All necessary psychometric data should be collected by contractor for the given site conditions before starting operation of dehumidifier to ensure that desired values of dew point, moisture content in enclosed scope is achieved.
- Dehumidification shall be maintained round the clock for surface preparation and painting till the total coating application is over.
- Dehumidifier shall not be stopped under any condition till the entire blasted surface is primed to the satisfaction of the technical representative of the paint manufacturer interested with quality assurance for the work. In case the dehumidifier breaks down in middle of the job, the same shall be replaced at the risk and the cost of the contractor and the entire unfinished work shall be repeated.
- The Engineer in charge shall have the right to disallow usage of dehumidifier if the performance is not meeting the specified requirements. Under such circumstances the contractor shall remove the equipment and replace the same with another equipment to provide satisfactory results without any additional cost to the owner.
- Irrespective of the method of surface preparation, the first coat of primer must be applied by airless spray / air assisted conventional spray if recommended by the paint manufacturer on dry surface. This should be done immediately and in any case within 4 hours of cleaning of surface. However, at times of unfavourable weather conditions, the Engineer in charge shall have the liberty to control the time period, at his sole discretion and/or to insist on recleaning, as may be required, before primer application is taken up. In general, during unfavourable weather conditions, blasting and painting shall be avoided as far as practicable.
- The external surface of R.C.C. chimney stack to be painted shall be dry and clean. Any loose particle of sand, cement, aggregate etc. shall be removed by scrubbing with soft wire brush. Acid etching with 10-15% HCL solution for about 15 minutes shall be carried and surface must be thoroughly washed with water to remove acid & loose particles and then dried completely before application of paint.

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9.4 Air Blast Cleaning with abrasives:

- The surfaces shall be blast cleaned using one of the abrasives like angular chilled cast iron or steel grit, copper slag or Nickel slag, $Al_2 0_3$ particles at pressure of 7 kg/cm^2 at an appropriate distance and angle depending of nozzle size maintaining constant velocity and pressure.
- Chilled cast iron or steel shall be in the form of shot or grit of size in the range of G 16 - G42 conforming to SSPC AB1and S250 grade size of steel shots (maximum) to obtain a desired surface profile of 35-50 microns trough to peak. For all other abrasives, size shall be in the range of G16 -G24. The combination of steel grits and shots shall be normally in the ratio of 3 : 1 . The quality of abrasives shall be free from contaminants and impurities and shall meet the requirements of SSPC AB1.
- Compressed air shall be free from moisture and oil. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the materials for liners. Nozzles orifice may vary from 3/16" to 3/4". On completion of blasting operation, the blasted surface shall be clean and free from any scale or rust and must show a grey white metallic luster. Primer / first coat of paint shall be applied within 4 hours of surface preparation. Blast cleaning shall not be done outdoors in bad weather without adequate protection or when there is dew on the metal, which is to be cleaned. Surface profile shall be uniform to provide good key to the paint adhesion (i.e. 35 to 50 microns). If possible vacuum collector shall be installed for collecting the abrasives and recycling.

9.5 Mechanical or Power Tool Cleaning:

Power tool cleaning shall be done by mechanical striking tools, chipping hammers, grinding wheels or rotating steel wire- brushes. Excessive burnish of surface shall be avoided as it can reduce paint adhesion. On completion of cleaning, the detached rust mill scale etc. shall be removed by clean rags and /or washed by water or steam and thoroughly dried with compressed air jet before application of paint.

9.6 Non-Compatible Shop Coat Primer:

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- For equipment on which application of total protective coating (Primer+ Intermediate + top coat) is carried out at shop, compatibility of finish coat with primer should be checked with paint manufacturer. Specific duration mentioned in the manufacturer specification shall be fully If the shop coat is in satisfactory condition showing no major defect upon arrival at site, the shop coat shall not be removed.
- Shop coated equipment (coated with Primer & finishing coat) should not be repainted unless paint is damaged. Repair shall be carried out as per **Table 10.2** of paint systems depending upon compatibility of paint.
- Shop primed equipment and surfaces will only be 'spot cleaned' in damaged areas by means of power tool brush cleaning or hand tool cleaning and then spot primed before applying one coat of field primer unless otherwise specified. If shop primer is not compatible with field primer then shop coated primer should be completely removed before application of selected paint system for particular environment.
- For Package units/equipment, shop primer should be as per the paint system given in this specification. However, manufacturer's standard can be followed after review.
- Coating application at field (field primer, intermediate and top coat) on equipment, structures, piping, etc. shall be carried out only after its erection and all welding, testing, steam purging (wherever carried out) have been completed.

10. COATING PROCEDURE & APPLICATION

- All paint coatings shall be applied by airless spray excepting at the following special cases where application can be carried out by brush subject to suitability of the application of the paint product by brush.
    - Spot repair
    - Stripe coating on edges
    - Small bore parts not suitable for spray application
- Irregular surfaces such as sharp edges, welds, small brackets, and interstices may stripe coated to ensure specified DFT is achieved. Paint manufacture's recommendation should be followed before deciding for brush application.

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- Surface shall not be coated in rain, wind or in environment where injurious airborne elements exists, when the steel surface temperature is less than 5°F above dew point when the relative humidity is greater than 85% or when the temperature is below 40°F and when the ambient/substrate temp is below the paint manufacturer's recommended temperature of application and curing. De-humidifier equipment shall be used to control RH and Dew point. The paint application shall not be done when the wind speed exceeds 20 km per hour.
- Blast cleaned surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hours the same day.
- To the maximum extent practicable, each coat of material shall be applied as a continuous film uniform thickness free of probes. Any spots or areas missed in application shall be recoated and permitted to dry before the next coat is applied. Applied paint should have the desired wet film thickness.
- Each coat shall be in proper state of cure or dryness before the application of succeeding coat. Material shall be considered dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting or loss of adhesion of the under coat. Manufacturer instruction shall be followed for inter-coat interval.
- When the successive coat of the same colour have been specified, alternate coat shall be tinted, when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface. The tinting material shall be compatible with the material and not detrimental to its service life and shall be recommended by the original paint manufacturer.
- Airless spray application shall be in accordance with the following procedure: as per steel structure paint Manual Vo. 1 & Vol. 2 by SSPC, USA, Air less spray relies on hydraulic pressure rather than air atomization to produce the desired spray. An air compressor or electric motor is used to operate a pump to produce pressures of 1000 to 6000 psi. Paint is delivered to the spray gun at this pressure through a single hose within the gun, a single paint stream is divided into separate streams, which are forced through a small orifice resulting in atomization of paint without the use of air. This results in more rapid coverage with less over spray.

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- Airless spray equipment is mounted on wheels, and paint is aspirated in a hose that sucks paint from any container, including drums. The unit shall have in built agitator that keep the paint uniformly mixed during the spraying. The unit shall consist of in built strainer. Usually very small quantity of thinning is required before spray. In case of high build epoxy coating (two pack). 30:1 pump ratio and 0.020-0.023" tip size will provide a good spray pattern. Ideally fluid hoses should not be less than 3/8" ID and not longer than 50 ft to obtain optimum results. In case of gun choking, de-choking steps shall be followed immediately.
- Brush application of paint shall be in accordance with the following:
    - Brushes shall be of a style and quality that will enable proper application of paint.
    - Round or oval brushes are most suitable for rivets, bolts, irregular surface, and rough or pitted steel. Wide flat brushes are suitable for large flat areas, but they shall not have width over five inches.
    - Paint shall be applied into all corners.
    - Any runs or sags shall be brushed out.
    - There shall be a minimum of brush marks left in the applied paint
    - Surfaces not accessible to brushes shall be painted by spray, doubers, or sheepkin.
- For each coat the painter should know the WFT corresponding to the specified DFT and standardize the paint application technique to achieve the desired WFT. This has to be ensured in the qualification trial.
- No coat shall be applied until the preceding coat has dried. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of undercoats. Drying time of the applied coat should not exceed maximum specified for it as a first coat; if it exceeds the paint material has possibly deteriorated or maxing is faulty.
- No paint shall be force dried under conditions which will cause chalking, wrinkling, blistering formation of pores, or detrimentally affect the conditions of the paint.
- No drier shall be added to paint on the job unless specifically called for in the manufacturer's specification for the paint.

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- Paint shall be protected from rain, condensation, contamination, snow and freezing until dry to the fullest extent practicable.

11. SURFACE PREPARATION METHOD

The table below describes the methods for surface preparation and the standards used for cleanliness and surface preparation for painting /coating works.

SURFACE PREPARATION

Sr. No.	Description	International Standards (Equivalent)			Remarks
		ISO 8501-1 / SIS-05 59 00	SSPC-SP,USA	NACE, USA	
1.	- **Solvent Cleaning** Remove oil, grease or wax with a suitable solvent/degreasor (Non-Chloride solvent to be used on SS substrate)	ST-1	SSPC - SP1		
2.	**Manual or hand tool cleaning:** Removal of loose rust, loose mill scale and loose paint, chipping, scrapping, standing and wire brushing. Surface shall have a faint metallic sheen.	ST.2	SSPC-SP-2	-	This method is applied when the surface is exposed to normal atmospheric conditions when other methods cannot be adopted and also for spot cleaning during maintenance painting.
3.	**Mechanical or power tool cleaning:** Removal of loose rust loose mill scale and loose paint to by power tool chipping, de-scaling, sanding, wire brushing and grinding, after removal of dust, surface shall have a pronounced	ST.3	SSPC-SP-3	-	

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	metallic sheen.				
4	**Dry abrasive Blast cleaning:** There are four common grades of blast cleaning White metal				
4.1	**Blast cleaning to white metal cleanliness:** Removal of all visible rust. Mill scale, paint & foreign matter 100% cleanliness with desired surface profile	SA 3	SSPC-SP-5	NACE #1	Where extremely clean surface can be expected for prolong life of paint system.
4.2	**Near white metal:** Blast cleaning to near white metal cleanliness, until at least 95% of each element of surface area is free of all visible residues with desired surface profile.	SA 2 ½	SSPC-SP-10	NACE #2	For chemically resistant paint systems such as epoxy, vinyl, polyurethane based and inorganic zinc silicate paints, and for paint systems used under fairly corrosive conditions to obtain desired life of paint system.
4.3	**Commercial Blast:** Blast cleaning until at least two-third of each element of surface area is free of all visible residues with desired surface profile.	SA 2	SSPC-SP-6	NO. 3	For steel required to be painted with conventional paints for exposure to mildly corrosive atmosphere for longer life of the paint systems.
4.4	**Brush-off Blast:** Blast cleaning to white metal cleanliness, removal of all visible rust, mill scale, and paint foreign matter. Surface profile is not so important	SA 1	SSPC-SP-7	NO. 4	

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12. PAINTING / COATING MATERIALS

12.1 List of Primers and Finish Paints used:

A broad list of primers and finish paints to be used for painting and coating works is as given below:

PRIMERS	
PR-1	**Chlorinated Rubber Zinc Phosphate** Primer
PR-2	**Etch Primer / Wash Primer**
PR-3	Two component **Epoxy Zinc Phosphate** Primer cured with polyamine hardener
PR-4	Single pack, cold galvanizing compounds containing minimum 92% **Electrolytic Zinc** in dry film. make **ZINGA, LOCKTITE** (of HENKEL) or **ZRC**
FINISH COATS / PAINTS	
FP-1	Two component **Acrylic – Polyurethane** finish paint
FP-2	**Chlorinated Rubber** finish paint
FP-3A	**High Build Epoxy** finish coating cured with polyamine hardener
FP-3B	**High Build Epoxy** finish coating cured with polyamide hardener
FP-3C	**Solvent less Epoxy** Coating cured with polyamine hardener
FP-4	**High build Coal Tar Epoxy** coating cured with polyamine hardener
FP-5	Self-priming surface Tolerant **High Build Epoxy** coating. cured with polyamine hardener
FP-6	Two component **Inorganic Zinc Silicate** coating
FP-7	Heat resistant synthetic medium based **Aluminium** paint
FP-8	Two component Heat resistant **Silicone Aluminium** paint.
FP-9	Specially formulated **Coal Tar Epoxy** coating. cured with polyamine hardener
FP-10	Two component **Epoxy Phenolic** coating cured with Polyamine adduct hardener system
FP-11	Engineered Epoxy **Poly Siloxane** Coating or High Build cold applied inorganic Co-polymer based Aluminium coating
FP-12	Two component solvent free type **High Build Epoxy Phenolic / Novalac Epoxy** Phenolic coating cured with Polyamine adduct hardener system

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12.2 Detailed Specification of Primers and Finish Paints

The following are the various parameters of primers, finish paints and coating materials to be used for carrying out various painting / coating works

PRIMERS

Sr. No.	Description	PR-1	PR-2	PR-3	PR-4
1.	Technical Name	Chlorinated Rubber Zinc Phosphate Primer	Etch Primer / Wash Primer	Epoxy Zinc Phosphate Primer	Zinga, Locktite or ZRC Cold Galvanized
2.	Pack Type	Single Pack	Two Pack	Two Pack	Single Pack
3	Composition	Air Drying Chlorinated, Rubber based medium Plasticized with unsaponifiable Plasticizer, pigmented with zinc phosphate	Polyvinyl butyral resin medium cured with phosphoric acid solution. pigmented with zinc tetroxy chromate	Polyamine cured epoxy resin, medium, pigmented with zinc phosphate	Synthetic resin based zinc galvanizing containing min 92% of electrolytic zinc dust of 99.95% purity.
4.	Vol. Solids %	40±3	10±1	50±1	37%
5.	DFT (Micron) / Coat	40-45	8-10	40-50	40-50fl
6.	Covering M^2 / Coat / Litre	8-10	8-10	8-10	4 m^2/kg
7.	Wt. Kg. / Litre	1.3±0.05	1.2±0.05	1.4±0.05	2.67 kg at l5°C
8.	Touch Dry at 30^0C Min.	30 minutes	2hrs.	After 30 min.	10 minutes
9.	Hard Dry at 30^0C Max.	8 hrs.	24 hrs.	8 hrs.	24 hrs.
11.	Over-coat Interval at 30^0C	Min.: 8 hrs.	Min.: 4-6 hrs.	Min.:8hrs.	Min.:4 hrs
12.	Pot Life at 30^0C	Not applicable	Not applicable	6-8 hrs.	Unlimited
13.	Temperature. Resistance min	60°C Drv service	NA Dry service	80°C Dry service	50°C Dry service

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FINISH PAINTS

Sr. No.	Description	FP-1	FP-2	FP-3A /B	FP-3C	FP-4
1.	Technical Name	**Acrylic Polyurethane** finish paint	**Chlorinated Rubber** based finish paint	**Epoxy-High Build** coating	**Solvent less Epoxy** coating	**High Build Coal Tar Epoxy** coat.
2.	Pack Type	Two pack	Single pack	**FP-3A:** Two pack	Two pack	Two pack
3	Composition	Aliphatic isocynate cured acrylic finish paint with Glossy-High Glossy finish	Plasticized chlorinated rubber based medium with chemical and weather resistant pigments.	**FP-3A:** Aromatic amine cured epoxy resin medium suitably pigmented. **FP-3B:** polyamide cured epoxy resin medium suitably pigmented	Cured with Amine Adduct; catalyzed epoxy resin suitably pigmented.	Polyamide cured epoxy resin blended with coaltar medium, suitably pigmented
4.	Vol. Solids %	40±3	38±2	60±3	99±1	65±3
5.	DFT (Micron) / Coat	30-40	30-40	100-125	200-500	100-125
6.	Covering M^2 / Coat / Litre	11-15	11-15	5-6	2-3	5.2-6.5
7.	Wt. Kg. / Litre	1.15±0.03	1.15±0.03	1.42±0.03	1.40±0.03	1.40±0.03
8.	Touch Dry at 30^0C Max.	30 Min.	30 Min.	3 Hrs.	3 Hrs.	4 Hrs..
9.	Hard Dry at 30^0C Max. Full Cure at 30^0C for Immersion	8 Hrs. NA	8 Hrs.. NA	16 Hrs. 5 days	16 Hrs. NA	48 Hrs. 5 days
10.	Over-coat Interval at 30^0C (Min)	12 Hrs.	Overnight.	Overnight. Max.: 5 days	8 Hrs.. Max.: 48 hrs	24 Hrs. Max.:5 days
11.	Pot Life at 30^0C for paints -two components	6-8 Hrs.	NA	4-6 Hrs.	30 Min.	4-6 Hrs.
12.	Temperature. Resistance - Dry service - Immersion	80°C -	- 60°C	80°C -	120°C 50°C	- 125°C

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FINISH PAINTS… CONT'D

Sr. No.	Description	FP-5	FP-6	FP-7	FP-8
1.	Technical Name	**High Build Epoxy**, self-priming type surface tolerant coating (for complete rust control)	**Inorganic zinc silicate** coating	**Aluminum Paint** Heat resistant synthetic medium based suitable up to 250°C dry temp	**Silicone Aluminum Paint** Heat resistant suitable up to 500°C dry temp.
2.	Pack Type	Two pack	Two pack	Two pack	Single pack
3	Composition	Epoxy resin based suitable pigmented and capable of adhering to manually prepared surface and old coating.	Air drying self curing solvent based inorganic zinc silicate coating with minimum 80% zinc content on dry film. The final cure of the dry film shall pass the MEK rub test. Zinc purity shall be Type-II of ASTM D520	Heat resistant synthetic medium based Aluminium paint suitable upto 250°C.	Silicon resin based medium with Aluminum flakes.
4.	Vol. Solids %	78±3	60±3	38±0.03	20±2
5.	DFT (Micron) / Coat	100-125	65-75	15-20	15-20
6.	Covering M^2 / Coat / Litre	6.0-7.2	8-9	10-12	8-10
7.	Wt. Kg. / Litre	1.41 ± 0.03	2.3 ± 0.03	0.95 ± 0.03	1.0 ± 0.03
8.	Touch Dry at 30^0C Max.	3 Hrs.	30 Min.	3 Hrs.	30 Min.
9.	Hard Dry at 30^0C Max. Full Cure 30^0C for Immersion	24 Hrs. 5 days	12 Hrs. NA	12 Hrs. NA	24 Hrs. NA
10.	Over-coat Interval Min.	10 hrs.	12 hrs. at 20°C & 50% RH.	24 hrs.	24 hrs.
11.	Pot Life at 30^0C	90 Min.	4-6 Hrs.	NA	NA
12.	Temperature. Resistance Min. Dry service	80°C	540°C.	250°C	500°C .

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FINISH PAINTS… CONT'D

Sr. No.	Description	FP-9	FP-10	FP-11	FP-12
1.	Technical Name	**Coal Tar Epoxy** Polyamine cured	**Epoxy Phenolic** coating Two-component cured with Polyamine adduct hardner system (primer + intermediate coat + finish paint).	**Poly Siloxane Coating** - ambient temperature curing / **High build inorganic copolymer based Aluminium** coating, cold applied suitable for under insulation coating of CS and SS piping for high temperature service	**High Build Epoxy phenolic based -** Two components solvent free type / **Novalac Epoxy Phenolic coating**
2.	Pack Type	Single pack	Two pack	Two pack	Single pack
3	Composition	Specially formulated polyamine cured coal tar epoxy suitable for application under insulation	Temperature curing epoxy phenolic coating system suitable for application under insulation of CS/AS/SS piping	Amercoat 738 from PPG Protective & Marine Coatings or Interterm 751 CSA of International (Akzo Nobel). Note: 6	High build epoxy phenolic / Novalac Epoxy phenolic coating cured with Polyamine adduct hardner system
4.	Vol. Solids %	70 ± 3	70 ± 3	60 ± 2	98 -100
5.	DFT (Micron) / Coat	100-125	75-100	75-100	125-150
6.	Covering M^2 / Coat / Litre	5-8	4-5	7-9	6.5-8
7.	Wt. Kg. / Litre	1.45 ± 0.03	1.65 ± 0.03	1.3	1.7
8.	Touch Dry at 30^0C Min.	4 Hrs.	3 Hrs.	1 Hrs.	2 Hrs.
9.	Hard Dry at 30^0C Max.Full Cure 30^0C for Immersion	24 Hrs. 168 Hrs.(7days)	24 Hrs. 168 Hrs.(7days)	16 Hrs. -	24 Hrs. 168 Hrs.7days)
10.	Over-coat Interval Min,	6 Hrs. Max.: 5 days	16 Hrs. Max.: 21 days	16 Hrs.. Max.: NA	16 Hrs. Max.: 21 days
11.	Pot Life at 30^0C	4 Hrs.	4-6 Hrs.	1 Hr.	1 Hr.

