



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract
No.

Piping Material Specification

Class

1

5365

Pr. Code	Area	Disc.	Type	Seq.	Rev.
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REVISION RECORD SHEET

REV. NO.	PURPOSE	LIST OF UPDATED MODIFIED SECTIONS IF ANY
01	Issued for Approval	<p>Clause 2 & 3 Codes and standards & Reference Documents</p> <p>Clause 4 Abbreviation</p> <p>Clause 5.2. Wall Thickness</p> <p>Clause 5.4. Threaded Connection</p> <p>Clause 5.6. Pipe</p> <p>Clause 5.8. Flange, Spectacle Blind, Blank & Spacer</p> <p>Clause 5.9. Gasket</p> <p>Clause 5.10 Bolt & Nut</p> <p>Clause 5.11. Valves</p> <p>Clause 6. Class Numbering</p> <p>Clause 7. Piping Class Index</p> <p>Piping Class B01/ B07/ B08/ B09/ B31/ C06 / B02</p> <p>Piping Class C11/ G08/ H08 /B05/ B06/ B11/ B12</p> <p>Branch Table 2 & 3 & 5</p> <p>Attachment #1: PIPING MATERIAL SPECIFICATION WPH1, Designed by PEEC</p> <p>Service: Hot Oil (Glycol), Hot Oil (Glycol) Closed Drain deleted from piping class B07</p> <p>To avoid duplication data between PMS & Piping Standard Drawings, "Spectacle Blind, Blank & Spacer Thickness "as an Attachment #1 deleted of PMS.</p>



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1. INTRODUCTION

1.1. Development Overview

The Resalat Field previously known as Rakhsh Field, is located in the Persian Gulf, some 80 km to the South of Lavan Island, in water depth of 65-75 meters. The facilities which were originally developed in 1968 have sustained some damage due to the Iran/Iraq war and adverse climate conditions thereafter.

To increase oil production capacity from this field (adding 12,000 stock barrels per day to current production), Iranian Offshore Oil Company (IOOC) has defined new project which includes Engineering, Drilling, Procurement, Construction for following items:

- New satellite Wellhead Platform (WHP1) with totally nine (9) conductor slots.
- Development and renovation of Existing offshore complex consist of new power generation, control system, HVAC, Electrical /control room, electrical panels(LV &MV), process & utility piping, and all necessary activities which shall be done for connection to existing facilities(Tie in requirements)
- Drilling of two new production wells in R1 and two wells in WHP1 platform and Re-entry and work-over of two existing well in R1 platform.
- One 10” productions submarine pipeline from WHP1 to PP and a single submarine cable (power and data) from SP to WHP1
- Inspection, Strengthening, Modification and Repair of existing R1 complex Jackets and topsides and replacement of boatlanding and Barge Bumpers.

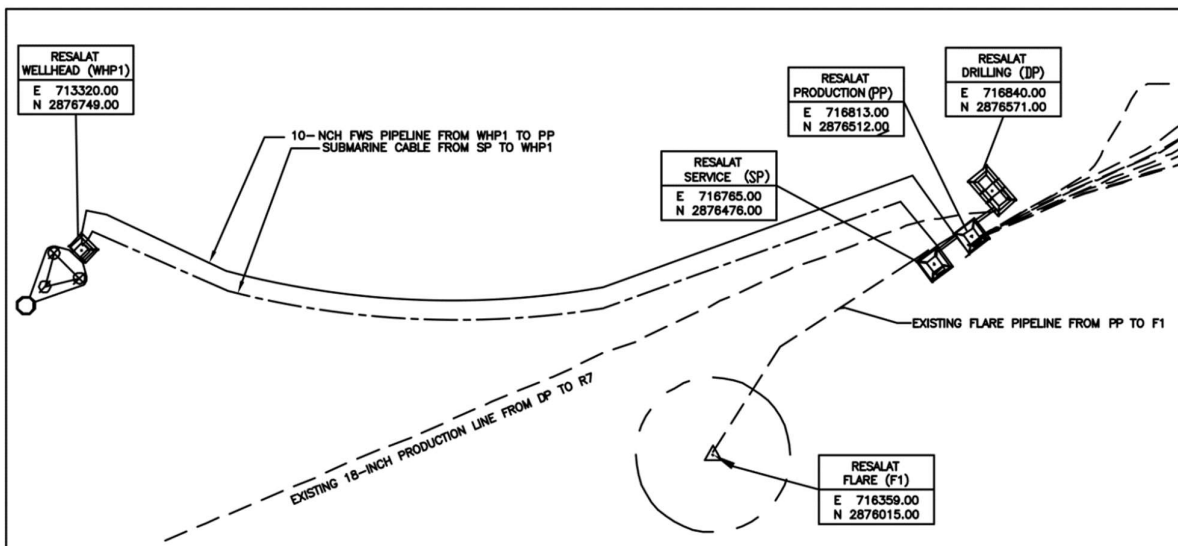


Figure 1: Resalat Development Field Layout (Datum ED 77, Zone 39, Cent. Meridian 51° East)



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1.2. Purpose of Scope

This specification covers the requirements for the selection of materials to be used in the construction and fabrication of all process and utility piping systems for Resalat Oil Field Development – Phase 1 Project. Except the following items;

- Heating, plumbing, ventilation and similar piping inside buildings
- Ducts
- Instrumentation tubing
- Pipeline

1.3. Definitions

PROJECT	Resalat Oil Field Development – Phase 1
COMPANY	Iranian Offshore Oil Company (IOOC)
CONTRACTOR	Consortium of Iranian Offshore Engineering and Construction Company (IOEC) and Intelligent Solutions Inc. (ISI)
SUB-CONTRACTOR	Tehran Raymand Consulting Engineers (TRCE)
PURCHASER	Any firm who buy services, material and/or equipment for execution of the project within a dedicated contract.
SUPPLIER	Any vendor, manufacturer who supply any Service, Material or Equipment for the project
SHALL	Refer to a mandatory requirement
SHOULD	Refer to a recommendation
MAY	Refer to one acceptable course of action



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2. CODES AND STANDARDS

The following codes, standards and project engineering documents shall be used to meet the requirements of this specification. Unless otherwise specified, the applicable version is the specified in “ List of Applicable Codes and Standards, Doc No: LRSL-000-PM-LI-743“

Reference	Title
API (American Petroleum Institute)	
6D	Specification for pipeline valves
6FA	Specification for Fire Test for Valves
6FD	Specification for Fire Test for Check Valves
5L	Specification for Line Pipe
594	Check Valves :flanged, Lug, Wafer and Butt-welding
598	Valve, inspection and test
599	Metal Plug Valves – Flanged, Threaded and welding ends
600	Steel Gate Valves-Flanged and But Welding Ends, Bolted Bonnets
602	Steel gate, Globe and check Valves for Sizes NPS4 (DN100) and Smaller for the Petroleum and Natural Gas Industries
607	Fire Test for Soft Seated Quarter Turn Valves
609	Butterfly Valves :Double-flanged, Lug and Wafer type
RP 14E	Design and Installation of Offshore Production Platform Piping
IPS (Iranian Petroleum Standards)	
E-PI-221	Piping Material Selection (On Plot Piping)
E-PI-240	Engineering standard for plant piping systems
C-PI-240	Construction standard for plant piping system