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12.	Temperature. Resistance Min.	-45°C to 125°C under insulation And immersion	-45°C to 150°C under insulation & immersion. **(Note: 5)**	• Up to 400 °C for CS & SS for Intertherm 751 CSA • Up to 480 °C for CS and up to 600 °C for SS for Amercoat 738 **(Note 6)**	-45°C to l50°C for immersion service

Notes:

1. Covering capacity and DFT depends on method of application. Covering capacity specified above is theoretical. Allowing the losses during application, min. specified DFT shall be maintained.
2. All primers and finish coats shall be cold cured and air drying unless otherwise specified.
3. All paints shall be applied in accordance with manufacturer's instructions for surface preparation, intervals, curing and application. The surface preparation, quality and workmanship shall be ensured. In case of conflict between this specification and manufacturer's recommendation, the same shall be clarified with Engineer in charge.
4. Technical data sheets for all paints shall be supplied at the time of submission of quotations.
5. FP-10 Two-component Epoxy phenolic coating cured with Polyamine adduct hardner system (primer + intermediate coat + finish paint) suitable upto 225°C (Intertherrn 228 from M/s Akzo Nobel Coatings India Pvt Ltd. Bangalore). For all other companies, the temperature resistance shall be a maximum of 150°C.
6. FP-11 Ambient temperature curing epoxy poly siloxane Coating or high build cold applied inorganic co-polymer based aluminium coating. Amercoat 738 from PPG Protective & Marine coatings, Mumbai is suitable up to 480°C for CS surfaces and 600°C for SS surfaces. Intertherm 751 from Akzo Nobel Coatings India Pvt Ltd., Bangalore, Inorganic co- polymer cold applied Aluminium spray coating is suitable upto 400°C of CS & SS surfaces.

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13. PAINTING SYSTEM TABLES & SELECTION CRITERIA

13.1 Painting System Tables:

There are 11 painting system tables in this specification covering most of painting and coating works. However, new table may be added based on project requirement for any specific painting works as necessary. The tables are as under:

Table-01	Painting systems for uninsulated piping, equipment and structures in process units, power plant, DM plant, cooling tower, chimney / stack, package units and any other equipment in process units also including offsite in coastal areas
Table-02	Painting system for insulated equipment and piping (under insulation) in process units and off sites (Carbon steel, LTCS, SS & low alloy steel)
Table-03	Painting system for uninsulated storage tanks in process units and off sites (Carbon steel & low alloy steel)
Table-04	Painting system for internal surface of storage tanks in process units and off sites (Carbon steel & low alloy steel)
Table-05	Painting system for external surface of underground piping and vessels in units and off sites (Carbon steel)
Table-06	Painting system for internal protection of components of coolers / condensers in fresh water service in units and off sites (Carbon steel)
Table-07	Painting system for internal protection of components of coolers / condensers in fresh water service in units and off sites (Stainless steel, duplex stainless steel, non-ferrous materials & galvanized steel)
Table-08	Painting system for effluent treatment plants (ETP)
Table-09	Coating systems for gratings, rolling & stationery ladders, spiral stairways and hand rails in all location
Table-10	Repair of pre-erection / pre-fabrication or shop primer after erection / welding of uninsulated piping and equipment in all environments. (CS, LTCS & low allow steel)
Table-11	Painting system for uninsulated Piping, Equipment, Tanks & Package units in Process Units & Off-Sites (Stainless Steel)

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13.2 Table selection Criteria:

The painting Table shall be selected based on following broad parameters given below. The selection criteria shall also be in the order below. All necessary precaution shall be taken in selecting the applicable table. In case of any difficulty Contractor may seek clarification before starting the works from Engineer in charge whose decision shall be final and binding on the Contractor.

Sr. No.	Criteria	Description	Details
1	Plant Location	• Non Coastal / Inland • Coastal / Marine	More than 50 KM from Sea shore Coastal / Marine Within 50 KM from Sea shore
2	Environment	• Industrial • Industrial Marine	Use Industrial , if Marine environment is not mentioned
3	Type of facility	• Units • Offsite	Process Units, Power Plant, Cooling Towers, DM Plant, pipe Rack in units, Package units, chimney/ stack, any other equipment in units Offsite- pipe racks, Piping on Sleepers
4	Temperature Ranges	(-) 180°C to 600°C	Temperature varies for case to case. Selection of painting systems according to the operating temperatures of the line.
5	Material of Const. (MOC)	Carbon Steel (CS) Low Alloy Steel, Stainless Steel (SS)	Aluminium,Copper , Monel, Incoloy, Nickel No painting is required
6	• Insulated • Non Insulated	Equipment / Piping Equipment / Piping	See Under insulation table

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7	• Aboveground • Underground	Equipment / Piping Equipment / Piping	Equipment /piping in pit consider underground
8	Surface	• External • Internal	Equipment /piping Equipment only

NOTES: (For ALL Tables)

1. The list of items specified in tables is not exhaustive. More items may be included for a particular Contract as necessary. The Contractor shall complete painting including prefabrication primer for all the items in his scope of work as per tender documents and instructions of Engineer in charge**.**
2. If the pre-erection / prefabrication and shop primer has already been completed, the same shall not be repeated again in the field. In case the damages of primer are severe and spread over large areas, the Engineer in charge may decide and advise re-blasting and priming again. Repair of pre- fabrication / pre-erection primer, as instructed, shall be carried out by Contractor.
3. All coating system including surface preparation, primer and finish coat for piping shall be done at site / field only.
4. Finish coating is not permitted at equipment manufacture shop.

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TABLE -01

PAINTING SYSTEMS FOR UNINSULATED PIPING, EQUIPMENT AND STRUCTURES IN PROCESS UNITS, POWER PLANT, DM PLANT, COOLING TOWER, CHIMNEY / STACK, PACKAGE UNITS AND ANY OTHER EQUIPMENT IN PROCESS UNITS ALSO INCLUDING OFFSITES (Carbon Steel, LTCS & Low Alloy Steel)

Sl. No.	Temp.in °C	Surface Preparation & Pre erection / Shop Primer	Painting System (Post-erection / Field)		Total Final DFT in Micr. (min.)	Remarks
			Primer	Finish Coat		• No over coating to be done on FP-6 as it will lead to mud cracking. • FP-8 shall be ambient temperature curing type. • Finish coat including primer compatible with finish coat. (I.e. field primer) shall be applied at site only.
1.2	-14 to 100	SSPC-SP-10 FP-6 = 75 µm FP-3A =150 µm FP-1 =35 µm Total DFT at shop = 260 µm	FP-1 =40 µm will apply after pressure water wash & surface rubbing Cummulative DFT = 300		300	
1.3	101 to 400	SSPC-SP-10; 1 coat of FP-6 @ 65 - 75 micr. DFT / Coat	None	2 Coat of FP-8 @ 20 micr. DFT / Coat 2x20 =40	105 - 115	
1.4	401 to 540	SSPC-SP-10; 1 coat of FP-6 @ 75 micr. DFT / Coat	None	2 Coat of FP-8 @ 25 micr. DFT / Coat (2x25 =50)	125	

- For external surface of MS chimney with or without refractory lining and for internal surface without refractory lining, paint system at Sl. No.1.3 of the above table shall be followed.

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- For external surface of RCC Chimney 2 coats of FP-3A @ 100 Micr. DFT/ coat to obtain total DFT of 200 Micr. shall be applied after proper surface preparation as per Clause 9.3.7
- In case of paint systems as per Sl. Nos. 1.3 and 1.4, the colour bands shall be applied over the Aluminum paint as per the Color coding system requirement for specific service of piping.
- For 1.3 & 1.4 finish coat at field may be applied at shop itself and touch-up will be done at field.

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TABLE -02

PAINTING SYSTEM FOR INSULATED EQUIPMENT AND PIPING (UNDER INSULATION) IN PROCESS UNITS AND OFFSITES (Carbon Steel, LTCS, SS & Low Alloy Steel)

Sl. No.	Temp.in °C	Surface Preparation & Pre erection / Shop Primer	Painting System (Post-erection / Field)		Total Final DFT in Microns (min.)	Remarks
			Primer / Intermediate	Finish Coat		
2.1	**Equipment & Piping - Carbon steel, LTCS and low Alloy steel**					
2.1.1	- 45 to 200	SSPC-SP-10 1 coat of FP-10 @ 125 micr. DFT/coat.	None	1 coat of FP-10 @ 75micr. DFT/coat. (1x125=125)	250	
2.1.2	201 to 540	SSPC-SP-10; 1 coat of Titanium catalyzed inorganic ceramic coploymer @ 150 micr. DFT/coat.	None	1 coat of Titanium catalyzed inorganic ceramic coploymer @ 150micr. DFT/coat.	300	
2.2	**Piping -Stainless Steel including Alloy-20 (Note:2)**					
2.2.1	-180 to 600	For SS SSPC-SP-6 Commercial Blast/ For SS SSPC-SP-1 With non-chloride solvent 1 coat of Titanium catalyzed inorganic ceramic coploymer @ 150 micr. DFT/coat.	None	1 coat of Titanium catalyzed inorganic ceramic coploymer @ 150micr. DFT/coat. (150x1=150)	300	
2.3	**No painting is required for insulated Monel, Incoloy and Nickel lines.**					

- **"Cyclic Service"** is characterized by rapid temperature fluctuation.
- The blast cleaning abrasives for SS and Alloy steel surfaces shall be Aluminium oxide grits/shots or garnet.
- Surface shall be thoroughly degreased using an appropriate emulsion cleaner and

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abrasive cleaned (sweep blasting) to create a sufficient anchor profile.Abrasive for blast cleaning of stainless steel surfaces shall be performed with a suitable non-metallic abrasive such as aluminum oxide. When hand or power tool cleaning is required on stainless steel, only stainless steel wire brushes that have not been previously used on carbon steel surface must be used.All coatings and solvents for use on stainless steel shall be free of substances such as chlorides and other halides, sulfur, and shall be free of low melting point metals (zinc,aluminum, tin and lead).

- For 2.1.1 ,2.1.2 & 2.2.1 finish coat at field may be applied at shop itself and touch-up will be done at field.

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TABLE -03
PAINTING SYSTEM FOR UNINSULATED STORAGE TANKS IN PROCESS UNITS AND OFFSITES (Carbon Steel & Low Alloy Steel)

Sl. No.	Temp.in °C	Surface Preparation (Field)	Painting System (In field after welding & erection)		Total DFT in Microns (min.)	Remarks
			Primer	Finish Coat		
3.1	**All external surfaces of shell, wind girders, appurtenances, roof tops of all above ground tank including top side of external and internal floating roof and associated external structural works.**					
3.1.1	-14 to 100	SSPC-SP-10	1 coat of FP-6 @ 65-75 micr. DFT/coat +1 coat of PR-3@ 40 micr. DFT/coat.	2 coats of FP=3A @ 100 micr. DFT/coat + 1 coat of FP-1 @ 70 micr. DFT/coat;	345-355	FP-3A should be suitable for occasional water immersion.
3.1.2	101 to 150	SSPC-SP-10	1 coat of FP-10 @ 80 micr. DFT/coat +1 coat of FP-10 intermediate coat @ 80 micr. DFT/coat.	1 coats of FP-10 @80 micr. DFT/coat + 1 coat of FP-1@ 40 micr. DFT/coat;	280	-
3.1.3	151 to 500	SSPC-SP-10	1 coat of FP-6 @ 65-75 micr. DFT/coat	2 coats of FP-8 @20 micr. DFT/coat (or) 1coat of FP-11 @ 50 micr.	105	-
3.2	**External surfaces of bottom plate (soil side) for all storage tanks.**					
3.2.1	-14 to 80	SSPC-SP-10	1 coat of FP-6 @ 75 micr. DFT/coat.	2coat of High Glass Flake Epoxy @ 200 micr. DFT/coat.(2x200= 400)	475	

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3.2.2	81 to 150	SSPC-SP-10	1 coat of FP-10 @ 80 micr. DFT/ coat +1 coat of FP-10 intermediate coat @ 80 micr. DFT/ coat. (80+80=160)	1 coats of FP-10 finish coat @80 micr. DFT/coat.	240	-
3.2.3	151 to 550	SSPC-SP-10	1 coat of FP-11 @ 125 micr. DFT/coat	1 coats of FP-11 finish coat @80 micr. DFT/coat.	250	-
3.3	**For underside of the bottom plate (in case tank is not lifted during PWHT) (see Note 2c)**					
3.3.1	-180 to 650	For CS SSPC-SP-6 Commercial Blast For SS SSPC-SP-1 With non-chloride solvent	1 coat of inter polymeric matrix coating @ 125 microns.	2 coat of inter polymeric matrix coating @ 125 microns.	350-400	Products from JOTUN or HI-TEMP coating or SK FOMULATION recommended.

- All paint coating application including primer for tankage shall be carried out at field after erection and completion of all welding.
- For underside of bottom plate, painting shall be carried out before laying of bottom plate for tanks with Non-Post Weld Heat Treatment (PWHT).
- For tanks with PWHT, painting shall be carried out after PWHT.
- In case tank is not lifted during PWHT then painting shall be applied before laying of bottom plate, Sl no. 3.3.1 shall be followed.

Caution: PWHT temperature shall not exceed 650°C.

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TABLE -04

PAINTING SYSTEM FOR INTERNAL SURFACE OF STORAGE TANKS IN PROCESS UNITS AND OFFSITES (Carbon Steel & Low Alloy Steel)

Sl. No.	Temp.in °C	Surface Preparation (Field)	Painting System (In field after welding & erection)		Total DFT in Microns (min.)	Remarks
			Primer	Finish Coat		
4.1	**Crude oil, ATF, Turpentine oil, Lubricating oil and Vegetable oil** Underside of floating roof, internal surface of cone roof, inside of bottom plate, Internal surfaces of Shell - including wetted and free board height, oil side surfaces of deck plates, oil side surfaces of pontoons, roof structures, structural steel, ladders and other carbon steel internals.					
4.1.1	-14 to 90	SSPC-SP-10	1 coat of FP-10 primer@ 80 micr. DFT/coat.	1 coats of FP-10 intermediate coat @80micr. DFT/coat+ 1coat of FP-10 finish coat@ 80 micr.	240 - 300	-
4.2	Petroleum products & Intermediates Like LDO, HSD, Gas oil, Feeds of FCC -PC, FCC-LCO, VGU-HDT, ISOM, DHDT, Reformate, DCU, NHT & Gasoline, Naphtha, Isomerate and Kerosene. Underside of Floating roofs, internal surface of cone roof, inside of bottom plate, internal surfaces of Bare shell for full height, underside of floating roof, oil side surfaces of deck plates, oil side surfaces of pontoons, support structures and ladders etc.					
4.2.1	-14 to 45	SSPC-SP-10	1 coat of FP-6 @ 75 micr. DFT/coat.	-	75	Note-1
4.2.2	46 to 90	SSPC-SP-10	1 coat of FP-10 primer@ 80 micr. DFT/coat+	1 coats of FP-10 intermediate coat @80micr. DFT/coat+ 1coat of FP-10 finish coat@ 80 micr. DFT/coat;	240-300	-
4.3	Raw / Fresh water, Potable water and Fire water All internal surfaces, accessories and roof structures of cone and dome roof tanks					
4.3.1	-14 to 65	SSPC-SP-10	1 coat of PR-3 @ 100 microns. DFT/coat	2 coats of FP3A @ 100 micr. DFT/coat. (2x100=200)	300	Note-2

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4.4	De-mineralized water (DM) All internal surfaces, accessories and roof structures of cone and dome roof tanks					
4.4.1	-14 to 60	SSPC-SP-10	1 coat of PR-3@ 100micr. DFT/coat.	2 coats of FP-3C @ 200 micr. DFT/coat. (2x100=200)	400 - 450	-
4.4.2	61 to 150	SSPC-SP-10	1 coat of FP-10 primer@ 80 micr. DFT/coat.	1 coats of FP-10 intermediate coat @80micr. DFT/coat+ 1coat of FP-10 finish coat@ 80 micr. DFT/coat; (80+80=160)	240 - 300	-
4.5	**Hydrochloric Acid (HCl) 10%** All internal surfaces, accessories and roof structures of cone and dome roof tanks					
4.5.1	-14 to 60	SSPC-SP-10	None	Natural Rubber Lining	4.5 mm	-
4.6	**Aggressive Solvents like Hexane, Hexene, Benzene, Xylene and Toluene** All internal surfaces, accessories and roof structures of cone and dome roof tanks.					
4.6.1	-14 to 65	SSPC-SP-10	1 coat of FP-6 @ 75microns. DFT/coat	-	75	-
4.7	**Ethylene Glycol (EG) Tanks** Internal shell-full height, bottom plate, underside of roof and all accessories					
4.7.1	ALL	SSPC-SP-10	1 coat of FP-10 primer@ 80micr. DFT/coat.	31 coats of Vinyl chloride Co-polymer Amercoat 23 @75micr. DFT/coat (3x75=225)	225	-
4.8	**Inside pontoon and inside of double deck of all tanks floating roofs**					
4.8.1	-14 to 80	SSPC-SP-3	1 coat of FP-5@ 100micr. DFT/coat.	1 coats of FP-5 coat @100micr. DFT/coat	200	-
4.9	**Wet Slops, Amine Solutions, Sour water, Water draw off** All internal surfaces, accessories and roof structures of Cone and Dome roof tanks.					

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4.9.1	-14 to 90	SSPC-SP-10	1 coat of Novolac Phenolic Epoxy Primer@ 125micr. DFT/coat.	1coat of Novolac Phenolic Epoxy finish coat@ 125 micr. DFT/coat; (80+80=160)	250	-
4.10	**Vacuum Residue, Fuel oil, Dry Slop, Bitumen and other High Temperature Hydrocarbon Liquids.** Underside of floating roof, internal surface of cone roof, bottom plate, inside of bare shell - including wetted and non-wetted surfaces, oil side surfaces of deck plates, oil side surfaces of pontoons, roof structures, structural steel and ladders.					
4.10.1	Up to 150	SSPC-SP-10	1 coat of FP-12 Primer@ 125micr. DFT/coat.	1 coats of FP-12 intermediate coat @125micr. DFT/coat+ 1coat of FP-12 finish coat@ 125 micr. DFT/coat; (125+125=250)	375	Note-3
4.11	**Alkalis up to 50 % Concentration** All internal surfaces accessories and roof structures of cone and dome roof tanks					
4.11.1	Up to 60	SSPC-SP-10	1 coats of Novolac Phenolic Epoxy primer @125micr. DFT/coat.	1coats of Novolac Phenolic Epoxy @100micr. DFT/coat. (1x125=1250)	250	-

Notes:

1. FP-6 shall be suitable and resistant for immersion service for the respective Hydrocarbons.
2. FP-3A shall be suitable for drinking water service and should have competent authority certification.
3. This system can be used where maximum operating temperature is below 150°C and design temperature is up to 200°C. Cases of operating temperature above 150°C are not covered in this spec; such cases shall be covered in the job specifications.

TABLE -05

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PAINTING SYSTEM FOR EXTERNAL SURFACE OF UNDERGROUND PIPING AND VESSELS IN UNITS AND OFFSITES (Carbon Steel)

Sl. No.	Temp.in °C	Surface Preparation & Shop Primer	Coating System (Field)		Total Final DFT in Microns (min.)	Remarks
			Surface Preparation & Primer	Finish Coat		
5.1	**External surface of non-insulated underground piping**					
5.1.1	25 to 65	-	SSPC-SP-10; Three layer polyethylene coating, thickness as per JSS for coating.			
5 .1.2	66 to 150	-	SSPC-SP-10; 1 coat of FP-12 primer @ 125micr. DFT/coat.	1 coats of FP-12 intermediate coat @125micr. DFT/coat+ 1coat of FP-12 finish coat @ 125 micr. DFT/coat;	375	-
5.1.3	151 to 400	-	SSPC-SP-10; 1 coat of FP-11 primer @ 125micr. DFT/coat.	1 coat of FP-11 finish coat @ 125micr. DFT/coat.	250	-
5.2	**External surface of non-insulated underground storage vessels**					
5.2.1	-14 to 80	SSPC-SP-10; 1 coat of FP-6 @ 65-75 micr. DFT/coat.	-	3 coat of FP-4 @ 100 micr. DFT/coat.	365-375	-
5.2.2	81 to 150	SSPC-SP-10; 1 coat of FP-6 @ 125 micr. DFT/coat.	-	1 coat of FP-12 Intermediate coat @ 125micr. DFT/coat+ 1coat of FP-12 finish coat @ 125 micr. DFT/coat;	375	-
5.2.3	151 to 400	SSPC-SP-10; 1 coat of FP-11 @ 125 micr. DFT/coat.	-	1 coats of FP-11 finish coat @125micr. DFT/coat	250	-

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TABLE -06
PAINTING SYSTEM FOR INTERNAL PROTECTION OF COMPONENTS OF COOLERS / CONDENSERS IN FRESH WATER SERVICE IN UNITS AND OFFSITES (Carbon Steel)

Sl. No.	Temp.in °C	Surface Preparation & Shop Primer	Coating System (Field)		Total Final DFT in Microns (min.)	Remarks
			Surface Preparation & Primer	Finish Coat		
6.1	**Fresh water boxes, channels, partition plates, end covers and tube sheets etc.**					
6.1.1.	Up to 80	SSPC-SP-10;	1 coat of FP-10 @ 80micr.	2 coat of FP-10@ 80 micr. DFT/coat;	240	-
6.1.2.	80 to 140	SSPC-SP-10;	-	1Coat of glass Fibre Reinforced **Novolac** epoxy of 1.5mm DFT	1500	-

TABLE -07
PAINTING SYSTEM FOR INTERNAL PROTECTION OF COMPONENTS OF COOLERS / CONDENSERS IN FRESH WATER SERVICE IN UNITS AND OFFSITES (Stainless Steel, Duplex Stainless Steel, Non-ferrous materials & Galvanized Steel)

Sl. No.	Temp.in °C	Surface Preparation & Shop Primer	Coating System (Field)		Total Final DFT in Microns (min.)	Remarks
			Surface Preparation & Primer	Finish Coat		
7.1	Up to 80	Sweep Blasting	1 coat of FP-10 @ 80micr. DFT/coat;	1 coat of FP-105@ 80 micr. DFT/coat;	160	-
7.2.	8 0 to 140	Sweep Blasting	-	1Coat of glass Fibre Reinforced **Novolac** epoxy of 1.5mm DFT	1500	-

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TABLE -08

PAINTING SYSTEM FOR EFFLUENT TREATMENT PLANTS (ETP)

Sl. No.	Temp.in °C	Surface Preparation	Coating System		Total DFT in Microns	Remarks
			Primer	Finish Coat		
8.1	**External Surface of C.S./ M.S. items screens, walk way, bridges, baffles, dual media filters, Vertical pumps, piping in treated effluent sump, bio sludge pump,**					
8.1.1	-14 to 80	SSPC-SP-10	1 coat of FP-6 @ 65-75 micr. DFT/coat	2 coats of FP-3A@100 micr. DFT/coat+ 1coat of FP-1 @ 40 micr. DFT/coat; (2xl00+40=240)	305 - 315	
8.2	**Internal surfaces of CS/MS Items: Bio-sludge sump, Filter feed sump, Process sump, Sanitary sump, Transfer sump, Sludge, Slop oil tank, scrapping mechanism in Clarifier**					
8.2.1	-14 to 80	SSPC-SP-10	1 coat of FP-6 @ 65-75 micr. DFT/ coat.	3 coats of FP-3A @100 micr. DFT/coat (3x100=300)	365 - 375	See * below
8.3	**R.C.C./concrete surfaces exposed to effluent water / liquid such as tanks, structures, drains etc. in process sump, TPI separator (Process and oil), Aeration tank and Transfer sump etc.**					
8.3.1	-14 to 80	Blast cleaning to SSPC-SP guide lines and Acid etching with 10-15% HCl acid followed by thorough water washing.	Epoxy Screed lining		3mm	Epoxy screed lining shall be applied as per specific manufacturer and Engineer in charge instructions.
8.4	**C.S/ M.S Dual media filters (Internal), Chemical dosing tanks(internal) such as Di Ammonium Phosphate (DAP) and Urea**					
8.4.1	Up to 60	SSPC-SP-10	Natural Rubber Lining (As per IS 4682, Part I)		4.5mm	Natural Rubber lining shall be applied as per specific manufacturer and Engineer in charge instructions.

- The paint /coating manufacturers shall provide their Quality control test certificate of coating materials (F-3A) for immersion service of the exposed effluent given in 9.2.

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TABLE -09

COATING SYSTEMS FOR GRATINGS, ROLLING & STATIONERY LADDERS, SPIRAL STAIRWAYS AND HAND RAILS IN ALL LOCATION

Sl. No.	Temp.in °C	Coating System	Total DFT in Microns (min,)
9.1	Up to 60	1 coat of High Build Epoxy @ 75 micr. DFT/Coat and 1 coat pf FP-1 @ 50 micr. DFT/Coat	80 microns of finish coat (excluding the thickness of galvanizing) 125

NOTES:

1. No galvanized specimen shall have thickness less than 125 microns.
2. Repair of the damaged area of galvanized coatings due to welding during erection shall be carried out as per recommended practice IS 11759 using cold galvanizing spray process. Organic Paint systems are not acceptable for repair.
3. Approved Cold Galvanizing manufacturers are **ZINGA, LOCKTITE** or **Z.R.C**.

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TABLE -10

REPAIR OF PRE-ERECTION / PRE-FABRICATION OR SHOP PRIMER AFTER ERECTION / WELDING OF UNINSULATED PIPING AND EQUIPMENT IN ALL ENVIRONMENTS. (CS, LTCS & low allow steel)

Sl. No.	Temp.in °C	Surface Preparation	Coating System	Total DFT in Micr (min.)	Remarks
10.1	-90 to 400	SSPC-SP-3	1coat of FP-6	65-75	See note below and clause 5.9.3
10.2	401 to 550	SSPC-SP-3	1coat of FP-8	20	

- The repair of pre-erection / pre-fabrication or Shop Primer given above shall be done for all items requiring repairs. In case the damages of primer are severe and spread over large area, entire primer shall be removed by blasting to achieve SSPC-SP-10 and surfaces to be primed again with FP-6 or FP-8 as applicable.
- The primer shall be quickly removed from damaged area by mechanical scraping and emery paper conforming to SSPC-SP-3 to expose the white metal. Blast cleans the surface, if possible. Feather the primed surface over the intact adjacent surface(approximately 50mm) surrounding the damaged area by emery paper.

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TABLE -11

PAINTING SYSTEMS FOR UN-INSULATED PIPING, EQUIPMENT, TANKS & PACKAGE UNITS IN PROCESS UNITS AND OFFSITES
(STAINLESS STEEL)

Sl. No.	Temp.in °C	Surface Preparation	Painting System (Post-erection / Field)		Total Final DFT in Micr. (min.)	Remarks
			Primer	Finish Coat		
11.1	0 to 120	SSPC-SP-6 *'Sweep blast' using Aluminium Oxide or Garnet abrasive media* SSPC-SP-1 *With non-chloride solvent*	2 Coats of FP-10 @ 125 micr. DFT / Coat 2x125=250	1 Coat of FP-1 @ 75 micr. DFT / Coat 1x75 =75	325	
11.2	121 to 200	SSPC-SP-6 *'Sweep blast' using Aluminium Oxide or Garnet abrasive media* SSPC-SP-1 *With non-chloride solvent*	2 Coats of FP-10 @ 125 micr. DFT / Coat 2x125=250	2 Coats of Silicon Acrylic @ 20 micr. DFT / Coat 2x20 =40	290	

- Surface preparation of stainless steel shall be in accordance with IS 8504-2, Sa 1 light blast cleaning to achieve a 25-40µm profile.
- Surface shall be thoroughly degreased using an appropriate emulsion cleaner and abrasive cleaned (sweep blasting) to create a sufficient anchor profile.Abrasive for blast cleaning of stainless steel surfaces shall be performed with a suitable non-metallic abrasive such as aluminum oxide. When hand or power tool cleaning is required on stainless steel, only stainless steel wire brushes that have not been previously used on carbon steel surface must be used. All coatings and solvents for use on stainless steel shall be free of substances such as chlorides and other halides, sulfur, and shall be free of low melting point metals (zinc,aluminum, tin and lead).
- Only air curing heat resistant silicone aluminium paints shall be applied, post heat curing materials are not acceptable
- The colour bands shall be applied over the Aluminum paint as per the Color coding system requirement for specific service of piping.
- Finish coat at field may be applied at shop itself and touch-up will be done at field.

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14. FINISH COLOUR SCHEDULE

14.1 General

This section covers the general colour requirements for structural steelwork and equipment with operating temperatures below 120 deg.C:

Structural Steel, Tanks, Spheres, Electrical Equipment		
Sl. No:	**Service**	**Shade – Shade Number**
N/A	Structural Steelwork	Light Grey – RAL 7035
N/A	Spheres and Storage tanks	White – RAL 9003
N/A	Electrical Switch Boards, Cable Conduit and Transformers and all other electrical equipment	Manufacturers Painting standard (including RAL 7035) conforming to relevant code and practices prevailing in the country of manufacture
Un-insulated Equipment, Tanks and Structures		
Sl. No:	**Service**	**Shade – Shade Number**
-	Loading Arms (i) Structural Steel (ii) Arms	 Light Grey – RAL 7035 Yellow – RAL 1023
96	Heater Structure	Signal Grey – RAL 7004
97	Heater Casing	Aluminium – RAL 9006
98	Vessels and Columns	Aluminium – RAL 9006
99	Hydrogen Bullets	Antique Pink – RAL 3014
100	LPG Vessels	Oxide Red – RAL 3009
101	SO_2 Vessel	Yellow – RAL 1023
102	Heat Exchangers	Aluminium – RAL 9006
103	FO Tank and Hot Tanks	Black – RAL 9017
104	All Other Tanks	Aluminium – RAL 9006
105	Caustic/Amine/Acid Tanks	Gold/Yellow – RAL 1004
106	Sour Water	Sky Blue – RAL 5015
107	Outer Surface in Boiler House	Aluminium – RAL 9006
108	Steam Turbine	Aluminium – RAL 9006
109	Compressors and Blowers	Dk Grey BS4800 18 B 25
110	Pumps	Cobalt Blue RAL – 5013
111	Motors (Except Fire Motors)	Bluish Green RAL 5021
112	Hand Railing	Red – RAL 3001
113	Staircase, Ladders and Walkways	Black – RAL 9017
114	Load lifting equipment & mono rails etc.	Brown – RAL 8003

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Safety Colour Schemes		
Sl. No:	**Service**	**Shade – Shade Number**
115	General Structure	Black – RAL 9017
116	Switchgear (including inside sub- station)	Light Grey RAL 7035
117	Dangerous Obstruction	Alternate Black (RAL 9017) and Orange (RAL 2008) Diagonal Banding
118	Dangerous or Exposed Parts of Machinery	Orange – RAL 2008

14.2 Pipe Colour Bands

This section covers the requirements for a colour scheme identifying the contents of piping carrying products. The colour coding system is based on international specfications such as ASME, ANSI, BS and Indian Standars including IOCL's existing specification for colour coding.

The system of coding consists of a ground/base colour superimposed with secondary colour bands. The ground colour identifies the basic nature of the service and the secondary colour bands distinguish the particular service product contained.

Ground colour shall be applied to the entire length of un-insulated piping.

The ground colours and secondary banding colours are defined in section 14.4.

The frequency of banding on un-insulated pipe shall be as follows:

- Unit Area – Bands at intervals of 6 metres
- Offsite Area – Bands at intervals of 10 metres

Each pipe segment will have a minimum of 1 identification band irrespective of length.

Colour bands of the correct size shall be applied to the pipe, at:

- Both sides of valves, tees and other fittings
- Where pipes enter and emerge through walls
- Where pipes enter and emerge from walkway overpasses and battery limits
- At uniform intervals along long sections of pipe
- Adjacent to tanks, vessels and pumps.

Insulated piping shall received ground colouring and coloured (secondary) identification bands at a minimum of either side of valves, flanges and the like, at each change in flow direction and at no greater than 6 metre intervals, ground colours should be 2 metres long.

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Secondary colours are to be applied using adhesive plastic tapes to the specificied colour.

Bands widths are shown below for different pipe diameters and are to be spaced 25mm apart when two bands (or more) are used:

Outside diameter of pipe or covering (inches)	Width of colour bands (mm)
< 2”	200
2” – 4”	300
6” – 8”	600
>= 10”	800

Bands shall also be displayed conspicuously near walkways, both sides of culverts, tanks, dykes, vessels, suction and discharge of pumps/compressors, unit battery limit, near valves of line, etc.,

14.3 Identification Lettering

Name of service and direction of flow, for all lines shall be positioned at the following locations:

- Offsite lines: Both sides of culverts, any one side of walkways, near tank dykes, at tank inlet/outlet points and suction/discharge pumps/compressors.
- Unit lines: At the battery limit, suction/discharge of pumps/compressors, near vessels, columns, tanks, exchangers etc.,

Identification/legend letter sizes on piping shall depend on the pipe diameter. Either white or black letters are to be selected so as to afford maximum contrast with the identification band colour.

Outside diameter of pipe or covering (inches)	Size of legend letters (mm)
< 2”	19
2” – 4”	32
6” – 8”	64
>= 10”	89

Pipe contents and direction of flow is to be identified using legend letters and arrows, any hazard must be identified clearly by the legend.

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Size of letters (stenciled or pre-formed adhesive) for equipment shall be:

Equipment	Size of legend letters
Column and vessel	150 mm (height)
Pump, compressor and other machinery	50 mm (height)

Lettering shall be black on pipes painted with light shade colours and white on pipes painted with dark shade colours ti give good contrast.

14.4 IOCL Paint Colour Code and Banding

The following base / ground and secondary colour designation for identification of various important services shall be followed:

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Sl. No:	Service	Base/Ground Colour	Secondary Band Colours
	Hydrocarbon Lines – (Un-insulated)		
1.	Crude Sour	Dk Grey BS4800 18 B 25	(x1) Orange – RAL 2008
2.	Crude Sweet	Dk Grey BS4800 18 B 25	(x1) Red – RAL 3001
3.	Lube Oils	Dk Grey BS4800 18 B 25	(x1) Green – RAL 6002
4.	Flare Line	Aluminium – RAL 9006	Aluminium – RAL 9006
5.	L.P.G.	Orange – RAL 2008	(x1) Oxide Red – RAL 3009
6.	Propylene	Orange – RAL 2008	(x2) Oxford Blue – RAL 5003
7.	Naptha	Orange – RAL 2008	(x1) Green – RAL 6002
8.	M.S.	Orange – RAL 2008	(x1) Dk Grey BS4800 18 B 25
9.	AV. Gasoline (96 RON)	Orange – RAL 2008	(x1) Green – RAL 6002 + (x1) White – RAL 9003 + (x1) Red – RAL 3001
10.	Gasoline (regular, leaded)	Orange – RAL 2008	(x1) Black – RAL 9017
11.	Gasoline (premium, leaded)	Orange – RAL 2008	(x1) Blue – RAL 5017
12.	Gasoline (white)	Orange – RAL 2008	(x1) White – RAL 9003
13.	Gasoline (aviation 100/130)	Orange – RAL 2008	(x1) Red – RAL 3001
14.	Gasoline (aviation 115/145)	Orange – RAL 2008	(x1) Purple – RAL 4006
15.	N-Pentane	Orange – RAL 2008	(x2) Blue – RAL 5017
16.	Diesel Oil (white)	Oxide Red – RAL 3009	(x1) White – RAL 9003
17.	Diesel Oil (black)	Oxide Red – RAL 3009	(x1) Yellow – RAL 1023
18.	Kerosene	Oxide Red – RAL 3009	(x1) Green – RAL 6002
19.	HY. Kero	Oxide Red – RAL 3009	(x2) Green – RAL 6002
20.	Disulfide Oil (Ex-Merox)	Oxide Red – RAL 3009	(x1) Black – RAL 9017
21.	M.T.O.	Oxide Red – RAL 3009	(x3) Green – RAL 6002
22.	DHPPA	Oxide Red – RAL 3009	(x2) White – RAL 9003
23.	Flushing Oil	Oxide Red – RAL 3009	(x2) Black – RAL 9017
24.	Lab FS	Oxide Red – RAL 3009	(x2) Dk Grey BS4800 18 B 25
25.	Lab RS	Oxide Red – RAL 3009	(x3) Dk Grey BS4800 18 B 25
26.	Lab (Off. Spec.)	Oxide Red – RAL 3009	(x1) Lt Grey RAL 7036
27.	N-Paraffin	Oxide Red – RAL 3009	(x1) Blue – RAL 5017
28.	Heavy Alkylate	Oxide Red – RAL 3009	(x1) Red – RAL 3001
29.	Blow Down, Vapour Line	Aluminium – RAL 9006	(x1) Brown – RAL 8003
30.	Blow Down	Aluminium – RAL 9006	(x2) Brown – RAL 8003

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Sl. No:	Service	Base/Ground Colour	Secondary Band Colours
31.	A.T.F.	Brown – RAL 8003	(x1) White – RAL 9003
32.	Toluene	Brown – RAL 8003	(x1) Yellow – RAL 1023
33.	Benzene	Brown – RAL 8003	(x1) Green – RAL 6002
34.	Lab Product	Brown – RAL 8003	(x1) Blue – RAL 5017
35.	Fuel Oil	Black – RAL 9017	(x1) Yellow – RAL 1023
36.	Fuel Oil (aromatic rich)	Black – RAL 9017	(x2) Yellow – RAL 1023
37.	Asphalt	Black – RAL 9017	(x1) White – RAL 9003
38.	Slop and Waste Oils	Black – RAL 9017	(x1) Orange – RAL 2008
39.	Slop Aromatic	Black – RAL 9017	(x2) Orange – RAL 2008