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Reference	Title
C-PI-290	Construction standard for welding of plant piping systems
G-PI-230	General standard for strainers and filters
M-PI-110	Material and equipment standard for valves
M-PI-150	Material and equipment standard for flanges and fittings
M-PI-190	Material and equipment standard for line pipe
ASME (American Society of Mechanical Engineers)	
B31.3	Process Piping
B1.1	Unified Inch Screw Threads
B1.20 .1	Pipe Threads
B16.5	Pipe flanges and flanged fittings
B16.9	Wrought Steel butt welding fittings
B16.10	Face-to-Face and end-to-end Dimensions for Valves
B16.11	Forged Steel fitting socket welding and threading
B16.20	Metallic gaskets for pipe flanges-ring-joint, spiral-wound
B16.21	Nonmetallic gasket for pipe flanges
B16.25	Butt welding ends
B16.34	Valves-Flanged, Threaded, and Welding End
B16.47	Large Diameter Steel Flanges, NPS 26 through NPS 60
B16.48	Line Blanks
B 18.2.1	Square and Hex Bolt and Screws
B18.2.2	Square and Hex nuts



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Reference	Title
B36.10	Wrought-steel pipe
B36.19	Stainless steel pipe
B46.1	Surface Texture (surface roughness, waviness and lay)
B16.36	Orifice Flange
BS (British Standards)	
BS 1873	Specification for Steel GLOBE and GLOBE Stop and Check Valves (Flanged and Butt-Welding Ends) for the Petroleum Petrochemical and Allied Industries
BS 6364	Valves for cryogenic service
BS EN 12266-1	Testing of Valves Part 1: Specification for Production Pressure Testing Requirements
ISO (International Organization for Standardization)	
ISO 10434	Bolted Bonnet Steel Gate Valves for the Petroleum, Petrochemical and allied industries
ISO 10497	Testing of Valves – Fire Type – Testing Requirements
ISO 15761	Steel Gate, Globe and Check Valves for size DN 100 and smaller, for the Petroleum and Natural Gas Industries
ISO 17292	Metal ball valves for petroleum, petrochemical and allied industries
MSS (Manufactures Standards Society)	
MSS SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting Ends Flanges of Valves and Fittings
MSS SP-25	Standard Marking Systems for Valves, Fittings, Flanges and Unions
MSS SP-75	Specification For High Test Wrought Butt Welding Fittings



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Reference	Title
MSS SP-95	Swage Nipples and Bull Plugs
MSS SP-97	Forged carbon steel branch outlet fittings
MSS SP-80	Bronze Gate, Globe, Angle and Check Valves
MSS SP-44	Steel pipe line flanges
NACE (NATIONAL ASSOCIATION OF CORROSION ENGINEERING)	
MR0175/ISO 15156	Petroleum, Petrochemical, And Natural Gas Industries – Materials For Use In H ₂ S-Containing Environments In Oil And Gas Production
TM0177	Laboratory Testing Of Metals For Resistance To Sulfide Stress Cracking And Stress Corrosion Cracking In H ₂ S Environments
TM0284	Evaluation Of Pipeline And Pressure Vessel Steels For Resistance To Hydrogen-Induced Cracking

3. REFERENCE DOCUMENTS

LRS�-R1X-MW-CR-001	Corrosion study and Material Selection Report
LRS�-000-PI-SP-684	Specification for Pipe
LRS�-000-PI-SP-685	Specification for Flange
LRS�-000-PI-SP-686	Specification for Fitting
LRS�-000-PI-SP-687	Specification for Valve
LRS�-000-PI-SP-689	Specification for Bolt & Nut
LRS�-000-PI-DB-676	Piping Design criteria
LRS�-R1X-PI-CC-001	Wall Thickness calculation
LRS�-000-PI-SP-688	Specification for Gaskets



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4. ABBREVIATIONS

Abbreviations	Descriptions
PE	PLAIN END
BE	BEVELLED END
PBE	PLAIN BOTH ENDS
POE/TOE	PLAIN ONE END / THREADED ONE END
TBE	THREADED BOTH ENDS
BLE/PSE	BEVELLED LARGE END/PLAIN SMALL END
PLE/TSE	PLAIN LARGE END / THREADED SMALL END
BBE	BEVELLED BOTH ENDS
BOE/TOE	BEVELLED ONE END / THEADED ONE END
SW-F	SOCKET WELD FEMALE
BW	BUTT WELD
TE-F	THREADED FEMALE
TE-M	THREADED MALE
WN	WELDING NECK
FLGD	FLANGED
RF	RAISED FACE
RTJ	RING TYPE JOINT
NIP	NIPPLE
CS	CARBON STEEL
SS	STAINLESS STEEL
GLVD	GALVANIZED



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Abbreviations	Descriptions
SMLS	SEAMLESS
SAW	SUBMERGED ARC WELDING
EFW	ELECTRIC FUSION WELDED
CON	CONCENTRIC
ECC	ECCENTRIC
LR	LONG RADIUS
RED. TEE	REDUCED TEE
CA	CORROSION ALLOWANCE
GR.	GRADE
HEX	HEXAGONAL
LTCS	LOW TEMPERATURE CARBON STEEL
mm	MILLIMETER
PLATF	PLATFORM
SCH	SCHEDULE
THK.	THICKNESS
PWHT	POST WELD HEAT TREATMENT
HO	HAND OPERATED
GO	GEAR OPERATED
BB	BOLTED BONNET
UB	UNION BONNET
OS	OUTSIDE SCREW



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Abbreviations	Descriptions
RS	RISING STEM
OS&Y	OUTSIDE SCREW & YOKE
ISRS	INSIDE SCREW RISING STEM
ISNRS	INSIDE SCREW NON RISING STEM
STP	STRAIGHT PATTERN
MFR STD	MANUFACTURE STANDARD
FV	FULL VACUUM
NA	NOT APPLICABLE

5. TECHNICAL CONSIDERATIONS

5.1. Design Limits

Pipe wall thicknesses that are specified in this document are adequate for the pressure/temperature combination mentioned for each piping class.

5.2. Wall Thickness

The calculation of pipe wall thickness values shall be in accordance with the ASME B31.3, Para. 304.1 And shall include a corrosion allowance as well as mill tolerance as applicable, and specified in project document "Wall Thickness calculation".

All steel pipes and piping components of welded construction and 100% radio-graphically examined as specified in this document are considered with joint factor of 1.0. In other cases, joint factor shall comply with the code. Unless otherwise noted in each piping class, minimum pipe wall thickness does not address any verification to external loadings or vacuum conditions.

Minus 12.5 % mill tolerance shall be considered for thickness calculation unless otherwise specified. For all ratings, pressure/temperature combination range of ASME B16.5 has been considered.



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For rating 1500 actual maximum pressure/temperature (+ margin to cover probable future changes), combination of streams has been considered.