	Chemical Lines (Un-insulated)		
40.	Tri-Sodium Phosphate	Yellow – RAL 1023	(x1) Violet – RAL 4008
41.	Caustic Soda	Yellow – RAL 1023	(x1) Black – RAL 9017
42.	Sodium Chloride	Yellow – RAL 1023	(x1) White – RAL 9003
43.	Ammonia	Yellow – RAL 1023	(x1) Blue – RAL 5017
44.	Corrosion Inhibitor	Yellow – RAL 1023	(x1) Aluminium – RAL 9006
45.	Hexameta Phosphate	Yellow – RAL 1023	(x2) Black – RAL 9017
46.	Acid Lines	Gold/Yellow – RAL 1004	(x1) Red – RAL 3001
47.	Rich Amine	Yellow – RAL 1023	(x2) Blue – RAL 5017
48.	Lean Amine	Yellow – RAL 1023	(x3) Blue – RAL 5017
49.	Solvent	Yellow – RAL 1023	(x1) Green – RAL 6002
50.	LCS	Yellow – RAL 1023	(x1) Grey – RAL 7001

	Water Lines (Un-insulated)		
51.	Raw Water	Sky Blue – RAL 5015	(x1) Black – RAL 9017
52.	Industrial Water	Sky Blue – RAL 5015	(x2) Red – RAL 3001
53.	Treated Water	Sky Blue – RAL 5015	(x1) Oxide Red – RAL 3009
54.	Drinking Water	Sky Blue – RAL 5015	(x1) Green – RAL 6002
55.	Cooling Water	Sky Blue – RAL 5015	(x1) Pale Brown – RAL 8025
56.	Service Water	Sky Blue – RAL 5015	(x1) Red – RAL 3001
57.	Tempered Water	Sky Blue – RAL 5015	(x2) Green – RAL 6002
58.	DM Water	Sky Blue – RAL 5015	(x1) Aluminium – RAL 9006
59.	DM Water above 150ºF	Sky Blue – RAL 5015	(x2) Black – RAL 9017
60.	Sour Water	Sky Blue – RAL 5015	(x2) Yellow – RAL 1023

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Sl. No:	Service	Base/Ground Colour	Secondary Band Colours
61.	Stripped Water	Sky Blue – RAL 5015	(x2) Blue – RAL 5017
62.	ETP Treated Water	Sky Blue – RAL 5015	(x2) Oxide Red – RAL 3009

	Fire Protection System (Above Ground)		
63.	Fire Water, Foam and Extinguishers	Red – RAL 3001	Red – RAL 3001

	Air and Other Gas Lines (Un-insulated)		
64.	Service Air	May Green – RAL 6017	(x1) Red – RAL 3001
65.	Instrument Air	May Green – RAL 6017	(x1) Black – RAL 9017
66.	Nitrogen	May Green – RAL 6017	(x1) Orange – RAL 2008
67.	Freon	May Green – RAL 6017	(x1) Yellow – RAL 1023
68.	Chlorine	Yellow – RAL 1023	(x1) Oxide Red – RAL 3009
69.	SO_2	Yellow – RAL 1023	(x2) White – RAL 9003
70.	H_2S	Orange – RAL 2008	(x2) Oxide Red – RAL 3009
71.	Gas (fuel)	Orange – RAL 2008	(x1) Aluminium – RAL 9006
72.	Gas (sour)	Orange – RAL 2008	(x2) Aluminium – RAL 9006
73.	Gas (sweet)	Orange – RAL 2008	(x1) Red – RAL 3001
74.	Hydrogen	Orange – RAL 2008	(x1) May Green – RAL 6017

	Steam and Condensate Lines (Un-insulated)		
75.	HP Steam &VHP Steam Line	Aluminium – RAL 9006	(x1) Yellow – RAL 1023
76.	MP Steam	Aluminium – RAL 9006	(x1) Red – RAL 3001
77.	MLP Steam	Aluminium – RAL 9006	(x1) Orange – RAL 2008
78.	LP Steam	Aluminium – RAL 9006	(x1) Green – RAL 6002
79.	Condensate	Sky Blue – RAL 5015	(x1) White – RAL 9003
80.	Condensate above 150ºF	Sky Blue – RAL 5015	(x3) Oxide Red – RAL 3009
81.	BFW	Sky Blue – RAL 5015	(x2) Traffic Red – RAL 3020
Note: For all insulated steam lines, the colour coding shall be followed as given for un-insulated lines with the specified length of colour bands			

	Insulated Hydrocarbon Lines		
82.	IFO Supply	Black – RAL 9017	(x1) Yellow – RAL 1023
83.	IFO Return	Black – RAL 9017	(x1) Green – RAL 6002
84.	HPS	Black – RAL 9017	(x1) Red – RAL 3001
85.	Bitumen	Black – RAL 9017	(x2) Red – RAL 3001

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Sl. No:	Service	Base/Ground Colour	Secondary Band Colours
86.	CLO	Black – RAL 9017	(x1) Brown – RAL 8003
87.	VB Tar	Black – RAL 9017	(x2) Brown – RAL 8003
88.	VR AM (Bitumen/VBU Feed)	Black – RAL 9017	(x1) Blue – RAL 5017
89.	VR BH	Black – RAL 9017	(x2) Blue – RAL 5017
90.	VAC. Slop	Black – RAL 9017	(x1) White – RAL 9003
91.	Slop	Black – RAL 9017	(x1) Orange – RAL 2008
92.	Crude Sweet	Dk Grey BS4800 18 B 25	(x1) Red – RAL 3001
93.	Crude Sour	Dk Grey BS4800 18 B 25	(x1) Orange – RAL 2008
94.	VGO/HCU Feed	Oxide Red – RAL 3009	(x1) Signal Grey – RAL 7004
95.	OHCU Bottom/FCCU Feed	Oxide Red – RAL 3009	(x2) Signal Grey – RAL 7004

15. STORAGE

All paints and painting materials shall be stored only in rooms to be arranged by contractor and approved by Engineer in charge for the purpose. All necessary precautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent building. A signboard bearing the word "**Paint Storage – No Naked Light - Highly Inflammable**" shall be clearly displayed outside. Manufacturer's recommendation shall be followed for storage of paint materials.

16. QUALITY CONTROL, INSPECTION & TESTING

- All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable
- The contractor must produce Test Certificate from Pre-Qualified Paint Manufacturer for various tests as specified in this document, for each batch and for each category of product. The Engineer in charge shall have the right to test wet samples of paint from each batch at random for verifying quality of paint supplied. Contractor shall arrange to have such tests, when called for by Engineer in charge, performed at his cost any one of the independent laboratories listed in this document.

  Samples for the test will be drawn at random in presence of Engineer in charge or his

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representations. Following tests to be carried out if called for by Engineer in charge:

- Specific Gravity
- % solids by weight (% zinc content in case of inorganic or organic zinc primer)
- Drying time (touch dry & full curing)
- Adhesion
- Flexibility
- Hardness
- Storage stability (pot life)

Test methods for above tests shall be as per relevant ASTM or ISO Standard.

- The painting work shall be subject to inspection by Engineer in charge at all times. In particular, following stage-wise inspection will be performed and contractor shall offer the work for inspection and approval of every stage before proceeding with the next stage. The record of inspection shall be maintained in the registers. Stages of inspection are as follows:
  - Surface preparation
  - Primer application
  - Each coat of paint

During surface preparation, following tests are to be carried out:

- Test for absence oil and grease after degreasing before blasting.
- Tests for surface finish of blasted surface shall be done by visual inspection using SSPC-VISl. Clear cellophane tape test as per ISO 8502-9 shall be used to confirm absence of dust on blasted surface. Checks shall be done on each component at least once per 200 m2 of blasted surface and minimum of 3 checks per shift.
- Test for presence of soluble salt as per method ISO 8502-9. Maximum allowable salt content shall be considered 20 mg /m^2. Checks shall be done on each component at least once per 200 m2 of blasted surface and minimum of 3 checks per shift. In case salt exceeds specified limit, the contaminated surface shall be cleaned by method as per Annexure-C of ISO: 12944-4 (water cleaning). After cleaning surface shall be retested for salt after drying.
- Blast profile measurement
- Test for blasting Media and Blasting air- In addition to above, record should include type of shop primer already applied on equipment e.g. zinc silicate, or zinc rich epoxy, or zinc phosphate.

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Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of Engineer in charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work, contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make- up the DFT specified without any extra cost to owner, the extra coat should have prior approval of Engineer in charge.

- **Primer Application**: After surface preparation, the primer should be applied to cover the crevices, comers, sharp edges etc. in the presence of inspector nominated by Engineer in charge.
- The shades of successive coats should be slightly different in colour in order to ensure application of individual coats, the thickness of each coat and complete coverage should be checked as per provision of this specification. This should be approved by Engineer in charge before application of successive coats.
- The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring.
    - Dry film thickness of each coat,
    - Surface profile gauge for checking of surface profile in case of sand blasting.
    - Holiday detectors and pinhole detector and protector whenever required for checking in case of immersion conditions.
- Prior to application of paints on surfaces of chimneys, the thickness of the individual coat shall be checked by application of each coat of same paint on M.S.test panel. The thickness of Paint on test panels shall be determined by using gauge such as 'Elkometer'. The thickness of each coat shall be checked as per provision of this specification. This shall be approved by Engineer in charge before application of paints on surface of chimney.
- At the discretion of Engineer in charge, the paint manufacturer must provide the expert technical service at site as and when required. This service should be free of cost and without any obligation to the owner, as it would be in the interest of the manufacturer to ensure that both surface preparation and application are carried out as per their recommendations. The contractor is responsible to arrange the same.
- Final inspection of finished coating shall consist of measurement of:
    - Paint dry film thickness (DFT),

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- Adhesion, and,
- Holiday detection check as well as for finish and workmanship.

- Coating DFT measurement shall be as per ISO: 2808. Type II electromagnetic gauges should be used for ferrous substrates. DFT gauge calibration, number of measurement shall be as per SSPC-PA 2. Measured DFT shall be within + 10% of the dry film thickness, specified in the specifications.
- Adhesion of the primer to the steel substrate and intercoat adhesion of the subsequent coat(s) after curing for at least a week after application of the topcoat shall be examined by a knife-test in accordance with ASTM D6677. For the knife test, if the rating is better than 8, the adhesion is considered acceptable. The adhesion is detective and:-tested areas shall be repaired afterward using the spot repair procedure. Alternatively, the applicator may perform the adhesion test on a steel coupon coated using the same surface preparation and coating application procedure as the work piece. Adhesion testing shall be carried out for each component at least once per 200 m2 (2000 ft2) of coated surface.
- Holiday testing shall be conducted in accordance with NACE SP0188. For immersion services, 100% of coated area shall be inspected for holidays. For atmospheric exposure, 10% of coated area which must include weld seams, comers and edges to be holiday tested. Voltage at which test is to be carried out will depend upon DFT of coating being tested and shall be as per NACE SP0188. Any holiday is unacceptable and should be marked and repaired immediately.
- The contractor shall arrange for spot checking of paint materials for Specific gravity, glow time (ford cup) and spreading rate.
- **Final Inspection of coating system:**

  A final inspection shall be conducted prior to the acceptance of the work. The Contractor and the Owner / Engineer in charge shall both be present and they shall sign an agreed inspection report. Such reports shall include:

  - General
    - Names of the painting Contractor and the responsible personnel
    - Dates when work was performed
  - Painting Materials

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- Information on painting materials being applied
- Condition of painting materials received

- Environmental Conditions
  - Weather and ambient conditions
  - Painting periods

- Surface Preparation
  - Condition of surface before preparation
  - Tools and methods used to prepare surface
  - Condition of surface after preparation

- Painting Application
  - Equipment used
  - Mixing procedure prior to application
  - Coating application techniques used

- Testing
  - Type and calibration of inspection instruments used
  - Type of quality control tests performed, and results

17. GUARANTEE

The Contractor-shall guarantee that the chemical and physical properties of paint material used are in accordance with the specifications contained herein / to be provided during execution of work.

18. QUALIFICATION CRITERIA OF PAINTING CONTRACTOR / SUB-CONTRACTOR

Painting contractor who is awarded the contract for painting by the Owner, must have necessary equipment's, machinery, tools and tackles for surface preparation, paint application and

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inspection. The contractor must have qualified, trained and experienced surface preparator, paint applicator, inspector and supervisors. The Contractor supervisor, inspector, surface preparator and paint applicator must be conversant with the standards referred in this specification.

19. QUALIFICATION / ACCEPTANCE CRITERIA FOR PAINT COATING SYSTEM

- Pre-Qualification of Paint Coating Manufacturer and his Products

  Paint / coating manufacture meeting the following requirements shall be considered for supply of their products. Contractor is advised to select coating manufacturer. Only after obtaining prequalification from Owner for the manufacturer based on following requirements. Even those manufacturers, whose names are appearing elsewhere in the tender document, under the list of "Owner Recommended or Approved Vendors", will also be required to meet the following prequalification requirements.

  - Manufacturer should have been in continuous business of paint / coating formulation and manufacturer for at least past 5 years.
  - Manufacturer should possess past experience of supplying his products to hydrocarbon processing industry or offshore platforms in the past 5 years.
  - Coating manufacturer should have supplied at least 10000 litre of an individual product to hydrocarbon processing industry or offshore platform.
  - The manufacturer's manufacturing procedure & QA/QC system shall meet ISO 9001 Requirements and preferably should possess ISO 14000 certificate.
  - The Quality control set up should be manned by qualified paint technologists whose bio data should be sent along with quality control organization chart.

- Pre-Qualification Testing:

  Manufacturer should have got his products tested at least one time in last 3 years at a reputed independent laboratory for the following test items. Test certificates which are more than 3 years old will not be considered.

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Test	Test Method
Specific gravity	ASTM D1475
Dipping properties	ASTM D823
Film characteristics	-
Solid content by weight	ASTM D2369
Drying Time	ASTM D1640
Flexibility	ASTM D1737 / D522
Hardness	ASTM D3363
Adhesion	ASTM D2197
Abrasion resistance	ASTM D968/ D1044
DFT/coat	As per SSPC guidelines
Storage Stability	ASTM D1849
Resistance to moisture vapour permeability for 2000 hrs	ASTMD2247
Cyclic Test for the duration of 4200 h (25 cycles a 168 hours)	ASTM D5894
% Zn in Dry film for Inorganic Zinc Silicate primer	-
Chemical Resistance test - 10% & 40% NaOH (applicable only for F-6 & F-15) - 10% H_2SO_4 (applicable only for F-6 & F-15) - 10% Nitric Acid test (applicable only for F-6 & F-15) - Benzene / Toluene (applicable only for F-6 & F-15) - Kerosene (applicable only for F-6 & F-15) - Sea water (applicable only for F-6 & F-15) - MIBK test (applicable only for F-6 & F-15)	ASTM D543
Resistance to water using water immersion (applicable only for F6-, F-7, F-8, F-14 & F-15)	ASTM D870
Dry Heat Resistance test (applicable only for F-9, F-6AIB, F-2, F-15, F-16, Polysiloxane, heat;:resistance Al silicone)	ASTM D2485
Thermal shock resistance test (only for F-9, F-6, Polysiloxane)	ASTM D2485 - 91
Cathodic Disbondment Test	ASTM G42 @60 deg C

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- Each coating product to be qualified shall be identified by the following
  - An infrared scan (fingerprint), for Part A and B, each component as per ASTM D2621
  - Specific gravity of Base and curing agent (Ref. ISO 2811)
  - Ash content (ASTM 01650), volatile and non-volatile matters (ISO 3251) of each component
- The identification shall be carried out on the batch, which is used for the Pre-qualification testing. Pre-qualification of the products shall be carried out at an independent laboratory.
- Test shall be carried out at any one of the following laboratories and tests to be witnessed & certified by third party inspection agency (TUV, BY, DNV)

  IICT, Hyderabad
  HBTI, Kanpur
  DMSRDE, Kanpur
  BIS Laboratories
  UICT, Matunga, Mumbai
  RITES, Kolkata
  PDIL,-Sindri
  NTH, Kolkata
- Contractor shall furnish to Owner for approval / acceptance of all necessary documents / information including test certificates to prove that the paint manufacturers, from whom he intends to procure paint products, meet the various requirements for fulfilling the pre-qualification criteria as given above. The paint manufacturer shall be qualified and approved for supply after review / assessment of the submission made by the contractor.
- Contractor along with delivery of paint material has to furnish following information from paint manufacturer to Owner for acceptance / approval of products.

  a) Batch test certificates (Batch Testing)

  Contractor has to produce test certificate from paint manufacturer for each batch and for each category of product for the following test items. Test to be witnessed & certified by third party inspection agency. All test results must mention clearly the batch no. and category of product tested. Tests to be conducted for following properties:
  - Infrared scan for Part A and B, each component
  - Specific Gravity
  - % solids by weight (% zinc content in case of inorganic or organic zinc primer)

  b) Product information sheet Technical data sheet for each category of product.

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20. METHOD OF SAMPLING & DISPATCH FOR LABORATORY TESTING

(Pre-Qualification tests, Batch testing and Inspection testing)

Samples of coating materials should be submitted to the Govt. laboratory in sealed containers with batch no. and test certificate on regular format of manufacturer's testing laboratory. The sampling shall be certified and sealed by a certifying agency.

All test panels should be prepared by Govt. testing agency coloured photographs of test panels should be taken before and after the test and should be enclosed along with test report.

Sample batch no. and manufacturer's test certificate should be enclosed along with the report. Test report must contain details of observation and rusting if any, as per the testing code.

Manufacturers should intimate the company, details of sample submitted for testing, name of Govt. testing agency, date, and contact personnel of the govt. testing agency. At the end of the test the manufacturer should submit the test reports to the company for approval.

Coating systems for panel test shall be decided after discussion with Owner.

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JOB SUPPLY SPECIFICATION FOR VALVES

Pages modified in this revision : Pages 14

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			Karthikeyan Chokkalingam 2020.06.10 19:19:11 +05'30'	Loganathan Sudarsan 2020.06.10 19:36:18 +05'30'	Vaidyasubramaniam V 2020.06.11 11:23:18 +05'30'	Morischristopher Jesumarian 2020.06.12 00:43:28 +05'30'
C	10-JUNE-2020	ISSUED FOR DESIGN	CK	AS/SL	VV	JMC
B	22-JAN-2020	ISSUED FOR DESIGN	CK	SL	VV	JM
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1. INTRODUCTION

INDIAN OIL CORPORATION LIMITED (IOCL) has awarded Fax of Acceptance (FOA) dated 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India

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
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
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related
SRU	Sulphur Recovery Unit
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute

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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 and stainless steel valves of various types such as gate, globe, check, ball, plug, butterfly, diaphragm, needle and piston type valves commonly used in refineries, petro-chemical and other chemical / industrial plants.

Cast iron, non-metals, coated or lined valves or valves of special design / special materials etc. are not covered herein. However the specification may be used for any other valves 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
BW	Butt Weld
SW	Socket Weld

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SCRD	Screwed
DP	Dye-Penetrant Test
MP	Magnetic Particle Test
NDT	Non Destructive Testing
PMI	Positive Material Identification
IGC	Inter Granular Corrosion
HIC	Hydrogen Induced Cracking
SSC	Sulfide stress cracking
CRYO	Cryogenic
MOV	Motor Operated Valve
IBR	Indian Boiler Regulations
AARH	Arithmetic Average Roughness Height
BGO	Bevel Gear Operator
BHN	Brinell Hardness Number
DFT	Dry Film Thickness
ITP	Inspection Test Plan
TPI	Third Party Inspection
MOC	Material of Construction
IRN	Inspection release notification
HAZ	Heat affected Zone
PMS	Piping Material Specification
SMYS	Specified minimum yield strength

5. REFERENCE CODES & STANDARDS

The following codes shall be referred, 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. 6A	Specification For Wellhead and Christmas Tree Equipment
API. 6D	Pipeline Valves
API. 6FA	Fire Test for Valves
API. 594	Check Valves: Flanged, Lug, Wafer and Butt-Welding
API. 598	Valve Inspection and Testing
API. 599	Metal Plug valves – Flanged, Threaded and Welding Ends

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API. 600	Bolted Bonnet Steel Gate Valves for Petroleum and Natural Gas Industries
API. 602 / ISO-15761	Steel Gate, Globe and Check Valves for Sizes DN100 and Smaller for Petroleum and Natural Gas Industries
API. 607	Fire Test for Quarter-Turn Valves and valves equipped with Non-mettalic seats
API. 608	Metal ball valves – Flanged, threaded, and welding ends
API. 609	Butterfly Valves: Double Flanged, Lug and Wafer Type
ASME Sec. V	ASME Boiler and Pressure Vessel Code- Nondestructive Exam.
ASME Sec-VIII Div-1 Appendix-2.	ASME Boiler and Pressure Vessel Code
ASME B1.1	Unified Inch Screw Threads
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME.B 16.5	Pipe Flanges and Flanged Fittings
ASME.B 16.10	Face To Face and End To End Dimensions of Valves
ASME.B 16.11	Forged Fittings Socket-Welding and Threaded
ASME.B 16.25	Butt Welding Ends
ASME. B 16.34	Valves – Flanged, Threaded, and Welding End
ASME.B 16.47	Large Diameter Steel Flanges
ASME.B 31.1	Power Piping
ASME.B 31.3	Process Piping
ASME.B 46.1	Surface Texture (Surface Roughness, Waviness, and Lay)
ASTM A 123	Zinc " Hot Dip Galvanized" Coating on Iron and steel Products
MSS-SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
MSS-SP-25	Standard Marking System for Valves, Fittings, Flanges & Unions
MSS-SP-44	Steel Pipeline Flanges
MSS-SP-45	By-Pass and Drain Connections
MSS-SP-80	Bronze Gate, Globe, Angle and Check Valves
MSS- SP-134	Valves for Cryogenic Service including Requirements for Body / Bonnet Extensions
BS -1414	Specification for Steel Wedge Gate Valves (Flanged and Butt-Welding Ends)
BS-1868	Specification for Steel Check Valves (Flanged and Butt-Welding Ends)

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BS-1873	Specification for Steel Globe and Globe Stop and Check Valves (Flanged and Butt-Welding Ends)
BS- 6364	Specification for Valves for Cryogenic Service
ISO -5211	Industrial valves -- Part-turn Actuator Attachments
ISO -10497 (Superceded BS-6755-Part 2)	Testing of Valves- Fire Type Testing Requirements
ISO-15761 (Superceded BS-5352)	Steel Gate, Globe and Check Valves for Sizes DN 100 and Smaller
EN-12266-1 (Superceded BS-6755-1)	Industrial valves. Testing of Metallic Valves
ISO – 17292 (Superceded BS-5351)	Metal Ball Valves for The Petroleum, Petrochemical and Allied Industries
BS EN-10204	Metallic Products – Type of Inspection Documents
NACE-MR 0103	Material Resistant to Sulphide Stress Cracking in Corrosive Petroleum Refining Environments
MR-0175 / ISO -15156	Petroleum and Natural Gas Industries – Materials for Use In H2S-Containing Environments in Oil And Gas Production.
EN 558-1	Industrial Valves, Face to face and centre to face dimensions of metal valves for use in flanged pipe systems (Part-I: PN designated valves)
EN 558-2	Industrial Valves, Face to face and centre to face dimensions of metal valves for use in flanged pipe systems (Part-2: Class designated valves)
EN 12627	Industrial valves, Butt welding ends for steel valves

6. GENERAL REQUIREMENTS

- Valve shall be designed, manufactured, tested, inspected and marked as per the manufacturing standards, design codes and standards indicated in the respective valves specification mentioned in PMS.Any conflict between the requisition, enclosures, specifications and referred standards / codes 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. The drawings submitted for review shall not include any deviations except as communicated in writing in deviation permits. The Drawings shall be reviewed only for design and construction features.
- All Valves and their design features, dimensions, tolerance, chemical composition, physical properties, heat treatment, hydro test and other testing and marking requirements shall

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confirm to the latest codes and standards specified in material requisition (MR) and or valve details specified in PMS. Deviation(s), if any shall be clearly highlighted in the offer.

- Any conflicts between requirements of this Purchase Specification, PMS, MR, codes / standards and any other documents attached to MR, vendor shall refer to purchaser for clarification.
- Vendor shall supply valves along with auxiliaries, such as gear operators, actuators, locking arrangement (for LO / LC valves) , chain operator, hand wheel extension ,by-pass valves, taps for vent and drain etc,wherever specified in valve specification in PMS.MR or other enclosures to the material requisition or necessarily required otherwise.
- All cast valves where specified as per various BS-EN standards shall also meet pressure temperature conditions of respective class as per ASME B16.34 and vendor shall certify the same.
- The offered valves to various ASTM / ASME standards shall also meet requirements of Metric unit system of relevant code e.g. ASTM A105 shall also meet requirements of ASTM A105M.Stainless steel materials are always dual grade SS304/304L, SS316/316L, or lower graded as specified in PMS, vendor not to supply in straight grades.
- The Vendor shall furnish the detailed fabrication drawings showing all dimensions, parts/ materials lists weight etc. and get these drawings approved from purchaser before proceeding on actual manufacturing.
- Vendor shall quote strictly in accordance with the specification and standards mentioned in PMS, subject purchase specifications and all other enclosures to the material requisition. Deviations if any, unless pointed out by vendor shall be assumed as vendor's acceptance. Only those deviations which are must and vendor cannot meet the requirements at all shall be provided as a deviation list to be submitted along with offer. Such deviations shall also be listed separately in deviation list along with detailed reasons for seeking such exceptions / deviations.
- Vendor must avoid any substitution of material, design, valve features etc. of his own or offer alternate for the same, which may not be accepted. Alternate valve design standard or testing standard shall not be accepted unless specified standards have been withdrawn or superseded. No post order waiver/ deviation shall be granted.

7. APPLICABLE CODES

- All codes and standards for manufacture, testing, inspection etc. shall be of latest editions as on issue date of material requisition.
- The table below shows codes and standards applicable for type, size and rating of valves for general guidance purpose only. However vendor shall adhere to the codes/ std. specified in Valve details specified in PMS. Purchaser may not accept any deviation from codes specified in purchase requisition.

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Valve	Size	Rating	Design. Std.	Testing Std. / Fire safe Test Std.
Gate	½" - 1½"	800-1500	API 602	EN -12266 -1 / API 598
Globe /Check	½" - 1½"	800/1500	API 602	EN -12266 -1 / API 598
Gate	2"-24"	150/300/600	API 600	EN-12266 -1 / API 598
Gate	26"-32"	150/300	API 600 Where Applicable	EN -12266 -1 / API 598
Globe	2"- 8"	150/300/600	BS-1873	EN -12266 -1 / API 598
Check	2"-24"	150/300/600	BS-1868	EN -12266 -1 / API 598
Dual Plate Check	2"-24"	150/300/600	API-594	EN -12266 -1 / API 598
Ball	½"-16"	150/300/600	ISO 17292 / B16.34 / API 6D BS-5351	API-598, ISO10497 / Superceded BS-6755 Pt.1
Ball	½"-16"	900/1500	API 6D	API-598, ISO10497 / Superceded BS-6755 Pt.1
Plug	½" -12"	All	API-599/ BS-5353	API-598, ISO10497 / BS 6755 Pt 1
Butterfly	3" & Above	All	API-609 / EN 593 / AWWA C504	API-598, ISO10497 / Superceded BS-6755 Pt.1 / AWWA C504
Diaphragm	All	All	EN 13397	ISO10497 / Superceded BS-6755 Pt.1
Bronze	1 ½" -3"	150	MSS-SP-80.	MSS-SP-80.
Cu- Ni	½" - 1½"	150 / 300	ISO-15761 (API 602)	EN -12266 -1 / API 598
All Valves	All	API 2000 To API 15000	ISO-15761 (API 602)	API 6A

If not covered above, the valve shall be as per B 16.34 / relevant MSS-SP Std.

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8. DESIGN AND CONSTRUCTION

8.1 Valve Dimensions:

- Dimensional tolerances of valves shall be within the limit specified in applicable valve design standard and specification
- Valves face-to-face and end-to-end dimensions shall be in accordance with ASME B16.10. In case the type is not covered under ASME B16.10, the dimension shall be as per EN 558-1, EN 558-2, EN 12627 or Manufacturer's Standard.
- VENDOR shall state, in their quotations, the face to face, end to end or centre to end dimensions of any valve offered that does not agree with the referenced specifications. This data shall appear on a list of deviations.
- Valves flange dimension shall be as per ASME B16.5 Up to 24" size and ASME B16.47-Series B for sizes 26" and above.

8.2 End Connection:

End connection shall be in accordance with the following standard.

Threading : NPT, ASME B1.20.1

SW (Socket weld) / Screwed : ASME B16.11

FLGD (Flanged End) : ASME B16.5 for NPS 24 and smaller

: ASME B16.47 Series B for NPS 26 and larger

BW (Butt weld Ends) : ASME B16.25

8.3 Bevelled Ends:

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

Material	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

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- Valve ends shall match thickness of the connecting pipe. Sloping of inside contour of valves shall be done wherever necessary to achieve this.

8.4 Flange Finish:

- Flange finish shall be as per MSS-SP-6 / ASME B46.1 / ASME B16.5 / ASME B16.47
- Flange Face finish shall be normally specified in the valve specification as125 AARH. The interpretation for range of face finish shall be as follows:

Stock Finish : 250 - 1000μ in AARH

125 AARH / Serrated, Smooth Finish : 125 -250μ in AARH

63 AARH / Extra Smooth Finish : 32-63 μ in AARH (For RTJ groove)

Serration shall be concentric type for hydrogen or any toxic / flammable service

8.5 Hardness of RTJ Flanges:

- For flanged valves with ring joint flanges the hardness shall be as follows.

Flange Material	Min. Hardness of Groove (BHN)
Carbon Steel	140
Low Temp. C.S (LTCS)	160
1 % Cr. to 5 % Cr, ½% Mo	150
Type 304, 316, 321,347/LTCS	160
Type 304L, 316L	140

8.6 Materials:

- Maximum carbon content for any carbon steel shall not exceed 0.25%.
- Valve body / bonnet shall be forged / cast as specified. Forging are acceptable in place of castings but not vice-versa.
- Material of construction of yoke shall be in similar material composition as bonnet.
- Hand wheel for valve may be of cast or forged steel or malleable iron. Cast iron hand wheel or welded (bar / plate / pipe) shall not be accepted
- No copper or copper alloys shall be used in any part that comes into contact with process fluid.

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- Stem shall be forged or machined from forged / rolled bar. No casting is permitted. Where stem or any other trim material is made from rolled bar, the bars shall conform to the ASTM standard for "General Requirements" referred in the valve material ASTM standard.
- Stem or other trim parts rolled from structural steel quality bars are not acceptable; the bars used shall be of matching forging material quality. Rolled parts shall be acceptable only up to 2" size, for higher sizes only forging shall be accepted.
- Renewable seat rings shall be seal welded for valves of size 3" and above to prevent loosening in service.
- However integral stem of cast stainless steel plug valve is acceptable.
- If an overlay weld-deposit is used for the body seat ring seating surface, the corrosion resistance of the seat ring base material shall be at least equal to the corrosion resistance of the material of the shell.
- Use of asbestos is strongly forbidden for any parts of the valves.

8.7 Stelliting:

- Stelliting / hard facing by deposition shall be minimum 1.6mm, finished thickness after final machine condition.
- Where stelliting is specified for valve trim, all parts of trim including back seat shall be stellited.
- Whenever the term 'STELLITE' is mentioned it mean that the facing of seat and disc or wedge by Cobalt- Chromium-Tungsten alloy. Stelliting should be able to maintain hardness of 375 BHN at high temperatures. Whenever the term' HARD' is mentioned with reference to seat or disc of valve, it should be 350-500 BHN(min). Stellite grade material shall be suitable to service, design pressure and temperature requirement specified in data sheet, if not mentioned then vendor will ask this information's from purchaser
- Hardness of seating surfaces shall be in accordance with the applicable standard except following differential hardness between body seat ring(s) and closing seat surface(s) which shall be:
- 15 HB mini for Stainless and Monel Trim.
- When hardness differential between surfaces is required, the wedge/disc seating surface shall be the softer material.

8.8 Gland Packing:

- Unless otherwise specified valves gland packing shall be grafoil packing. Packing shall be die formed graphite rings with top and bottom braided graphite rings. Purity of graphite shall be more than 99%. Gland packing material shall be suitable to service, design pressure and temperature requirement specified in data sheet, if not mentioned then vendor will ask this information's from purchaser.

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- Stem packing shall be renewable with valve operating on stream.

Group	Packing Type	Service
'A'	Braided graphite top & bottom rings. Die-formed flexible graphite intermediate rings with corrosion inhibitor (low emission)	Hydrocarbon Liquid & Vapour, Hydrogen, H2S/HC/H2 mixtures, Saturated / Superheated Steam, Condensate, Air, Inert Gas, Water (including brackish). Caustic, Ammonia, Amines, Organic Solvents. Temp. Range: Minus 240°C to + 480°C
'B'	PTFE / Compressed synthetic Fibre with oil resistant binder	Potable Water, Chemicals, Acids, Halogens, Oxygen and other strong oxidisers Temp. Range : Minus 45°C to +232°C
'C'	THERMICULITE 835 or equivalent	Hydrocarbon Liquid & Vapour, Hydrogen,HC/H2 mixtures Temp. Range up to + 800°C

8.9 Bonnet Bolting:

- Valve's bonnet bolting material shall conform to the material below in line with valve body material unless specified otherwise.

Valve's Body Material	Bonnet Bolts Material	Bonnet Nuts Material
Carbon Steel	A193 Gr.B7	A194Gr. 2H
Cr-Mo steel (Alloy Steel)	A193Gr. B16	A194 Gr. 4
Stainless steel	A193Gr.B8 Cl.2	A194Gr. 8
Carbon Steel+NACE	A193 Gr.B7M	A194 Gr.2HM
LTCS	A320 Gr.L7	A194 Gr. 4

8.10 Bonnet Gaskets:

- For all spiral wound gaskets the filler material shall be Graphite. Asbestos shall not be used as a filler material.
- Spiral wound bonnet gaskets are to be provided with inner/ outer ring except when encapsulated gaskets type body-bonnet joints are employed. Outer ring may be avoided in

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case of non-circular spiral wound gasket used in 150# valve provided the outermost layer or spiral touches the bolts ascertaining the centering.

9. VALVES DESIGN FEATURES

9.1 General (Common for all Valves):

- Cast Iron valves are not permitted for use in firewater or any other service
- All cast valves irrespective of rating and material of construction shall have minimum wall thickness as per API 600.
- Valves body- bonnet joint shall be designed to ASME SECTION-VIII DIV-1 APPENDIX-2.
- Valves shall have stem to wedge / disc connections with a T-Slot within the forged wedge / disc. Tee joints made by welding are not permitted. The stem wedge/ disc design shall conform to ASME B16.34.
- All flanged valves shall have flanges integral with the valve body except forged valves
- All CS, AS & SS gate, globe and angle valves size ¾" and larger shall have outside screw and yoke (OS&Y) design
- All gate, globe valves shall have back seat on the bonnet.
- All valves of ASME 600# and over shall be provided with a lantern ring as per API 600. The lantern ring shall be provided with a threaded plug.
- For all valves in vacuum service lantern rings shall be provided. Live loading arrangement with Belleville springs shall also be provided. All valves in vacuum service shall be tested for vacuum. Piping classes where vacuum service is specifically mentioned shall undergo vacuum testing as per ASME sec -V article 10 ,HOOD method with the vacuum test pressure of 2.22Torr or less and the acceptance criteria is as follows,
  Valves DN15 to DN50 = 2 x 10^{-5} std cm^3/s
  Valves DN80 to DN300 = 4 x 10^{-5} std cm^3/s
  Valves DN350 to DN600 = 6 x 10^{-5} std cm^3/s
  Valves DN650 and larger 3.3 x 10^{-6} std cm^3/s per cm of stem circumference at the valve gland
  Type testing for the above leakage rates are acceptable and criteria for type testing is as follows one valve of size/rating/material/type. For IBR related piping class where vacuum testing is requested shall have specific design of gland packing(cup and cone packing rings design with an inverted V shaped pattern) to aid valve sealing instead of doing vacuum testing as per HOOD method.
- Locked open or car sealed open valves shall include metal tags permanently attached to the valves. The tag shall read: "This valve must not be closed without written permission from responsible authority". The stems of locked open or car sealed open valves shall be installed in horizontal position.
- Valves under Cryogenic service shall be as per BS-6364 and shall be procured from prequalified vendor.
- All Valves 2" and above should have greasing port.

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- For all Gate valves, Vendor shall submit Design Conformance Report of Strength test from Stem to Gate as per API 591, Appendix B1.
- All Valves used in Hydrocarbon services shall comply with the Fugitive Emission requirements of API-622 / ISO 15848 Part-1 as per their respective latest editions.
- Gland Packing for Valves used in Hydrocarbon services shall meet the Fire safe requirements of API-589 or API-607 as per their respective latest editions.
- When “CA” is stated in the ITEM Description, the supplier shall design the valve wall thickness including “CA” specified in ITEM Description. Upon OWNER / PMC request, Supplier should be able to provide a calculation note proving it. In case of design impossibility, Supplier could propose as alternate Corrosion Resistant Alloy weld overlay or solid material. This alternative shall be agreed by OWNER / PMC before order.
- When the valve, or a part of the valve, is fabricated, the VENDOR must, at inquiry stage, submit detail of weld assemblies to PMC/owner for approval. Any welding is subject to a welding procedure (WPS), qualification (PQR) and welding map. Welded flanges are only permitted if they are welding neck type and after PMC/Owner approval. For valves up to DN 40(1.5”), care shall be taken to save enough space between body and flange to allow passage of Heavy hex nuts at site assembly.
- Vendor shall furnish special tools and appurtenance necessary for the installation, maintenance, and/ or operation of valves covered by the specification, if any.

9.2 Gate, Globe and Check Valves:

- Gate valves Class 900 and over shall have split wedge.
- Bonnet of Valves 900 class and above shall be pressure- seal type. Threaded and seal welded or welded bonnet may be employed up to sizes 1.5”. Valves with Pressure Seal Bonnet shall have wall thickness and stem diameter as per API 600 (if required).
- For all Gate /Globe/Check and other metal seated valves wherever differential hardness exists within the trim, the body seat ring shall have the higher hardness (Eg. Trim No: 8 as per API 600). The body seat ring shall be seal welded type.
- Renewable seat rings shall be seal welded for valves of size 3" and above to prevent loosening in service. Threaded seats are not acceptable.
- The type of wedges for gate valves shall be designed as follows:

  Plain solid wedges : Maximum NPS 1 ½ “

  Flexible wedges : NPS 2” and larger.