5.3. Retirement Thickness

- The minimum wall thickness after reduction by:
 - Corrosion allowance
 - Mill tolerance
 - Threading allowance, where applicable, in accordance with ASME B1.20.1

Shall not be less than the following:

Size	Retirement Thickness (mm)
1/2" to 3/4"	1
1" to 8"	1.5
10"	2.3
12" to 14"	2.8
16" to 24"	3.1
26" to 36"	3.8
38" to 46"	4.6
48"	5.3
Above 48"	6.4

- Schedule "5S" shall not be used for stainless steels.
- In addition the minimum thickness specified in below table shall be followed for thickness selection:

Size	Carbon Steel	Stainless Steel
NPS <= 1 1/2"	For Process classes : SCH.160 For Utility classes : SCH.80	SCH.80S
2" <=NPS=<3"	For Process classes : SCH.80	SCH.40S



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5.4. Threaded Connection

All threaded connections shall have taper threads in accordance with ASME B1.20.1.

Threaded joints are only authorized on utility lines if and where listed on the relevant piping material class.

Threaded joints shall not be used on process service, with the exception of instrument connections, which are located downstream a block valve.

Threaded connections are absolutely not authorized in the following cases (related to particular fluids or services):

- Hazardous service, e.g.:
 - Sour and Severe sour service
 - Liquids above their Auto-Ignition Temperature (AIT), or at temperatures greater than 210°C, if the AIT is not known.
 - Flammable liquids flashing on leakage to form a substantial vapor cloud (this includes LNG condensate)
 - Lethal or toxic substances, including H₂S gas
- Pressure piping classes with rating $\geq 1500\#$
- Highly corrosive fluids (e.g., acids such as hydrochloric or Fluor hydric acids).

5.5. Material

- All material for all process piping which is exposed to H₂S shall be suitable for sour service and meet the requirements of NACE MR0175/ISO 15156. This shall be certified by reference to NACE standard or by results of test executed to verify the requirements of NACE.
- For all technical requirements of piping items used in sour and amine service condition, refer to document “Specification for Additional Requirements of Material in Special Services :LRSL-000-MW-SP-675”.
- NACE requirement is not a mandatory for sweet service application.
- Material shall be as specified in piping class descriptive table.
- Alternative shall satisfy the requirements of the standard for the material which is substituted and be suitable for the services specified in the piping class tables. However, application of alternative materials is subject to approval to use.



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- Supplying of all welded carbon steel piping materials for sour services & amine service shall be accompanied with post weld heat treatment.
- Any requirements of heat treatment, it shall comply to the requirement as stipulated on refer to Section 331 and Table 331.1.1 of ASME B31.3.

5.6.Pipe

- All Material requirement for Pipes shall be followed based on “Specification for Pipe : LRSL-000-PI-SP-684”.
- Non-standard pipe sizes such as 1¼”, 2½”, 3½”, 5”, 7”, 9” and 22” shall not be used, unless specifically dictated by process licensors.
- All process and utility piping inside packages shall be in accordance with this piping class material. For other piping, if applicable refer to equipment package specifications.
- All carbon steel pipe up to and including nominal size 16” shall be seamless.
- Carbon steel pipe with nominal sizes 18” and larger shall be longitudinal electric fusion welded (EFW) with 100% radiography test.
- For API 5L GR.B, carbon steel material with nominal size 18” and larger shall be longitudinal submerged arc welded (SAW) and longitudinal weld joint factor is 1 with 100% radiography test.
- Stainless steel pipe with nominal sizes 8” and larger shall be longitudinal electric fusion welded (EFW) with 100% radiography test.
- Spiral seam welded pipes are not acceptable.

5.7.Fitting

- All Material requirement for Fittings shall be followed based on “Specification for Fitting: LRSL-000-PI-SP-686”.
- All butt- welded fittings shall be accordance with ASME B16.9 and Screwed connection shall be in accordance with ASME B16.11.
- Carbon steel fittings with nominal sizes 18” and larger shall be longitudinal electric fusion welded (EFW) with 100% radiography test.
- Stainless steel fittings with nominal 8” and larger shall be longitudinal electric fusion welded (EFW) with 100% radiography test.



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- Wall thicknesses at the end of butt-weld fittings shall be equal to the thickness of the connected pipe.
- Usage of miter bend is not permitted.
- Connections of equal sizes always require an equal Tee.
- Connections where both header and branch are of a diameter less than 2 inches are made using Tees (equal or reduced).

5.8. Flange, Spectacle Blind, Blank & Spacer

- All Material requirement for Flanges shall be followed based on “Specification for Flange: LRSL-000-PI-SP-685”.
- Flange dimensions and specific requirements for nominal pipe size up to 24” shall be in accordance with ASME B16.5. for sizes 26” and above shall comply with ASME B16.47, series A.
- The facing of the gasket contact surface shall have a smooth serrated spiral finish in accordance with ASME B16.5 as per ASME B46.1.
- Surface finish should be 125 to 250 AARH for Raised Face and Flat Face flanges and 63 AARH for Ring joint flanges According to MSS-SP-6.
- When flanges are used with spectacle blind, blank & spacer and restriction orifice, one flange shall be jackscrew type as below:

Rating 150 & 300	Rating 600	Rating 900 & Above
NPS >= 6	NPS >= 3”	NPS >= 2”

- For spectacle blinds, thickness shall be according to “LRSL-000-PI-DR-677, Piping Standard Drawings”, other dimensions shall be according to ASME B16.48.
- For blanks & spacers, thickness and other dimensions shall be according to “LRSL-000-PI-DR-677, Piping Standard Drawings”.
- Spectacle blind, Blank & Spacer shall be considered as per below criteria:

Rating	Spectacle Blind	Blank & Spacer
150	NPS <= 12”	NPS >= 14”



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300	NPS <= 10"	NPS >= 12"
600	NPS <= 8"	NPS >= 10"
900	NPS <= 3"	NPS >= 4"
1500	NPS <= 2"	NPS >= 3"

- In Nonmetallic Piping Class (B31) the Max. Size of Spectacle Blind shall be Considered as 4" in order to avoid over loading in Flanged joints.

5.9. Gasket

- All Material requirement for gaskets shall be followed based on specified material and design code in this document.
- Asbestos or asbestos-containing gaskets are not allowed.
- Standard ring joint gaskets are style R. Dimensions of style R gaskets in 1500# are based on ASME B16.20.

5.10. Bolt & Nuts

- All Material requirement for Bolt & Nuts shall be followed based on specified material and design code in this document.
- Stud-bolt length shall be the effective thread length.
- Stud-bolt shall be in accordance with ASME B 18.2.1 and nut shall be in accordance with ASME B 18.2.2.
- For hydraulic bolt tensioning requirements see general requirement "Specification For Piping Fabrication, Installation And Testing: LRSL-000-PI-SP-693."
- Hydraulic bolt tensioning shall be applied for bolt diameters larger than 1½".
- Bolting intended for hydraulic bolt tensioning shall be specified with an additional length equal to the nominal diameter required for the application for hydraulic bolt-tensioning equipment.
- Except for stainless steel materials, the bolting shall undergo surface treatment of the "zinc plated+ bichromate treated" type. According to APPENDIXES X2. ASTM A-194. Plating SHALL performed according to ASTM B633-SC 3-Type II Standard Specification for Electrodeposited Coatings of Zinc.



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5.11. Valve

- Valve selection is based upon operational requirements and economic considerations.
- All specific requirements for Valves shall be followed based on “Specification for Valve: LRSL-000-PI-SP-687”.
- Unless otherwise specified, flanged valves shall have ASME B16.5 flanges for valves of diameter $\leq 24"$.
- Valves shall have the body/bonnet bolting in accordance with the requirements shown for line flanges.
- Asbestos-containing bonnet gaskets and gland packing are not allowed.
- “Quarter turn” valves (e.g. ball, butterfly, plug valves) with lever or wrench operator shall be provided with a stem extension of 100 mm for insulated lines. The stem extension is not required for instrument connections or vent and drains or gear-operated valves.
- Gear operator requirements for valves shall be in accordance with the following minimum requirements. However, gear operators may have to be provided beyond these requirements in order to meet the maximum allowable force applied to hand wheels or levers.

Rating	Gate	Globe	Ball	Butterfly
150	NPS $\geq 14"$	NPS $\geq 8"$	NPS $\geq 8"$	NPS $\geq 6"$
300	NPS $\geq 10"$	NPS $\geq 8"$	NPS $\geq 6"$	NPS $\geq 6"$
600	NPS $\geq 8"$	NPS $\geq 6"$	NPS $\geq 4"$	NPS $\geq 4"$
900	NPS $\geq 6"$	NPS $\geq 4"$	NPS $\geq 3"$	-
1500	NPS $\geq 4"$	NPS $\geq 4"$	NPS $\geq 3"$	-

- Ball valves shall be reduced port pattern generally. Where full port valves are required, they shall be indicated as such on the P&ID's.
- Ball Valves of diameter $\leq 1 \frac{1}{2}"$ shall be full port and have a port size at least equal to the internal bore of the matching pipe.
- All Socket weld Ball valves of nominal sizes $1/2"$ to $1 \frac{1}{2}"$ shall have extended end with the overall length of 100 mm on each side.
- Metal seat ball valves shall be used where operating temperature is greater than 200 °C.



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- Ball construction of Ball valves shall be according to below table:

Rating	Floating Ball	Trunnion Mounted Ball
150	NPS ≤ 6"	NPS ≥ 8"
300	NPS ≤ 4"	NPS ≥ 6"
600	NPS ≤ 1 1/2"	NPS ≥ 2"
900	-	NPS ≥ 1/2"
1500	-	NPS ≥ 1/2"

- Gate valves shall be reduced bore unless full port valves are required for process reasons indicated as such on the P&ID's.
- Check valves shall be installed horizontally. Just dual plate check valves could be used vertically if flow direction is upward or specified in data sheet.



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6. CLASS NUMBERING

The identification of the piping design specification is made of one alphabetical character, assigned in the following tables according to the line rating, and of two progressive numbers from 01 to 99, which have already been assigned to the basic specification attached hereto.

X		X	
Flange Rating		Base Material	
Rating	X Capital	Base Material	X Capital
150	B	CS	01 to 09
300	C	SS	11 to 19
600	D	ALLOY STEEL	21 to 29
900	G	Non-Metallic	31 to 39
1500	H		



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7. PIPING CLASS INDEX

CLASS	RATING	MATERIAL	CA (mm)	NDT CLASS	CODE	DESIGN TEMP. (C)	DESIGN PRES. (barg)	SERVICES	VALVE TRIM GATE, GLOBE, CHECK VALVE	VALVE TRIM BALL VALVE
B01	150#, RF	CS GALVANIZED	3	-	B31.3	-29 TO 200	19.6 TO 13.8	Instrument Air	For Body ASTM B62 UNS C83600 (NPS <=2") : ASTM B62 For Body A216 WCB (NPS >=3") : 13%CR	NA
B02	150#, RF	KILLED CS (SOUR SERVICE)	3	2	B31.3	-29 TO 200	19.6 TO 13.8	Acid Gas Flare, HC Drain Liquid	SS 316L + Stellite 6	SS 316
B05	150#, RF	KILLED CS	3	2	B31.3	-29 TO 200	19.6 TO 13.8	Fuel Gas	Check Valve NPS >=2" : SS 316 Others: 13%CR + Stellite 6	SS 316
B06	150#, RF	KILLED CS (AMINE SERVICE)	3	2	B31.3	-29 TO 200	19.6 TO 13.8	Rich Amine, Lean Amine , Amine Closed Drain	SS 316L + Stellite 6	SS 316
B07	150#, RF	CS	1.5	2	B31.3	-29 TO 200	19.6 TO 13.8	Nitrogen, Fuel Oil	Check Valve NPS >=2" : SS 316 Others: 13%CR + Stellite 6	SS 316



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CLASS	RATING	MATERIAL	CA (mm)	NDT CLASS	CODE	DESIGN TEMP. (C)	DESIGN PRES. (barg)	SERVICES	VALVE TRIM GATE, GLOBE, CHECK VALVE	VALVE TRIM BALL VALVE
B08	150#, RF	KILLED CS (SEVER SOUR SERVICE)	6	2	B31.3	-29 TO 85	19.6 TO 17.7	Hydrocarbon- Well Fluid	SS 316L + Stellite 6	SS 316
B09	150#, RF	CS GALVANIZED	1.5	-	B31.3	-29 TO 85	19.6 TO 17.7	Potable Water	For Body ASTM B62 UNS C83600 (NPS <=2") : ASTM B62 For Body A216 WCB (NPS >=3") : 13%CR	NA
B11	150#, RF	SS 316L	0	2	B31.3	-29 TO 200	15.9 TO 11.2	Sweet Gas, Rich Amine, Acid Gas, Demineralized Water	Gate: SS 316L + Stellite 6 Globe & Check: SS 316(L)	SS 316(L)
B12	150#, RF	SS 316L (SOUR SERVICE)	0	2	B31.3	-29 TO 200	15.9 TO 11.2	Sour Gas, Hydrocarbon Liquid, Rich Amine, Acid Gas	Gate: SS 316L + Stellite 6 Globe & Check: SS 316(L)	SS 316(L)
B31	150#,FF	GRE	0	-	MFR STD	85	16	Firewater (Sea water)	B148 GR.C95800	NA
C06	300#, RF	KILLED CS (AMINE SERVICE)	3	2	B31.3	-29 TO 200	51.1 TO 43.8	Lean Amine	SS 316L + Stellite 6	SS 316