- Gate and globe valves shall be backseat type to permit repacking while valve is fully opened and under service pressure. Gate and globe valves shall be subjected to back seat test
- In case of gear operated globe valve, stem will be non rotating type and guides are to be provided to minimize wear & to maintain stem movement aligned in all valve orientations.
- Globe valve type shall be Y-Pattern for tight shutoff conditions for design pressure ≥ 70 Kg/cm^2.
- Gate valves to be normally supplied as Fullbore by the vendor.

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9.3 By Pass for Gate Valves:

- A Globe type valve of size as per ASME B16.34 shall be provided as by-pass for the following sizes of gate valves.

Valve Class Rating	Valve Size
150	26" & Above
300	16" & Above
600	6" & Above
900 & 1500	4" & Above
2500	3" & Above

- The by-pass piping arrangement shall be such that clearance between main valve body and by-pass assembly shall be the minimum possible for layout reasons as per Annexure-1. Basic design of bypass shall be to MSS-SP-45 & ASME B16.34.

9.4 By Pass Valve size:

- By-pass valve shall be a globe valve. The sizes shall be as under:

Main Valve Size	By pass Valve size
4" and below	1/2" or more
6" & 8"	3/4" or more
10" and over	1" or more

- Vendor shall supply the by-pass valve duly tested and fitted to the main valve. Valves with by-pass shall have the direction of flow marked on the main valve.
- Bypass attachment to the main valve body shall not be screwed.
- All fillet welds for by-pass installation shall be 100% examined by DP/MP test. NDT of bypass valve shall be inline with main valve. Butt-weld joints shall be 100% examined by radiography.
- Bypass piping, fitting, and valve shall be of compatible material & design with main valve.

9.5 Check Valves:

- For all Swing check valves the hinge pin shall be inside the body. The valve body shall not be punctured. For Dual plate check valves the design shall be retainer less type.
- Unless specified otherwise in the data sheet all check valves 3" and above (except in 900#, 1500#, & 2500# rating) shall have a drain boss at location "G" (0.5" size for valve sizes 3" &

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4" and 0.75" size for valves 6' & larger) (refer fig. No. 1 of ASME B16.34). A tapped drain hole (except in CRYO valves and 900# 1500# & 2500# rating valves where tapping shall not be done in boss) with plug shall be provided as per ASME B16.34. Threads shall be NPT (taper) as per ASME B1.20.1.

- For heavy check valves provisions shall be available for lifting by way of lugs, eyebolts and such standard devices.
- The check valves having disc assembly supported from the cover of the check valves are not acceptable.
- Whenever check valve disc assembly is supported from the cover of the check valves, the following shall be ascertained.

  i. Positive location / Positioning of cover must be provided to ensure correct alignment of the valve disc.

  ii. Hinge pin design must permit accurate alignment of the disc and valve seat.

9.6 **Ball / Plug / Butterfly Valves:**

- Each valve shall be supplied with a lever / wrench except for gear operated/ motor operated valves. Levers shall be provided with plastic sleeves
- Soft-seated Ball, Plug and Butterfly valves shall be supplied with antistatic devices and Pressure and Temp. Rating of soft seating material shall be submitted by vendor.
- Ball, plug and butterfly valves, even with wrench or lever operators shall have "Open" position indicators with limit stops.
- As a prequalification, fire safe test as per API 607 / API 6FA / ISO -10497 shall be carried out on soft seated ball, plug & butterfly valves and also on lubricated plug valves. The test shall be witnessed and certified by a third party inspection agency. The vendor has to submit type test certificate for the particular design of the valve offered.
- Use of soft seated ball / plug / butterfly valves shall be suitably selected based on Design pressure and temperature specified in data sheet. The seat material used must be capable of withstanding the design temperature and shall be of proved design with performance guarantee. Complete soft seat material details, application references shall be provided with the offer itself.
- Soft-seated BW / SW end ball valves shall have 100 mm long seamless pipe nipple (pups) welded to each end of the valve. Nipples are to be welded prior to assembling soft seats / seals. Specifications of the nipples shall be as indicated in the material requisition, schedule to match pipe wall thickness.
- The ball for the ball valves shall be smooth finished with zero defects on ball surface so as not to allow more than permitted leakage during fire safe test and it is capable of holding the pressure after burnout of soft seats.
- The face-to-face dimensions of all ball valves shall be same as those of gate valves of the corresponding ASME class (except 10" onwards in Class 150 where the face- to-face dimensions shall be as per API 6D long patterns).
- The ball of ball valve must be solid and shall not protrude outside the end flanges of valve.
- The construction of the body seat rings or ring assemblies shall be such that body cavity

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relief is possible.

- Unless otherwise specified in the valve specification, bore of all reduced bore ball valves shall be limited to one size lower than the nominal bore. However If reduced bore is not specified in the data sheet the ball valve shall be supplied with full bore.
- Pressure relieving arrangement for body and bonnet shall be provided for ball valves.
- Non-metallic parts and elements which usually include such items as sleeves, seats and packing shall be suitable for the service. When specified, graphite packing shall be pure graphite (99.5% mini) with corrosion inhibitor.
- Gear operators shall be totally enclosed, weather proof type, packed with a suitable lubricant. Gear operators shall be fitted with easily accessible grease fitting to enable the lubricant to be renewed while the valve is in service. Number of turns to operate the valve shall not exceed 500. If necessary a dual stage reduction gear shall be used. Gear to valve assembly shall conform to ISO 5211 and to provide with lifting hooks (if applicable).
- Pressure temperature rating shall conform to ASME B16.5 for the complete range of temperature. If valves are limited to their seal materials, then supplier will clearly prescribe the limits in the offer
- e.g. Class 150 = 17.64 kg/cm²/ 100°C
- Where relative rating is not available on ASME B16.5, supplier shall submit and guarantee the applicable rating curve.
- Valves which are not specified by the applied code and/or standard shall be designed and manufactured based on ASME B31.3, Para 307.1.2.
- Floating / trunnion ball limitations:

Unless otherwise specified, the floating and trunnion ball limitation shall be as follow:

NPS (Note 1)	SW or Screwed Ends	Flanged 150#	Flanged 300#	Flanged 600# and Above	Flanged 1500# and Above
½" to 1 1/2"	Floating	Floating	Floating	Floating	Trunnion
2" to 3"	N/A	Floating	Floating	Trunnion	Trunnion
4"	N/A	Floating	Floating	Trunnion	Trunnion
6"	N/A	Floating	Trunnion	Trunnion	Trunnion
8" & above	N/A	Trunnion	Trunnion	Trunnion	Trunnion

Note 1: NPS of the ball in case of reduced bore ball valve.

- For actuated valves, trunnion ball is required for diameter 2" and above whatever the rating.
- Chromium plated ball and stem are not permitted. Hollow type ball is also not permitted. Vendor's offer of sealed cavity ball type has to be clearly mentioned in offer.
- Butterfly valves shall be self-centering when installed between piping flanges while disc is in closed position. Also butterfly valve shall be suitable for throttling application.

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- High performance metal seated, flanged / lugged / wafer bi-directional, triple offset design for butterfly valve shall be followed for applicable sizes up to 24", wherever these are used in hydrocarbon services. The valves shall be fire safe tested as per API 607.
- Butterfly valves if specified / used in other than cooling water lines (Cat.'D' services) shall be high performance fire safe design to API-609. When specified, fire safe design shall conform to API 607 / ISO10497. Existing certificates according to API 607 or BS 6755 (Part 2) are also acceptable.
- All butterfly valves shall be suitable for flow regulation and shall be tight in the closed positions. Unidirectional valves shall be clearly and permanently marked to identify the flow direction.
- Butterfly valves shall be of such a design to allow the disc to open inside on the connecting flanges.
- Butterfly valves may employ liners, sleeves or auxiliary seals extending from or over the body contact faces and acting as flange sealing surfaces.
- Lug-type valves shall be delivered with full length threaded bolt holes. Where recessed tapped holes are necessary because the body design does not allow through bolting, supplier shall include, in his quotations, the required bolting. Bolt holes threading and bolting materials shall be as specified in the material requisition or other attached documents
- Valves shall be designed to assume electric continuity between internal components and body.
- Wafer type valves are not allowed. Lug type is allowed if bolting assembly is fully enclosed. O-ring gaskets cannot be used without addition of a second fire resistant gasket.
- Unless otherwise specified, plug valve shall be pressure balance type.
- Design Pattern / Bore of Plug Valves

Unless otherwise specified design group bore shall be as follow:

Pattern Type	Class 150	Class 300	Class 600	Class 900	Class 1500
Short Pattern	¾"-12"	¾"-8"			
Regular Pattern			¾"-6"	¾"-4"	¾"-4"
Venturi Pattern	14"-24"	10"-24"	8"-24"	6"-20"	6"-16"

- Round-port full-bore pattern shall only be used when required by the process and so defined on material requisition. Standard plugs are acceptable for Class 150.For lubricated plug valves Class 300 and above "inverted type" plug shall be used.

- Plug and stem of metal seated plug valves to be case hardened along with anti friction coating.
- Unless otherwise specified in material requisition, lubricated plug valves shall be furnished with hydrocarbon - resistant lubricating sealant. Supplier will submit data for temperature range of the proposed lubricating sealant.Lubricating sealant shall be provided for a minimum of two years normal operation.

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- The MOV's are to be installed in an open area and the actuators shall be suitable for all weather conditions. The testing of complete assemblies of MOV's along with the actuators shall be done by the supplier at his works. Cast iron shall not be used for actuator body.
- Special valves (Orbit / Y-Globe / Stop Check / Y-Body Stop Check / Jacketed Valves of All types) shall strictly follow the requirements of valve details specified in PMS, process data sheet / special item data sheet etc..
- Jacketed valves shall be tested by 100% DP/MP check on Jacket welding, and 100% hydro test of Jacket. Jacket material shall be in similar material composition as valve body material.Jacket shall have one inlet and one outlet flanged of size DN20 and a third connection of same size at the bottom for drain. Steam inlet connection shall be placed at the top most portion of jacket and outlet connection shall be placed at the lowest portion of jacket.

10. HEAT TREATMENT

- Piping materials shall be stress relived in accordance with applicable material specifications.
- All austenitic stainless steel grades shall be solution annealed after welding and shall be free of subsequent cold work.
- For all alloy steel valves the maximum room temperature tensile strength of all pressure retaining components and welds shall be 100,000 psi (7030 kg/cm²).
- For all alloy steel valves accelerated cooling from the austenitizing temperature is acceptable, where permitted by the applicable product from specification.
- Pressure retaining components for alloy steel valves (regardless of size, thickness or product form) shall be post weld heat treated (PWHT) in accordance with the requirements of applicable material specifications. No exceptions from heat treatments are permitted.
- Strip test is required for 1% of total quantity of valves (Min. 1 No.) for all valves in process NACE / Hydrogen application.
- All forged valves shall be 100% UT tested & 100 % MPI /DP tested.
- All types of 321 or 347 stainless steel valves whose service temperature is above 454°C (Subject to Licensor package) shall be in a stabilised heat treated condition. Stabilising heat treatment shall be carried out subsequent to the normal solution annealing. Soaking temperature and holding time for stabilising heat treatment shall be 900°C and 4 hours respectively.
- Any scale and oxides on austenitic stainless steel valves resulting from heating operation shall be removed.

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11. VALVES OPERATION

- Valves shall be provided with suitable gear operator heavy duty type, completely housed in a weather proof enclosure as per below size and class rating.

Valve type	Class	Size requiring Gear Operation
Gate valve Globe valveDiaphragm valve	150	12" & above
	300	10" & above
	600	8" & above
	900	6" & above
	1500	3" & above
	2500	3" & above
Stop- check	900	6" & above
	1500	3" & above
	2500	3" & above
Ball Valve Plug Valve (other than pressure balance plug valve)	150	6" & above
	300	6" & above
	600	4" & above
	900	3" & above
	1500	3" & above
Butterfly Valve	150	10" & above
Butterfly Valve	300	6" & above

- For sizes lower than these ranges, hand wheel / lever / wrench shall be provided.

a) Pressure balance plug valves manufacturer's recommendation shall be acceptable provided the torque requirement is met.

b) Gear operator shall be as under, with position indicators for open / close positions and with limit stops. (Limit stops are not applicable for gate and globe valves).

For Gate / Globe / Diaphragm Valves	Totally enclosed bevel gear in grease case with grease nipples / plugs.
For Ball / Plug / Butterfly Valves	Totally enclosed helical worm or combination of helical worm and spur gear in grease case with grease nipples / plugs.

- Even if, valves are specified as hand wheel or lever operated, vendor shall provide gear operator if opening torque exceeds 350 N-m.
- Hand wheel orientation of gear operated valves will be specified clearly on the valve outline

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drawings.

- Gear drives shall be enclosed in weatherproof gear operators and Gear operator shall be so designed as to operate effectively with the differential pressure across the closed valve equal to the cold non-shock pressure rating.
- Where gear operator is not specified in material requisition, but vendor recommends a gear operator, the same shall be highlighted.
- Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500mm on each side. Effort to operate shall not exceed 35kgf at hand wheel periphery. However, failing to meet the above requirement, vendor shall offer gear operated valve.
- Hand wheels shall not be made of grey iron (SG iron) or fabricated from bars /plates , non-metallic materials.
- Gear operator shall be so designed to operate effectively with the differential pressure across the closed valve equal to the cold non-shock pressure rating.

12. GENERAL AND SPECIFIC REQUIREMENTS

12.1 IBR Requirements:

- Valves coming 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.
- For carbon steel valves under IBR the chemical composition shall conform to the following:

  Carbon (Max.) : 0.25 %

  Others (S ,P & Mn) : As prescribed in IBR regulations

  The above composition is not valid for non-IBR valves
- For valves described “IBR”, valves shall be in accordance with the latest IBR (Indian Boiler Regulation) including the requirements specified in the specification.
- All “IBR” valves shall be painted red in body-bonnet / body-cover joint.
- “Sa” values are from ASME B31.3. Values shall be as per the latest edition Prevailing.

12.2 Low Temperature / Cryogenic Valves Requirements:

- All grades of austenitic SS (mentioned as CRYO in piping class) material are categorized as cryogenic valves. All these valves shall have extended bonnet as per BS 6364 except check valves. Valves shall be suitable for installation in position in line with ANSI B16.34. In case of LTCS valves, stem extension shall be provided based on the insulation thickness.

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- For cryogenic service, in order to use austenitic stainless steel at low temperature, weld metal deposits and heat affected zone, if any, shall be impact tested as required by ASME B31.3 para. 323.2.2 and 323.3. Impact test temperature is –196 °C if not otherwise stated.
- Both cryogenic type test which is carried out under third party inspection agency and reference list together, as indicated herein, shall be considered for vendor qualification and vendor shall furnish the same, along with his offer of particular type / rating of valves.
- Vendors whose current supply does not cover valves of all sizes, materials and ratings (cryogenic type test carried out under third party inspection agency and reference list) required by material requisition, should confirm / furnish the following for consideration of their offer:
- Evidence of having conducted successfully at least one cryogenic test as per BS 6364.Test certificate for tests conducted and reference list shall be furnished with the offer.
  i. Vendor shall confirm to conduct cryogenic test for the remaining valves not later than 12 weeks from the date of purchase order. Offers of vendors who do not comply with above requirement would be rejected.
  ii. Tests carried out on a particular size of one type of valve, pressure rating and material shall qualify all sizes equal to and below the test valve size for the same type, pressure rating and material. In case of austenitic SS any one grade would qualify for all other grades of austenitic Stainless steel.
  iii. Cryogenic test need not to be conducted for every order. Test conducted previously of particular type / rating is acceptable but test certificates of particular type / rating to be furnished along with the offer. Also, IRN should include the reviewing of cryogenic test certificates by the third party inspection agency.
- Test temperature, unless specifically called for otherwise in the individual material requisition, shall be –45°C for LTCS and –196°C for all grades of austenitic stainless steel.
- Tests shall have to be witnessed and certified by any one of the approved third party inspection agencies.
- Vendor shall furnish reference list for valves supplied for cryogenic service indicating the name of client, year of supply, size, material, pressure rating, type of valve and quantity.
- Before conducting post order testing, vendor shall submit the following for approval.

  i. Test procedure (as per BS 6364).
  ii. Cross-section drawing of the valve with material of construction.
  iii. Schematic of test rig (as per BS 6364) with complete details

- Test has to be conducted on largest size of order for each type of valve and for each material and class rating. Vendor shall offer one, two or three valves for selection of test valve by inspector depending upon whether quantity of largest valve in the order is one, two or three and more than three respectively.
- In the event of failure of the test valve to meet the specification requirements, the vendor shall conduct test on two more valves. If the other two valves which pass test successfully, are of lower size, then the qualification will be valid only to sizes up to which test has been conducted successfully.
- In case of non-conductance of cryogenic test(s) within 12 weeks or failure in the test(s)

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conducted after receipt of order, the owner reserves the right to invoke any of the provisions of the purchase order including cancellation of the purchase order at the risk and cost of vendor.

- Bonnet extension, wherever specified in the valve sheet to BS 6364 shall be for "non cold box application" unless otherwise specified in the MR. Even if not called for in valve sheet, valves indicated as "CRYO" shall be supplied with bonnet extension.
- Bonnet and Gland extension joints shall be of butt welded construction.
- Repair welding procedure for austenitic stainless steel valves in "CRYO" service shall have to be qualified for impact test as per ASME B31.3. Minimum acceptable impact energy shall be 20J or lateral expansion of 0.38 mm at temperature of (-) 196 ºC.
- Wherever impact test of CS studs/ nuts is called for in the data sheet, the impact value shall be 27J at the intended service temperature specified in the PMS.
- Repair welding procedure for low temperature carbon steel valves in "LT" service shall have to be qualified for impact test as per ASME B31.3.

12.3 Hydrogen Service Valves Requirements:

- All cast valve flanges and bodies with flange rating of Class 900 or greater shall be examined in accordance with paragraphs 7.2 through 7.5 of Appendix 7 of ASME SEC-VIII, DIV.I, regardless of casting quality factor.
- Body / bonnet / cover joints & stuffing box of all valves shall have low emission. One valve per metallurgy, per rating, per size shall be helium leak tested as per ASME Sec.V, Subsection A, Article 10 (Detector Probe Technique), Appendix IV at a minimum of 25% of the allowable (rated) cold working pressure. Selection of valves for helium leak test shall be at random. Test duration shall be as follows:

Test Duration in Minutes					
Nominal Size	Pressure Class				
	Up to 300	600	800 & 900	1500	2500
Up to 2"	3	6	9	12	12
3" to 6"	6	9	12	15	18
8" to 16"	9	9	12	15	18
18" to 24"	9	12	15	18	21

Test is acceptable when no leakage is detected that exceeds the allowable rate of 1×10^{-5} std cm^3/s (1×10^{-6} Pa m^3/s).

- Only normalized and tempered material shall be used in the following specifications:

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Castings : A217 Gr.WC4, A217 Gr.WC5, A217 Gr.WC6, A217 Gr.WC9, A217 Gr.C5, A217 Gr.C12

Forgings : A182 Gr. F11. C1.2

- All valve castings shall be of radiographic quality. The requirement of radiography shall be as per Cl.16 of this specification.

12.4 Carbon Steel & Alloy Steel Valves Requirements:

- Bend test (S3) and Magnetic Particle inspection (S4) of the entire surface of body and bonnet casting shall be in accordance with ASTM A217. Supplementary requirement evaluation of magnetic particle, inspection shall be in accordance with MSS-SP-53 except that no linear discontinuities shall be allowed.
- The Brinell hardness of heat treated casting shall not exceed 200 BHN for carbon steel & 225 for alloy steel.
- Repair of defective casting shall be outlined in writing to the purchaser before repair starts. Repair method to be approved prior to welding.
- Casting shall be preheated to a minimum of 400 º F prior to welding and all Chromium-Molybdenum alloys shall be post weld heat treated after welding is complete. Stress relieving is essential for welds.
- Carbon steel shall be normalized and alloy steels shall be normalized & tempered.
- Dye Penetrant test of welds shall be in accordance with ASTM E165. Interpretation as per Appendix-8 of ASME-VIII Div.1.
- The tensile stress for AS shall be less than 100,000 psi.
- Charpy V-notch impact testing is to be done for valve material (average 20 ft-lb for set of 3 [minimum value 15 ft-lb] at 30ºF).
- For radiography and acceptance criteria for valve castings, refer Cl.16(Radiography of cast valves)

12.5 Stainless Steel Valves Requirements:

- Casting and test bar shall be heat treated together. Valve casting shall be in solution heat treated and pickled condition.
- Critical body and bonnet casting section typically defined by ASME B16.34 shall be radiographed and shall meet ASTM E446 (upto 2" thick) Category A,B & Ca Level 2, Category Cb, Cc, Cd Level 3, Category D,E & F Level 0. For wall thickness 2" to 4.5" comparable plates of ASTM E186 shall be used. ASTM E94 and ASTM E142 shall be used for recommended practice & controlling quality of radiography as guide. The entire surface of all castings shall be dye-penetrant inspected after pickling.
- Repair welds shall be 100% radiographed and evaluated in accordance with paragraph

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Table 302.3.3D of ASME B31.3 with a minimum casting quality factor of 0.95. Dye Penetration test shall be as per ASTM E165, Interpretation as per Appendix-8 of ASME-VIII Div.1

12.6 NACE / Sour Service (Wet H2S) Valves Requirements:

- All steels shall be fully killed and fine grained.
- The steel making process shall produce steel with high resistance to hydrogen sulphide attack i.e. HIC & SSC.
- All steels shall be manufactured by either basic oxygen or electric furnace process only.
- Carbon content shall be 0.20 % maximum.
- CS base material shall be supplied in normalized condition (or quenched and tempered), regardless of thickness.
- Ni content less than 1%.
- Thermal stress relieving (PWHT) required for seamless piping welds as minimum, even if it is not required by code.
- 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.
- 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.
- Globe valve type shall be Y-Pattern for tight shutoff conditions for H2S + Hydrogen service in design pressure ≥ 70 Kg/cm².
- Carbon equivalent shall be limited to 0.43 and the same shall be computed as per the following formulae depending upon the carbon content.

  If C = < 0.12

  Pcm = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/60 + Mo/15 + V/10 + 5B

  IF C > 0.12

  CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15
- Phosphorus and Sulphur content in the steel shall be limited as per following sections in order to avoid the formation of brittle phases during welding.
- All items under this category shall generally be as par NACE MR-0103 latest edition. Where NACE MR 0175 is specified .same shall be applicable
- Hardness shall be below 22 HRC for carbon steel materials.
- Valves where specified HIC and or NACE, in the material requisition shall comply with latest edition of NACE standard specified
- Valve body shall be forged construction or cast construction as per below table 1. Forged construction valves offered in lieu of cast construction are also acceptable.

Other components & trim materials & other requirements shall be as per valve specifications sheets. Generally, SS 316 with max hardness of RC22 is used. If hard faced with stellite hardness upto max RC43 is allowed.

Gate / Globe /Check / Ball /Needle

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Table 1- Chemical composition for Valves

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	0.010 % max
Other elements	As per specification
Pcm	0.21 % max
CE	0.40 % max

Forgings may be supplied in quenched and tempered or normalized, or normalized and tempered condition.

- **Chemical Composition for NACE Requirements:**

  This shall be carried out on heat / cast, as well as on finished product as per relevant product material specification and shall be as per Table-Chemical composition for valves as mentioned above.

- **Mechanical Properties for NACE Requirements:**

  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.

- **Hardness Test for NACE Requirements**:

  All valve bodies, bonnets, liquid level chambers & and all parts having contact with sour gas / liquid, shall be stress relieved after final machining & hardness tested.

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Max hardness shall be limited to HRC -22 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 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 and for those small products for which hardness values are found in excess of specified value shall be rejected. If the value on the sample of heat is more than the acceptable range then the entire raw material from the heat shall be rejected.

- **Non Destructive Testing for NACE requirements:**

  All valve castings shall be 100% radiographed irrespective of rating. The procedure, areas to be radiographed and acceptance limits shall be as per ANSI B16.34 Annexure-B. Dye penetrant or magnetic particle testing shall also be done on all casting. Procedure & acceptance criteria shall be as per ASME B16.34 Annexure-B

- **HIC Test for NACE requirements:**

  This shall be carried out on the finished product (material-wise & type of construction-wise i.e. cast & forged separately) per heat irrespective of size / rating / type of valve as per NACE-TM-0284. HIC test is required only if chemical composition exceeds Table-Chemical composition for valves.

  A. The test shall be performed on a set of three test specimen of the finished product. The test shall be performed as per NACE-TM-0284 and the acceptance criteria shall be as follows.

  CSR =< 0.00%

  CLR=< 5.00%.

  Both the above condition must be met by all the samples, samples shall be as mentioned in standard NACE-TM-0284.

  B. In case any one of the above samples fails to meet the acceptance criteria, three more additional specimens from the product from which the first set of specimen were taken

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shall be rested and results reported.

C. In case of failure of any of the samples in 'B' Above, two additional products shall be selected from the same heater and six specimens shall be tested (three from each product). In case of failure of any one of the six samples, that particular heat will be rejected.

SSC test is not required. But in case of deviation of S & P % from as per Table 1-Chemical composition for valves on the chemical analysis of the finished product or UTS being greater than 77000 psi the manufacturer shall either conduct SSC test on every heat as per NACE-TM-0177 successfully OR reject all the finished products made from that heat.

- **CORROSION TEST FOR NACE REQUIREMENTS**

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

- Reporting to Test Results

Curves shall be reported as per NACE –TM-0177 for various stress levels between 72% & 92% of SMYS.

- Acceptance Criteria

At 72% of SMYS, Time to failure shall not be less than 720 Hrs.

13. INSPECTION AND TESTING

- Vendor shall comply with the inspection test plan (ITP) for valves attached to the material requisition as a minimum.
- However a detailed inspection and test plan (ITP) shall be submitted for review by the purchaser along with bids. All valves will be subject to inspection in accordance with the purchaser approved inspection and test plan (ITP).

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- The certificates shall be issued, stamped and signed by the material manufacturer's inspector, who shall be independent of the manufacturer's production department. This certificate shall also be stamped and verified by the manufacturer's QA/QC department.
- Every valve, its components and auxiliaries shall be subjected to all mandatory tests and checks called in the respective codes / PMS by Purchaser or any third party as approved by the purchaser. For IBR valves refer IBR certification clause
- Purchaser or his authorised representative (third party) 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. The extent of inspection shall generally be as follows, although exact extent with hold points shall be decided by inspector in the form of inspection plan (ITP).

13.1 Forged Valves:

- Visual and dimensional inspection.
- Review of material test certificates.
- Any mandatory or supplementary test.
- Hydrostatic test on 10% valves selected on random basis as per size / type / rating. The test fluid used for hydrostatic testing shall be an emulsion of water with a water soluble oil to prevent rust. The chloride content of the test fluid shall not exceed 50ppm weight. The chloride content shall not exceed 30ppm and minimum pH 6,5 for stainless steel, duplex, nickel alloy and titanium valve but shall not exceed 5ppm when component to be tested is a stainless steel valve for which drying operation cannot by properly secured.
- Strip check is required for 1% of total ordered quantity of Gate and Globe valves (min. 1 No.) if specified in ITP, however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.
- During strip test the following will be check points and or as defined in ITP and the same will be witnessed by TPI.
  - Minimum wear travel allowance of wedge as per applicable standard.
  - PMI of SS & Alloy steel parts.
  - Hardness test of stem as per specification.
  - Trim materials as per valve details specified in PMS.
  - Shell wall thickness

13.2 Cast steel valves:

- Visual and dimensional inspection.
- Review of material test certificates.
- Review of radiographs/ radiographic reports or any other NDT tests wherever applicable as per data sheet.
- Any mandatory or supplementary test.

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- Hydrostatic test 100% for body, 10% other test.
- Strip check is required for 1% of total ordered quantity of Gate and Globe valves (min. 1 No. if specified in ITP, however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.
- During strip test the following will be check points and or as defined in ITP and the same will be witnessed by TPI.

  - Minimum wear travel allowance of wedge as per applicable standard.
  - PMI of SS & Alloy steel parts.
  - Hardness test of stem as per specification.
  - Trim materials as per valve details specified in PMS.
  - Shell wall thickness.

  Samples for strip check shall be selected at random and shall generally be in the highest size in the lot.

  In case of motor operated or actuator operated valves, functional / operational checks as per the requirements of the specifications shall be made on each valve.

14. POSITIVE MATERIAL IDENTIFICATION (PMI)

- Positive Material Identification (PMI) shall be performed as per the scope and procedures defined in specification for Positive Material Identification attached with the material requisition
- All alloy materials tested by PMI shall be identified using either of the following methods by indicating “PMI OK”
  - Bar Code/ Hologram Sticker
  - A low stress stamp marking
  - Any other method

15. INTER-GRANULAR CORROSION (IGC) TEST

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

OR

- ASTM A262 Practice 'E' with acceptance criteria of 'No cracks as observed from 20X

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magnification' for all materials other than castings. 'Microscopic structure shall be observed from 250X magnification in addition.

- 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.
- For some austenitic stainless steel grades such as SS309, 310, 316, 316H, etc. ASTM A262 Practice 'C' with acceptance criteria of' 15 mils / year (max.) shall be conducted, wherever specified in material requisition.

16. RADIOGRAPHY OF CAST VALVES

- All casting shall be of radiographic quality. This requirement to be ensured by sample radiography before proceeding with the actual production.
- Radiography procedure, areas of casting to be radiographed, and the acceptance criteria shall be as per ASME / ANSI B16.34.
- Radiography requirement for casting of sizes for special / critical piping classes shall be as follows:

a) For Hydrogen / Hydrogen Bearing, Oxygen, NACE, SOUR plus HIC, and Stress relieved caustic services.

Class	Size	Qty
150	All sizes	100%
300	All sizes	100%

b) For LT / CRYO service.

Class	Size	Qty
150	24”& below	20%
300	16”& below	20%

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c) Radiography requirement for castings for categories not mentioned above shall be as follows.

Class	Size	Qty
150	24"& below	5% For Carbon steel material (Except Cat 'D' & Fire water services for which it is NIL)
150	24"& below	10% For Alloy steels & Stainless Steelss
150	26"& above	100% For all materials (NIL for Cat. Fire water service)
300	16"& below	10% For all materials
300	18"& above	100% For all materials
600 & above	All	100% For all materials

- Radiography specified above as random 5% or 50% etc. implies 5% or 50% etc. of number of valves ordered against each item number with a minimum of one valve against each item.
- Radiography procedure, critical areas of casting to be radiographed shall be as per ASME B16.34 and acceptance criteria shall be as per ASME B16.34 Annexure-B. However for areas of casting to be radiographed for types of valves not covered in ASME B16.34, vendor shall enclose details of areas to be radiographed in line with ASME B16.34
- Random radiography wherever specified as above,the sampling shall be per size of the quantity ordered for each foundry.
- All valves casting in class 300# and above shall be of radiographic quality. This requirement to be ensured by sample radiography before proceeding with actual production.
- Radiography wherever required shall be done by X-Ray /ϒ-Ray to get the required sensitivity.
- MPI or DPI shall be carried out on all accessible interior and exterior surfaces, including machined surfaces of all cast or forged valves for flaw detection.
- Ultrasonic examination of castings may be carried out after specific approval by the purchaser, where radiographic inspection is not feasible.
- Weld on flanges shall be made full penetration joints and 100% radiographed.

17. MARKING & PAINTING

- Valve markings, symbols, abbreviations etc. shall be in accordance with MSS-SP-25 or the standard referred in valve specification sheet as applicable. Vendor's name, valve rating, material designation, nominal size, direction of flow (if any) etc. shall be integral on the body. In addition the purchase order number, the valve data sheet No./ Sap item Code (if any) & special condition such as:
  - "IBR","CRYO","NACE","H2" etc. shall also be marked.
  - Fire Safe ball / plug valves shall also be marked "Fire Safe" additionally

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- The marking which are not integral to the valve body shall be legibly stamped or stencilled. When metal stamping is used it shall be on the long edge of each component. Metal stamping on rolled surfaces shall be done with a "low stress" stamp. Markings shall be protected from erosion, wear, or other events that may render them unreadable.
- Each valve shall have a corrosion resistant tag giving Valve Size, Rating, MOC, Valve Tag No./ Item Code No / SAP Item Code , PO No. with Date , Project Name , Vendor's Name securely attached to the valve body.
- Additionally a separate stainless steel tag stamped with only valve tag number shall be permanently attached to each valve with corrosion resistance wire prior to shipment.
- Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc, Lead or copper which cause corrosive attack on heating.
- Carbon Steel / Alloy Steel / 3½ Ni Steel / LTCS valves shall be painted with two coat of Titanium catalysed inorganic copolymer (each coat shall be of minimum DFT 150 microns). However, surface preparation, testing and other requirements shall be in accordance with the painting specification. (document number : 080557C-000-JSD-2300-001)
- Stainless steel valves shall be supplied in pickling and passivated conditions.
- All items coming under "IBR","CRYO","NACE" shall be painted in red stripes, light purple brown stripes & canary yellow stripes respectively longitudinally throughout the length for easy identification.

18. PROTECTION & PACKING

- All valves hall be supplied in separate seaworthy packing / lots item-wise, size wise, rating wise, MOC wise etc. All unpacked valves shall be properly covered by suitable protective means to avoid any damage during transportation. Packing list shall be included as part of each package
- Each packing / lot shall be marked with purchase order No., valve tag No. / Sap code No., size, rating, MOC etc.
- All material test report for physical property, chemical composition, heat treatment, etc. shall be despatched for all mandatory and supplementary tests specified in accordance with applicable codes /standards or attached specifications.
- Valve shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.
- Valves shall be protected from rust, corrosion and any mechanical damage during transportation, shipment and storage.
- Rust preventive on machined surfaces to be welded shall be easily removable with a petroleum solvent or shall not be harmful to welding.
- Each end of valves shall be suitably protected, and the protectors shall be securely and tightly attached.

Flange face	:	Wood, metal or plastic cover
Beveled end	:	Wood, metal or plastic cover
Plain end	:	Plastic cap
SW & Screwed end	:	Screwed plastic cap

- Butt-welding ends of flanges shall be capped or properly protected. Machined surface (Threads, Bevel end, etc.) shall be coated with a corrosion inhibitor.

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- End protectors to be used on valves having flange faces shall be attached by at least three bolts or wiring through bolt holes and shall not be smaller than the outside diameter of the flange. However plastic caps for SW and Screwed end valves shall be press fit type.

19. DOCUMENTATION

19.1 Vendor shall submit the following documents with the offer:

- Manufacturer's complete descriptive and illustrative catalogue / literature.
- One copy of the valve specification sheets duly signed and stamped as "Accepted" by the manufacturer with all deviations marked clearly.
- If the valve is regretted or has no deviation, the manufacturer shall write clearly on valve specification sheets as "Regret" or "No Deviation".
- If there is any deviation from the "Purchase Specification for Valves", the same shall be listed clause wise. Even clauses which are acceptable shall be categorically confirmed as "Accepted". The Purchase Specification for Valves 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"
- On failure to submit documents as specified as per above, the offer shall not be considered as valid and NO further TQ shall be issued.

19.2 The following documents shall be submitted after placement of the order:

- Detailed dimensioned cross section drawing (GAD's) with parts / material list, weight etc for all the valves and valves to manufacturer's standard.
- Vendor must write in bold letters Valve tag No in title block on each drawing, without which drawing shall not be reviewed and returned to vendor for resubmission
- Drawings for valves with accessories like gear operator, extension bonnet, extended stems with stands, bypass etc. giving major salient dimensions.
- Vendor shall submit for approval above mentioned drawings before start of manufacture. Vendor shall have no claim for any manufacturing carried out without drawing approval in writing,
- Purchase's comments on drawings shall be fully implemented, if any comment is not acceptable same shall be fully justified and resolution sheet shall be attached for approval.
- Purchaser shall have the right to reject any valve for non-compliance with technical requirements without any commercial implication at any stage
- Material test certificates (physical properties, chemical composition & heat treatment report) of the pressure containing parts shall be furnished for the valves supplied. Material test certificates for the other parts shall also be furnished for verification during inspection. NDT test reports, PMI & any additional test as applicable.
  Type of inspection documents shall conform to EN 10204:
  Material certificates as follows,

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- 3-1 for body and bonnet and for stem DN 2” and above and for bolting of diameter 2” and above.

- 2-2 for all other metallic parts in contact with fluid and for stem lower than DN 2“ and bolting of diameter lower than 2”
- 2-1 For all other parts.

Test certificates

- 3-1 pressure tests and non-destructive tests.
- 2-1 functional test.

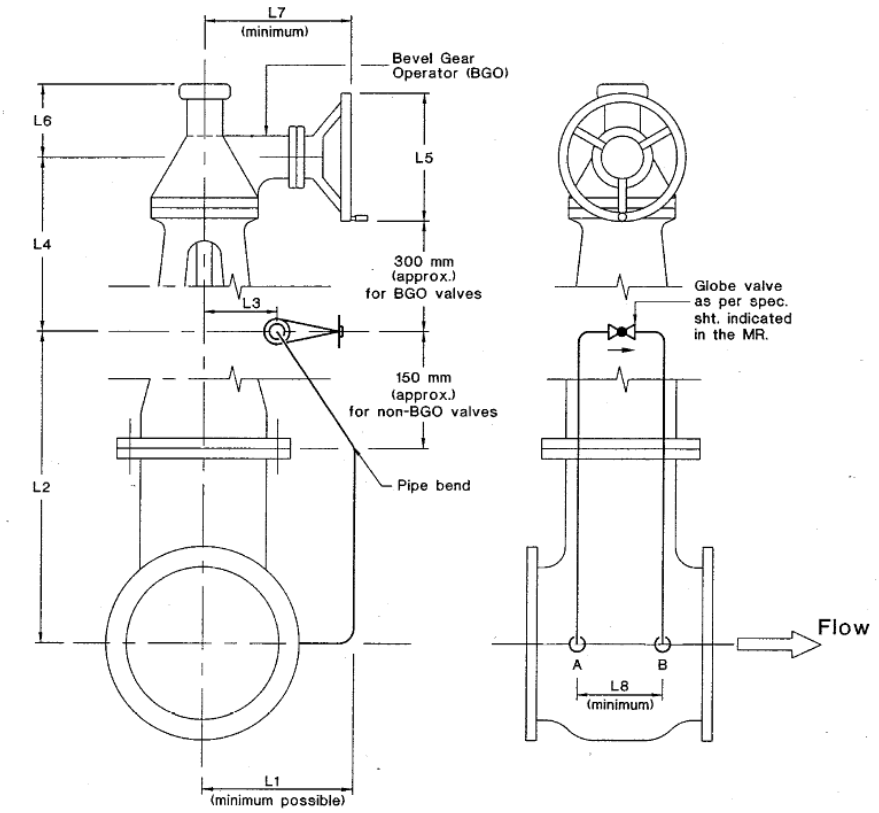
20. OTHER REQUIREMENTS

Guarantee / Warranty, Quality plan, Inspection, Positive Material Identification (PMI), Documentation and all other requirements shall be governed by the requirements as per other documents attached with the material requisition.