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CLASS	RATING	MATERIAL	CA (mm)	NDT CLASS	CODE	DESIGN TEMP. (C)	DESIGN PRES. (barg)	SERVICES	VALVE TRIM GATE, GLOBE, CHECK VALVE	VALVE TRIM BALL VALVE
C11	300#, RF	SS 316L	0	2	B31.3	-29 TO 200	41.4 TO 29.2	Chemical	Gate: SS 316L + Stellite 6 Globe & Check: SS 316(L)	SS 316(L)
G08	900#, RTJ	KILLED CS (SEVER SOUR SERVICE)	6	1	B31.3	-29 TO 85	153.2 TO 139.8	Hydrocarbon- Well Fluid	Alloy 625	Alloy 625
H08	1500#, RTJ	KILLED CS (SEVER SOUR SERVICE)	6	1	B31.3	-29 TO 85	173	Hydrocarbon- Well Fluid	Alloy 625	Alloy 625



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PIPING CLASS: B01

Base Material	CARBON STEEL GALVANIZED	Additional Requirements: -																																					
Design Code	ASME B31.3	Services: Instrument Air																																					
Corrosion Allowance	3																																						
Rating	150 #																																						
Finishing	RF (125-250 AARH)	<table border="1"> <tr> <td>Design Limits</td> <td>Temperature (°C)</td> <td>-29</td> <td>50</td> <td>100</td> <td>150</td> <td>200</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Pressure (barg)</td> <td>19.6</td> <td>19.2</td> <td>17.7</td> <td>15.8</td> <td>13.8</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>External Pressure</td> <td colspan="8">-</td> </tr> </table>								Design Limits	Temperature (°C)	-29	50	100	150	200					Pressure (barg)	19.6	19.2	17.7	15.8	13.8					External Pressure	-							
Design Limits	Temperature (°C)									-29	50	100	150	200																									
	Pressure (barg)									19.6	19.2	17.7	15.8	13.8																									
	External Pressure	-																																					
PWHT	AS PER CODE																																						

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4
Sch.	XXS	XXS	XXS	XXS	160	160	80
Thk. (mm)	7.47	7.82	9.09	10.15	8.74	11.13	8.56



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PIPING CLASS: B01

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	4	ASTM A53 GR.B., HOT DIP GALVANIZED TO ASTM A153, SMLS	TE-M & COUPLED	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A53 GR.B, HOT DIP GALVANIZED TO ASTM A153, SMLS	TBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	4	ASTM A234 WPB, WROUGHT-S, HOT DIP GALVANIZED TO ASTM A153	TBE	MSS-SP 95	
FULL COUPLING					
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 6000#	ASME B16.11	
PLUG HEX HEAD					
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-M	ASME B16.11	
UNION					
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 6000#	MSS-SP 83	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					



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PIPING CLASS: B01

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 6000#	ASME B16.11	
FLANGE (Note-1)					
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	RF, 150#	ASME B16.5	
SPECTACLE BLIND					
1/2	4	SPECTACLE BLIND, ASTM A516 GR.70, HOT DIP GALVANIZED TO ASTM A153, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	2	ASTM B62 UNS C83600, SOLID WEDGE, BB, ISNRS, HO	TE-F, 200#	MSS SP-80	
3	4	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	
GLOBE VALVE					
1/2	2	ASTM B62 UNS C83600, DISK, STP, BB, OS&Y, HO	TE-F, 200#	MSS SP-80	
3	4	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, HO	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	2	ASTM B62 UNS C83600, BALL TYPE, BC	TE-F, 200#	MSS SP-80	Note-7



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PIPING CLASS: B01

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
3	4	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BUTTERFLY VALVE					
2	4	ASTM A216 WCB, CONCENTRIC DESIGN, CATEGORY A, HO	LUG, RF, 150#	API 609	
STRAINER (Note-1, 8)					
1/2	2	Y-TYPE, ASTM A105, HOT DIP GALVANIZED TO ASTM A153, SCREEN ASTM B62	TE-F, 800#	MFR STD	
3	4	T-TYPE, ASTM A234 WPB, WROUGHT-S, HOT DIP GALVANIZED TO ASTM A153, SCREEN ASTM B62	FLGD, RF, 150#	MFR STD	
GASKET					
1/2	4	FLAT RING, 2 mm THK, GRAPHITE, ASBESTOS FREE	RF, 150#	ASME B16.21	
1/2	4	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 300#	ASME B16.20	Note-3
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7 WITH TWO HEAVY HEX NUTS ASTM A194-2H, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B01

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval.
- 3- Only for matching 300# flanged connections.
- 4- NA.
- 5- NA.
- 6- NA.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRS�-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRS�-000-PI-DR-677, piping standard drawing".



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PIPING CLASS: B02

Base Material	KILLED CARBON STEEL	Additional Requirements: Sour Service According To NACE MR0175/ISO 15156						
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)						
Corrosion Allowance	3 mm							
Rating	150 #	Services:						
Finishing	RF (125-250 AARH)	Acid Gas Flare , HC Drain Liquid						
PWHT	YES							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	19.6	19.2	17.7	15.8	13.8		
	External Pressure	-						

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	160	160	160	160	80	80	40	40	20	20	30				
Thk. (mm)	4.78	5.56	6.35	7.14	5.54	7.62	6.02	7.11	6.35	6.35	8.38				

Thickness – Threaded (Note-12)

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	XXS	NOT TO BE USED		
Thk. (mm)	7.47	NOT TO BE USED		



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PIPING CLASS: B02

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	12	ASTM A106 GR.B, SMLS, NACE MR0175/ISO 15156	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A106 GR.B, SMLS, NACE MR0175/ISO 15156	BBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BBE	MSS-SP 95	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2), LATERAL TEE (Note-15), LATERAL RED. TEE (Note-15)					
1/2	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
OLET (Note-1)					
1/2	4	WELDOLET, ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	BW	MSS-SP 97	
3	4	LATROLET, ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	BW	MSS-SP 97/ MFR STD	Note-15
FLANGE (Note-1)					
1/2	12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	



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PIPING CLASS: B02

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
6	12	ASTM A105 NORMALIZED , WITH JACK SCREW, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A105 NORMALIZED , NACE MR0175/ISO 15156	RF, 150#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	12	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED , TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A105 NORMALIZED , SOLID WEDGE, BB, ISNRS , HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2	12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS , HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 600	
GLOBE VALVE					
1/2	1 1/2	ASTM A105 NORMALIZED , PISTON, BB, OS&Y, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2	12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A105 NORMALIZED , BALL TYPE, BC, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	Note-7
2	12	ASTM A216 WCB, DUAL PLATE, NACE MR0175/ISO 15156	WAFER, RF, 150#	API 594	Note-7



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
BALL VALVE					
1/2	1 1/2	ASTM A105 NORMALIZED, FB, FLOATING BALL, SOFT SEAT, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	ISO 17292	Note-5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	3	SBB / DBB, ASTM A105 NORMALIZED, FB, With Vent (Needle), HO, NACE MR0175/ISO 15156	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A105 NORMALIZED, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					



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PIPING CLASS: B02

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
-	-	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B02

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- NA
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- NA
- 12- Just for orifice flange's tap point connection, a nipple 1/2" BOE/TOE could be used. Threaded connection shall not be used in other cases.
- 13- NA
- 14- NA
- 15- For flare lines.