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ANNEXURE -1



NOTES:

1.The orientation & location of handwheel of bevel gear operator & the bypass arrangement shall be strictly as per this sketch.

2. The bypass connection ends shall be socket welded upto 600# and butt welded for 900# and above rating.

3.The Bypass arrangement shall be properly clamped to & supported by the body of the main valve.

4. Basic design of bypass shall be to MSS-SP-45.

5. Material of bypass pipe & 90° elbows shall be same or equivalent to the body material.

6.Vendor shall furnish dimensions L1 to L8.

7. This sketch is applicable for both BGO & NON-BGO Valves.

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SPECIFICATION FOR COLOUR CODING OF PIPING MATERIALS SUPPLIED BY VENDOR

			Written By Karthikeyan Chokkalingam 2019.10.14 12:07:46 +05'30'	Checked By Subramanian Arumugam 2019.10.14 12:09:01 +05'30'	Approved By Vaidyasubramaniam V 2019.10.14 12:17:13 +05'30'	Authorized By Motichristopher Jesumarian 2019.10.15 21:10:34 +05'30'
A	14-OCT-2019	ISSUED FOR DESIGN	CK	AS	VV	JM
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 29th August 2019 to M/s. Technip India Limited (TPIL) for Consultancy services (PMC/EPCM services) for overall project management, FEED Review / FEED, Detailed Engineering, Procurement & expediting services, Tendering & award, Construction Management & Supervision, Assistance in start-up, Commissioning & performance test runs for installation of a Standby SRU of 525 TPD capacity and execution of Additional tanks for Paradip Refinery, Odisha, India.

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
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
PROJECT	Indicates Standby SRU and Additional tanks Project, Paradip Refinery
UNIT	Indicates any particular portion of the project to be built which can be Process related or Utilities/Offsites related

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SRU	Sulphur Recovery Unit
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.

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)

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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.

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).

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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

Annexure-1: Schematic representation of colour identification

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TABLE -1

BASIC COLOURS FOR IDENTIFICATION (IS: 5 - 2007)

(Approximate Munsell Value Reference)

Name of Colour	Sl. No.	Indian colour (ISC)	'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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TABLE – 2

COLOUR CODES FOR PIPES, FITTINGS, FLANGES & VALVES

Pipe	Elbows, Reducers, Tee's Caps	Flange/Blind Flange / Valves	Sl. 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 (Normalized)	A 234 Gr WPB (N)	A105N / A 216 Gr.WCB	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/	27	276	Lincoln Green
A 691 Gr.1.25 Cr. CL.42 (EFW)	A 234 Gr.WP11W	A182 Gr.F11/ A216 Gr.WC6	27	276	Lincoln Green

NOTE For Sl. No. refer Table-1

- For Hydrogen service, white colour band shall be applied in addition to above

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- For IBR material, Post Office red shall be applied in addition to above.
- For NACE material, Canary Yellow shall be applied in addition to above.
- For NACE+HIC material, Dark Brown shall be applied in addition to above.

TABLE - 2

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

Pipe	Elbows, Reducers, Tee's Caps	Flange/ Blind Flange / Valves	Sl. 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
	A 234 Gr.WP5W	—	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	12	177	Satin Blue
A 312 Gr.316/316L A 312 Gr.316/316L	A403 Gr.316/316L	A 182 Gr.F316/316L	15	218	Grass Green
A 312 Gr.321	A403 Gr.321	A 182 Gr.F321	17	220	Olive Green
A 312 Gr.347	A403 Gr.347	A 182 Gr.F347	87	591	Deep Orange

NOTE: For schematic representation, Refer Annexure-1

For Sl. No. refer Table-1

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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	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

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
Octagonal Ring Gasket	5 Cr, l/2 Mo (Max. 120 BHN)	25	267	Traffic Green
	Soft Iron (Max. 90 BHN)	89	628	Silver Grey

NOTE: For schematic representation, Refer Annexure-1

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ANNEXURE – 1

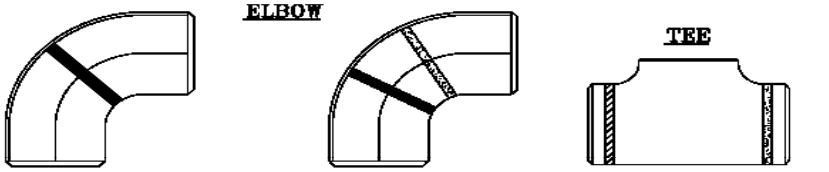
SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION

A. COLOUR IDENTIFICATION OF PIPES

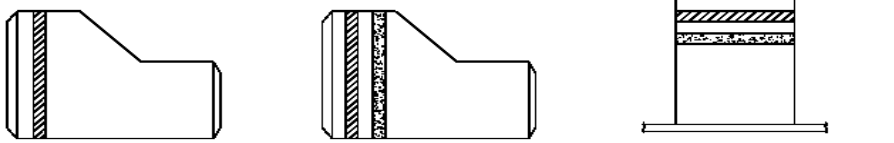


ONE COLOUR TWO COLOUR

B. COLOUR IDENTIFICATION OF FITTINGS



ONE COLOUR TWO COLOUR ONE OR TWO COLOUR(S)



ONE COLOUR TWO COLOUR ONE OR TWO COLOUR(S)



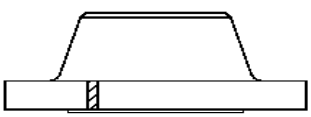
ONE OR TWO COLOUR(S) ONE OR TWO COLOUR(S)

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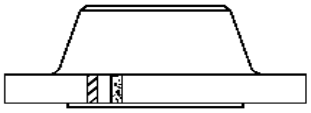
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SCHEMATIC REPRESENTATION OF COLOUR IDENTIFICATION

C. COLOUR IDENTIFICATION OF FLANGES

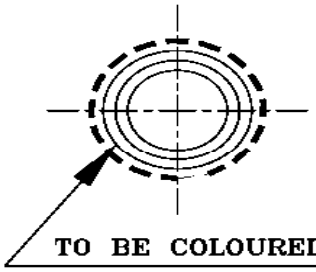


ONE COLOUR



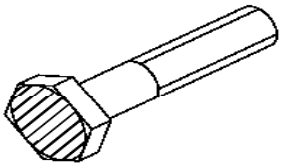
TWO COLOUR

D. COLOUR IDENTIFICATION OF GASKET



TO BE COLOURED AS SPECIFIED

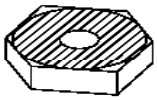
E. COLOUR IDENTIFICATION OF STUD/BOLTS & NUTS



MACHINE BOLT



STUD BOLT



NUT

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DOCUMENT CATEGORY	DOCUMENT REVIEW STATUS (BY CLIENT)
(USE "X" MARK) ☐ APPROVAL ☐ REVIEW ☒ INFORMATION	

REV	DATE	DETAILS OF REVISION	PREPARED	CHECKED	APPROVED
			AM	AM / LSJ	LSJ / SKJ
1	20/01/2022	REVISED & ISSUED AS SPECIFICATION	AM	LSJ	SH
0	06/07/2021	ISSUED AS SPECIFICATION	AM	LSJ	SH
A	31/05/2021	ISSUED FOR COMMENTS	AM	LSJ	SH

CLIENT	IndianOil	INDIAN OIL CORPORATION LIMITED PARADIP REFINERY PROJECT PARADIP ODISHA
CONSULTANT	TECHNIP ENERGIES	TECHNIP ENERGIES
PROJECT		525 TPD STANDBY SRU PROJECT IOCL PARADIP REFINERY, ODISHA, INDIA
ESC	ENGINEERS INDIA LIMITED	

			NAME	SIGN	DATE		
BHEL	BHEL Hyderabad	DRN					
		CHD					
DEPT. PE&SD.	CODE 450						

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TITLE- VALVE MATERIAL SPECIFICATION

BHEL/EIL DRG NO.- B366-6-44-0006 — **REV**

CUST. DRG NO.- 080557C-26899053-PIP-A2102-002 — 1

SHT NO.- 1 of 169 | **NO. OF SHT.- 169**

Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543BB
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543BB **PIPING CLASS :** A2A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 6.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	SS316; (NO CASTING)		
BALL	SOLID	SS316		
BODY SEAT		PEEK WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS	FLOATING BALL			
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS	I.B.R./ FV	STEAM/CONDENSATE; MAX TEMP 240 DEG C, & FULL VACUUM AT 175 DEG C		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1 THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2 ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3 NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4 VALVES CAN ALSO BE SUPPLIED IN ACCORDANCE WITH API-6D. FOR API 6D VALVES,MIN BODY WALL THICKNESS SHALL BE PER ASME B16.34.
5 VALVES TO COMPLY WITH DESIGN REQUIREMENTS OF IBR ALSO.
6 TESTING SHALL BE AS PER API-598 & IBR.
7 ALL VALVES SHALL BE BIDIRECTIONAL.
8 5% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
9 ALL VALVES TO BE SUPPLIED WITH IBR CERTIFICATE IN FORM-III C.
10 ALL VALVES SHALL BE PAINTED RED ON BODY-BONNET JOINT.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0	1	2
DATE	22/04/2021	10/06/2021	10/08/2021

543BB

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
12 STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
13 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT TYPE WITH SIDE ENTRY.
14 VALVES TO BE TESTED FOR FULL VACUUM, IN ACCORDANCE WITH ASME SECTION-V, ARTICLE-10 (HOOD METHOD).
15 VALVES SHALL MEET THE REQUIREMENTS FOR FULL VACUUM SERVICE, AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS) FOR VALVES.

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Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543CA
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543CA **PIPING CLASS :** A12A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 2.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	SS 316		
BODY SEAT		PEEK WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS	FLOATING BALL			
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS		MAX. TEMP 240 DEG. C & FULL VACUUM AT 240 DEG C.		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1. THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2. ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3. NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4. BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
5. TESTING OF VALVES SHALL BE AS PER API-598.
6. ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
7. ALL VALVES SHALL BE BIDIRECTIONAL.
8. 5 % VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
9. STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
10. VALVES SHALL BE PROVIDED WITH POSITION INDICATOR AND LOCKING DEVICE AT ANY POSITION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	14/10/2021

543CA

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT BODY TYPE WITH SIDE ENTRY.
12 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).

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Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543FA
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543FA **PIPING CLASS :** A23A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 6.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	13% CR STEEL; (NO CASTING)		
BALL	SOLID	13% CR STEEL/ SS304/ SS316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS				
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS	CATEGORY-D	MAX. TEMP 100 DEG. C		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1. THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2. ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3. NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4. BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
5. TESTING OF VALVES SHALL BE AS PER API-598.
6. ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
7. ALL VALVES SHALL BE BIDIRECTIONAL.
8. RADIOGRAPHIC EXAMINATION OF VALVE CASTING IS NOT REQUIRED.
9. STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
10. VALVES SHALL BE PROVIDED WITH POSITION INDICATOR AND LOCKING DEVICE AT ANY POSITION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	25/06/2021

543FA

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT BODY TYPE WITH SIDE ENTRY.

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Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543KA
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543KA **PIPING CLASS :** A52A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 0.5" TO 1.5" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGD	ASTM A 105 (NORMALISED)		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	ASTM A 182 GR F316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS				
REQUIREMENT OF GEAR OPERATOR				
REQUIREMENT OF RADIOGRAPHY				
SPECIAL SERVICE CONDITIONS		MAX. TEMP 200 DEG. C.		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1 THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2 ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3 NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4 ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
5 TESTING OF VALVES SHALL BE AS PER API-598.
6 ALL VALVES SHALL BE BIDIRECTIONAL.
7 BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
8 STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
9 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT TYPE WITH SIDE ENTRY.
10 VALVES SHALL BE PROVIDED WITH POSITION INDICATOR AND LOCKING DEVICE AT ANY POSITION.

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SHEET REV. NO.	0	1
DATE	26/04/2021	14/06/2021

543KA

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).

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Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543LA
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543LA **PIPING CLASS :** A52A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 8.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	SS 316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS				
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS		MAX. TEMP 200 DEG. C.		
TYPE	LONG PATTERN			
SPRING		UNS N07750		
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1. THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2. ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3. NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4. BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
5. TESTING OF VALVES SHALL BE AS PER API-598.
6. ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
7. ALL VALVES SHALL BE BIDIRECTIONAL.
8. 5 % VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
9. STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
10. VALVES SHALL BE PROVIDED WITH POSITION INDICATOR AND LOCKING DEVICE AT ANY POSITION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0	1
DATE	26/04/2021	14/06/2021

543LA

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT BODY TYPE WITH SIDE ENTRY.
12 FOR TRUNNION MOUNTED BALL,BODY SEAT SHALL BE SPRING LOADED.
13 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).

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Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 543TC
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :543TC **PIPING CLASS :** A28A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 0.75" TO 0.75" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	FORGD	ASTM A 105 (NORMALISED)		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	ASTM A 182 GR F316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7M		
BODY NUT		ASTM A194 GR 2HM		
OTHERS	FLOATING BALL			
REQUIREMENT OF GEAR OPERATOR				
REQUIREMENT OF RADIOGRAPHY				
SPECIAL SERVICE CONDITIONS	NACE + HIC	SOUR SERVICE + HIC RESISTANT, MAX. TEMP 200 DEG. C, AND FULL VACUUM AT 175 DEG C.		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1. THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2. ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3. NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4. ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
5. TESTING OF VALVES SHALL BE AS PER API-598.
6. ALL VALVES SHALL BE BIDIRECTIONAL.
7. BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
8. STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
9. CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT TYPE WITH SIDE ENTRY BOLTED CONNECTION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	26/10/2021

543TC

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

10 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).
11 NACE REQUIREMENTS SHALL BE AS PER MR0103.
12 NACE, SOUR SERVICE AND HIC REQUIREMENT OF VALVES SHALL ALSO BE MET AS MENTIONED IN DOCUMENT 'JOB SUPPLY SPECIFCATION FOR VALVES'.

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Client : IOCL
Project : PARADIP REF-S'BY SRU
Location : PARADIP, ODISHA

Dept./Sect. : 16/43
Tag No: 544LA
Sheet No. 1 of 2

BALL VALVE SPECIFICATION

TAG NO. :544LA **PIPING CLASS :** A52A
RATING : 300 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 3.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	SS 316; (NO CASTING)		
BALL	SOLID	SS 316		
BODY SEAT		RPTFE WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS				
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS		MAX. TEMP 200 DEG. C.		
TYPE	LONG PATTERN			
SPRING		UNS N07750		
HYDROSTATIC TEST PRESSURE	BODY : 1125 PSIG	SEAT : 825 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1. THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2. ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3. NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4. BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
5. TESTING OF VALVES SHALL BE AS PER API-598.
6. ALL VALVES SHALL BE FIRE SAFE DESIGN.FIRE SAFE TEST SHALL BE AS PER API 607 VI EDITION /(API 607/ ISO 10497) /API RP 6FA.
7. ALL VALVES SHALL BE BIDIRECTIONAL.
8. 10% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
9. STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
10. VALVES SHALL BE PROVIDED WITH POSITION INDICATOR AND LOCKING DEVICE AT ANY POSITION.

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	27/12/2021

544LA

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Sheet No. 2 of 2**

NOTES

11 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT BODY TYPE WITH SIDE ENTRY.
12 FOR TRUNNION MOUNTED BALL,BODY SEAT SHALL BE SPRING LOADED.
13 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).

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Client : IOCL	**Dept./Sect. :** 16/43
Project : PARADIP REF-S'BY SRU	
Location : PARADIP, ODISHA	**Tag No: 543JA** **Sheet No. 1 of 1**

BALL VALVE SPECIFICATION

TAG NO. :543JA **PIPING CLASS :** A52A
RATING : 150 **STANDARD** : API-608
SIZE RANGE : 2.0" TO 3.0" **ENDS** : FLGD TO B-16.5 RF/125AARH

MANUF'S OFFER

STANDARD:
MFGRS CAT/FIG:
(For category -II MRs only)
RATING: **ENDS:**

DESCRIPTION	CONSTRUCTION	MATERIAL	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A 216GR.WCB		
STEM	ANTI BLOWOUT	SS316; (NO CASTING)		
BALL	SOLID	SS316		
BODY SEAT		PEEK WITH SECONDARY METAL TO METAL		
GLAND	BOLTED/ RETAINED BY NUT & WASHER	ASTM A105N/13% CR STEEL/SS 316/SS 304		
STEM SEAL	RENEWABLE WITH VALVE OPEN ON STREAM	GRAFOIL		
BODY SEAL		GRAFOIL		
BODY STUD		ASTM A193 GR.B7		
BODY NUT		ASTM A194 GR 2H		
OTHERS	FLOATING BALL			
REQUIREMENT OF GEAR OPERATOR		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
REQUIREMENT OF RADIOGRAPHY		REFER JOB SUPPLY SPECIFICATION FOR VALVES.		
SPECIAL SERVICE CONDITIONS		STEAM/CONDENSATE/FUEL GAS; MAX TEMP 240 DEG		
TYPE	LONG PATTERN			
HYDROSTATIC TEST PRESSURE	BODY : 450 PSIG	SEAT : 325 PSIG		
TEST PRESSURE WITH AIR	80 PSIG			

NOTES

1 THIS VALVE SPEC SHEET SHALL BE READ IN CONJUNCTION WITH TECHNICAL NOTES FOR VALVES.
2 ONLY IN THE CASE OF CATEGORY - II MRs,BIDDER SHALL CLEARLY WRITE ALL/ ANY DEVIATION AGAINST EACH PART/ MATERIAL OF VALVE IN THE SPACE PROVIDED FOR AND WHEREVER BIDDER AGREES WITH EIL'S SPEC BIDDER SHALL INDICATE "AGREED".
3 NO CUTTING/ OVERWRITING BY BIDDER ON EIL'S SPEC IS ALLOWED.
4 VALVES CAN ALSO BE SUPPLIED IN ACCORDANCE WITH API-6D. FOR API 6D VALVES,MIN BODY WALL THICKNESS SHALL BE PER ASME B16.34.
5 TESTING SHALL BE AS PER API-598.
6 ALL VALVES SHALL BE BIDIRECTIONAL.
7 5% VALVE CASTINGS SHALL UNDERGO RADIOGRAPHIC EXAMINATION.
8 BIDDER'S STAMPING ON THE VALVE SPECIFICATION SHEET SHALL BE CONSTRUED TO MEAN BIDDER'S ACCEPTANCE OF SUITABILITY OF VALVE AND VALVE SHEETS FOR SERVICE AND 'SPECIAL SERVICE CONDITIONS' MENTIONED IN THE VALVE SPECIFICATION SHEETS.
9 STEM SEAL/BODY SEAL MATERIALS SHALL BE PROVIDED WITH CORROSION INHIBITOR.
10 CONSTRUCTION OF VALVE BODY SHALL BE OF 2 OR 3 PIECE SPLIT TYPE WITH SIDE ENTRY.
11 VALVES SHALL MEET THE MINIMUM DESIGN REQUIREMENTS FOR HYDROCARBON SERVICE AS MENTIONED IN JOB SUPPLY SPECIFICATION (JSS).

SIGNATURE & SEAL OF MANUFACTURER

SHEET REV. NO.	0
DATE	01/02/2022

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