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PIPING CLASS: B05

Base Material	KILLED CARBON STEEL	Additional Requirements: -							
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)							
Corrosion Allowance	3 mm								
Rating	150 #	Services:							
Finishing	RF (125-250 AARH)	Fuel Gas							
PWHT	AS PER CODE								
Design Limits	Temperature (°C)	-29	50	100	150	200			
	Pressure (barg)	19.6	19.2	17.7	15.8	13.8			
	External Pressure	-							

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	160	160	160	160	80	80	40	40	20	30	30				
Thk. (mm)	4.78	5.56	6.35	7.14	5.54	7.62	6.02	7.11	6.35	7.8	8.38				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	XXS	XXS	XXS	XXS
Thk. (mm)	7.47	7.82	9.09	10.15



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PIPING CLASS: B05

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PE	ASME B36.10M	
2	12	ASTM A106 GR.B, SMLS	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PBE, POE/TOE, TBE	ASME B36.10M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A234 WPB, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, 6000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, 6000#	ASME B16.11	
2	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	



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PIPING CLASS: B05

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A105 NORMALIZED	SW-F, 6000#	MSS-SP 97	
2	4	WELDOLET, ASTM A105 NORMALIZED	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, RF, 150#, 300# (Note-3)	ASME B16.5	
2	12	ASTM A105 NORMALIZED	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A105 NORMALIZED, WITH JACK SCREW	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A105 NORMALIZED	RF, 150#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	12	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A105, SOLID WEDGE, BB, ISNRS, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	



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PIPING CLASS: B05

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
GLOBE VALVE					
1/2	1 1/2	ASTM A105, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A105, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A105, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	2	SBB / DBB, ASTM A105, FB, With Vent (Needle), HO	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A105, SCREEN SS 316	SW-F, 800#	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316	BW	MFR STD	



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PIPING CLASS: B05

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7 WITH TWO HEAVY HEX NUTS ASTM A194-2H, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B05

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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PIPING CLASS: B06

Base Material	KILLED CARBON STEEL (FOR AMINE SERVICE)	Additional Requirements: -												
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature) For all welded items, PWHT is required regardless of thickness.												
Corrosion Allowance	3 mm													
Rating	150 #	Services:												
Finishing	RF (125-250 AARH)	Rich Amine, Lean Amine, Amine Closed Drain												
PWHT	YES													
Design Limits	Temperature (°C)	-29	50	100	150	200								
	Pressure (barg)	19.6	19.2	17.7	15.8	13.8								
	External Pressure	FV@85°C												

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12					
Sch.	160	160	160	160	80	80	40	40	20	30	30					
Thk. (mm)	4.78	5.56	6.35	7.14	5.54	7.62	6.02	7.11	6.35	7.8	8.38					

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	XXS	XXS	XXS	XXS
Thk. (mm)	7.47	7.82	9.09	10.15



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PIPING CLASS: B06

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PE	ASME B36.10M	
2	12	ASTM A106 GR.B, SMLS	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PBE, POE/TOE, TBE	ASME B36.10M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A234 WPB, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, 6000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, 6000#	ASME B16.11	
2	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	



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PIPING CLASS: B06

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A105 NORMALIZED	SW-F, 6000#	MSS-SP 97	
2	4	WELDOLET, ASTM A105 NORMALIZED	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, RF, 150#, 300# (Note-3)	ASME B16.5	
2	12	ASTM A105 NORMALIZED	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A105 NORMALIZED, WITH JACK SCREW	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A105 NORMALIZED	RF, 150#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	12	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A105, SOLID WEDGE, BB, ISNRS, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	



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PIPING CLASS: B06

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
GLOBE VALVE					
1/2	1 1/2	ASTM A105, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A105, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A105, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	2	SBB / DBB, ASTM A105, FB, With Vent (Needle), HO	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A105, SCREEN SS 316	SW-F, 800#	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316	BW	MFR STD	



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PIPING CLASS: B06

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B06

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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PIPING CLASS: B07

Base Material	CARBON STEEL	Additional Requirements: -									
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)									
Corrosion Allowance	1.5 mm										
Rating	150 #	Services:									
Finishing	RF (125-250 AARH)	Nitrogen, Fuel Oil									
PWHT	AS PER CODE										
Design Limits	Temperature (°C)	-29	50	100	150	200					
	Pressure (barg)	19.6	19.2	17.7	15.8	13.8					
	External Pressure	FV@85°C									

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	80	80	80	80	40	40	40	40	20	20	20				
Thk. (mm)	3.73	3.91	4.55	5.08	3.91	5.49	6.02	7.11	6.35	6.35	6.35				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	160	160	160	160
Thk. (mm)	4.78	5.56	6.35	7.14



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PIPING CLASS: B07

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PE	ASME B36.10M	
2	12	ASTM A106 GR.B, SMLS	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PBE, POE/TOE, TBE	ASME B36.10M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A234 WPB, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A105 <u>NORMALIZED</u>	SW-F, 3000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A105 <u>NORMALIZED</u>	SW-F, 3000#	ASME B16.11	
2	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
3	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A105 NORMALIZED	SW-F, 3000#	MSS-SP 97	
2	4	WELDOLET, ASTM A105 NORMALIZED	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, RF, 150#, 300# (Note-3)	ASME B16.5	
2	12	ASTM A105 NORMALIZED	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A105 NORMALIZED, WITH JACK SCREW	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A105 NORMALIZED	RF, 150#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	12	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A105, SOLID WEDGE, BB, ISNRS, HO	SW-F, 800#	API 602	



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PIPING CLASS: B07

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
2	12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	
GLOBE VALVE					
1/2	1 1/2	ASTM A105, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A105, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A105, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	2	SBB / DBB, ASTM A105, FB, With Vent (Needle), HO	Note-10	MFR STD	
STRAINER (Note-1, 8)					



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PIPING CLASS: B07

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
1/2	1 1/2	Y-TYPE, ASTM A105, SCREEN SS 316	SW-F, 800#	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7 WITH TWO HEAVY HEX NUTS ASTM A194-2H, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B07

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRS�-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRS�-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRS�-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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PIPING CLASS: B08

Base Material	KILLED CARBON STEEL	Additional Requirements: Sever sour Service According To NACE MR0175/ISO 15156 + HIC Test for welded pipes & fittings												
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)												
Corrosion Allowance	6 mm													
Rating	150 #	Services:												
Finishing	RF (125-250 AARH)	Hydrocarbon- Well Fluid												
PWHT	YES													
Design Limits	Temperature (°C)	-29	50	100										
	Pressure (barg)	19.6	19.2	17.7										
	External Pressure													

Thickness – BW / PE (Note-13)

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	1	1	XXS	XXS	160	160	80	80	60	60	40				
Thk. (mm)	1	1	9.09	10.15	8.74	11.13	8.56	10.97	10.31	12.7	10.31				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	NOT TO BE USED			
Thk. (mm)	(Note-12)			



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PIPING CLASS: B08

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1	12	ASTM A106 GR.B, SMLS, NACE MR0175/ISO 15156	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1	1 1/2	ASTM A106 GR.B, SMLS, NACE MR0175/ISO 15156	BBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1	2	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BBE	MSS-SP 95	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
OLET (Note-1)					
1	4	WELDOLET, ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	BW	MSS-SP 97	
FLANGE (Note-1)					
1	12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A105 NORMALIZED, WITH JACK SCREW, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	



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PIPING CLASS: B08

Size From To	Material, Description	End, Finishing, Rating	Standard	Note
BLIND FLANGE				
1 12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	RF, 150#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER				
1 12	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE				
1 1 1/2	ASTM A105 NORMALIZED, SOLID WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2 12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 600	
GLOBE VALVE				
1 1 1/2	ASTM A105 NORMALIZED, PISTON, BB, OS&Y, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2 12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	BS 1873	
CHECK VALVE				
1 1 1/2	ASTM A105 NORMALIZED, BALL TYPE, BC, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	Note-7
2 12	ASTM A216 WCB, DUAL PLATE, NACE MR0175/ISO 15156	WAFER, RF, 150#	API 594	Note-7
BALL VALVE				



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From	To	Material, Description	End, Finishing, Rating	Standard	Note
1	1 1/2	ASTM A105 NORMALIZED, FB, FLOATING BALL, SOFT SEAT, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	ISO 17292	Note-5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1	3	SBB / DBB, ASTM A105 NORMALIZED, FB, With Vent (Needle), HO, NACE MR0175/ISO 15156	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1	1 1/2	Y-TYPE, ASTM A105 NORMALIZED, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316, NACE MR0175/ISO 15156	BW	MFR STD	
GASKET					
1	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					
1	1	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B08

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- NA
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRS�-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRS�-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRS�-R1X-PI-DR-005".
- 11- NA
- 12- Threaded connection shall not be used in any case. If there is no other way for orifice flange tap points' connections, a nipple BOE/TOE SCH.XXS could be used but it shall be replaced with a new one every 5 years.
- 13-The minimum line size in this class is 1.



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PIPING CLASS: B09

Base Material	CARBON STEEL GALVANIZED	Additional Requirements: -						
Design Code	ASME B31.3	Services: Potable Water						
Corrosion Allowance	1.5							
Rating	150 #							
Finishing	RF (125-250 AARH)							
PWHT	AS PER CODE							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	19.6	19.2	17.7	15.8	13.8		
	External Pressure							

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4
Sch.	160	160	160	160	80	80	80
Thk. (mm)	4.78	5.56	6.35	7.14	5.54	7.62	8.56



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PIPING CLASS: B09

Size From To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE				
1/2 4	ASTM A53 GR.B., HOT DIP GALVANIZED TO ASTM A153, SMLS	TE-M & COUPLED	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG				
1/2 1 1/2	ASTM A53 GR.B, HOT DIP GALVANIZED TO ASTM A153, SMLS	TBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE				
1/2 4	ASTM A234 WPB, WROUGHT-S, HOT DIP GALVANIZED TO ASTM A153	TBE	MSS-SP 95	
FULL COUPLING				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 3000#	ASME B16.11	
PLUG HEX HEAD				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-M	ASME B16.11	
UNION				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 3000#	MSS-SP 83	



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PIPING CLASS: B09

Size From To	Material, Description	End, Finishing, Rating	Standard	Note
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, 3000#	ASME B16.11	
FLANGE (Note-1)				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	TE-F, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE				
1/2 4	ASTM A105, HOT DIP GALVANIZED TO ASTM A153	RF, 150#	ASME B16.5	
SPECTACLE BLIND				
1/2 4	SPECTACLE BLIND, ASTM A516 GR.70, HOT DIP GALVANIZED TO ASTM A153, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE				
1/2 2	ASTM B62 UNS C83600, SOLID WEDGE, BB, ISNRS, HO	TE-F, 200#	MSS SP-80	
3 4	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	
GLOBE VALVE				
1/2 2	ASTM B62 UNS C83600, DISK, STP, BB, OS&Y, HO	TE-F, 200#	MSS SP-80	



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PIPING CLASS: B09

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
3	4	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, HO	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	2	ASTM B62 UNS C83600, BALL TYPE, BC	TE-F, 200#	MSS SP-80	Note-7
3	4	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BUTTERFLY VALVE					
2	4	ASTM A216 WCB, CONCENTRIC DESIGN, CATEGORY A, HO	LUG, RF, 150#	API 609	
STRAINER (Note-1, 8)					
1/2	2	Y-TYPE, ASTM A105, HOT DIP GALVANIZED TO ASTM A153, SCREEN ASTM B62	TE-F, 800#	MFR STD	
3	4	T-TYPE, ASTM A234 WPB, WROUGHT-S, HOT DIP GALVANIZED TO ASTM A153, SCREEN ASTM B62	FLGD, RF, 150#	MFR STD	
GASKET					
1/2	4	FLAT RING, 2 mm THK, GRAPHITE, ASBESTOS FREE	RF, 150#	ASME B16.21	
1/2	4	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 300#	ASME B16.20	Note-3
BOLT & NUT					
1	1	STUD BOLT, ASTM A193-B7 WITH TWO HEAVY HEX NUTS ASTM A194-2H, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: B09

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval.
- 3- Only for matching 300# flanged connections.
- 4- NA.
- 5- NA.
- 6- NA.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".



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PIPING CLASS: B11

Base Material	STAINLESS STEEL 316L	Additional Requirements: -						
Design Code	ASME B31.3							
Corrosion Allowance	0							
Rating	150 #	Services:						
Finishing	RF (125-250 AARH)	Sweet Gas, Rich Amine, Acid Gas, Demineralized Water						
PWHT	-							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	15.9	15.3	13.3	12	11.2		
	External Pressure	FV@85°C						

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	80S	80S	80S	80S	40S	40S	10S	10S	10S	10S	10S				
Thk. (mm)	3.73	3.91	4.55	5.08	3.91	5.49	3.05	3.4	3.76	4.19	4.57				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	80S	80S	80S	80S
Thk. (mm)	3.73	3.91	4.55	5.08



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PIPING CLASS: B11

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A312 TP316L, SMLS	PE	ASME B36.19M	
2	6	ASTM A312 TP316L, SMLS	BE	ASME B36.19M	
8	12	ASTM A358 GR.316L, CL.1, EFW, 100%RT	BE	ASME B36.19M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A312 TP316L, SMLS	PBE ,POE/TOE	ASME B36.19M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A403 WP316L, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A182 F316L	SW-F, 3000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A182 F316L	SW-F, 3000#	ASME B16.11	
2	6	ASTM A403 WP316L, WROUGHT-S	BW	ASME B16.9	
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT	BW	ASME B16.9	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	6	ASTM A403 WP316L, WROUGHT-S	BW	ASME B16.9	
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT	BW	ASME B16.9	
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A182 F316L	SW-F, 3000#	MSS-SP 97	
2	4	WELDOLET, ASTM A182 F316L	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A182 F316L	SW-F, RF, 150#, 300# (Note-3)	ASME B16.5	
2	12	ASTM A182 F316L	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A182 F316L, JACK SCREW TYPE	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A182 F316L	RF, 150#	ASME B16.5	
SPECTACLE BLIND					
1/2	12	SPECTACLE BLIND, ASTM A240 TP316L, TO SUIT ASME B16.5 FLANGES	RF, 150#	ASME B16.48 STD DRAWING	Note-9



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
GATE VALVE					
1/2	1 1/2	ASTM A182 F316L, SOLID WEDGE, BB, ISNRS, HO	SW-F, 800#	API 602	
2	12	ASTM A351 CF3M, FLEX. WEDGE, BB, ISNRS, HO	FLGD, RF, 150#	API 600	
GLOBE VALVE					
1/2	1 1/2	ASTM A182 F316L, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A351 CF3M, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A182 F316L, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A351 CF3M, DUAL PLATE	WAFER, RF, 150#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A182 F316L, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A351 CF3M, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A351 CF3M, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	2	SBB / DBB, ASTM A182 F316L, FB, With Vent (Needle), HO	Note-10	MFR STD	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A182 F316L, SCREEN SS 316(L)	SW-F, 800#	MFR STD	
2	2	Y-TYPE, ASTM A351 CF3M, SCREEN SS 316(L)	BW	MFR STD	
3	6	T-TYPE, ASTM A403 WP316L, WROUGHT-S, SCREEN SS 316(L)	BW	MFR STD	
8	12	T-TYPE, ASTM A403 WP316L, WROUGHT-W, 100% RT, SCREEN SS 316(L)	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., SS 316 INNER & OUTER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B8M CL.2 WITH TWO HEAVY HEX NUTS ASTM A194-8MA, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing","LRSL-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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PIPING CLASS: B12

Base Material	STAINLESS STEEL 316L	Additional Requirements: Sour Service According To NACE MR0175/ISO 15156						
Design Code	ASME B31.3							
Corrosion Allowance	0							
Rating	150 #	Services:						
Finishing	RF (125-250 AARH)	Sour Gas, Hydrocarbon liquid, Rich Amine, Acid Gas						
PWHT	-							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	15.9	15.3	13.3	12	11.2		
	External Pressure	FV@85°C						

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	80S	80S	80S	80S	40S	40S	10S	10S	10S	10S	10S				
Thk. (mm)	3.73	3.91	4.55	5.08	3.91	5.49	3.05	3.4	3.76	4.19	4.57				

Thickness – Threaded (Note-12)

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	80S	NOT TO BE USED		
Thk. (mm)	3.73			



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PIPING CLASS: B12

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	6	ASTM A312 TP316L, SMLS, NACE MR0175/ISO 15156	BE	ASME B36.19M	
8	12	ASTM A358 GR.316L, CL.1, EFW, 100%RT, NACE MR0175/ISO 15156	BE	ASME B36.19M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A312 TP316L, SMLS, NACE MR0175/ISO 15156	BBE	ASME B36.19M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A403 WP316L, WROUGHT-S, NACE MR0175/ISO 15156	BBE	MSS-SP 95	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	6	ASTM A403 WP316L, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT, NACE MR0175/ISO 15156	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	6	ASTM A403 WP316L, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT, NACE MR0175/ISO 15156	BW	ASME B16.9	
OLET (Note-1)					
1/2	4	WELDOLET, ASTM A182 F316L, NACE MR0175/ISO 15156	BW	MSS-SP 97	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
FLANGE (Note-1)					
1/2	12	ASTM A182 F316L, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
6	12	ASTM A182 F316L, JACK SCREW TYPE, NACE MR0175/ISO 15156	WN, RF, 150#, 300# (Note-3)	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A182 F316L, NACE MR0175/ISO 15156	RF, 150#	ASME B16.5	
SPECTACLE BLIND					
1/2	12	SPECTACLE BLIND, ASTM A240 TP316L, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RF, 150#	ASME B16.48 STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A182 F316L, SOLID WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2	12	ASTM A351 CF3M, FLEX. WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 600	
GLOBE VALVE					
1/2	1 1/2	ASTM A182 F316L, PISTON, BB, OS&Y, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	
2	12	ASTM A351 CF3M, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	BS 1873	



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Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
CHECK VALVE					
1/2	1 1/2	ASTM A182 F316L, BALL TYPE, BC, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 602	Note-7
2	12	ASTM A351 CF3M, DUAL PLATE, NACE MR0175/ISO 15156	WAFER, RF, 150#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A182 F316L, FB, FLOATING BALL, SOFT SEAT, HO, NACE MR0175/ISO 15156	FLGD, RF, 150#	ISO 17292	Note- 5, 6
2	12	ASTM A351 CF3M, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6"AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5
2	12	ASTM A351 CF3M, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 6"AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, G.O. FOR DIA. 8" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RF, 150#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	3	SBB / DBB, ASTM A182 F316L, FB, With Vent (Needle), HO, NACE MR0175/ISO 15156	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A182 F316L, SCREEN SS 316(L), NACE MR0175/ISO 15156	BW	MFR STD	
2	2	Y-TYPE, ASTM A351 CF3M, SCREEN SS 316(L), NACE MR0175/ISO 15156	BW	MFR STD	
3	6	T-TYPE, ASTM A403 WP316L, WROUGHT-S, SCREEN SS 316(L), NACE MR0175/ISO 15156	BW	MFR STD	



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Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
8	12	T-TYPE, ASTM A403 WP316L, WROUGHT-W, 100% RT, SCREEN SS 316(L), NACE MR0175/ISO 15156	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., SS 316 INNER & OUTER RING (TO SUIT ASME B16.5)	RF, 150#, 300# (Note-3)	ASME B16.20	
BOLT & NUT (Note-14)					
-	-	STUD BOLT, ASTM A193-B8M CL.2 WITH TWO HEAVY HEX NUTS ASTM A194-8MA, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- Only for matching 300# flanged connections.
- 4- NA
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing"; "LRSL-R1X-PI-DR-005".
- 11- NA
- 12- Just for orifice flange's tap point connection, a nipple 1/2" BOE/TOE could be used. Threaded connection shall not be used in other cases.
- 13- NA
- 14- ASTM A193-B8M/ ASTM A194-8M shall not be used under insulation.



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PIPING CLASS: B31

Base Material	GRE	Additional Requirements: -						
Design Code	ASME B31.3 / ASTM D2996							
Corrosion Allowance	0 mm							
Rating	150 #	Services: Firewater (Sea Water)						
Finishing	FF (125-250 AARH)							
PWHT	-							
Design Limits	Temperature (°C)	85						
	Pressure (barg)	16						
	External Pressure	-						

Note:

1: Based on line design condition & service all material specifications and items' characteristics (including material, equivalent outside diameters, joint type, thicknesses, safety factor, outside diameters, minimum available size, type of branch connection, etc.) shall be specified by Manufacturer.

2: Sizes below 1" shall be avoided.

3: Below comparison table for GRE material size is preliminary and based on "FARASAN" Catalog, and will be finalized based on final Manufacturer data.

Size (Inch)	1	2	3	4	6	8	10	12								
Min OD (mm)	31.6	56.6	87	106.6	157.6	209.8	261.6	313.6								



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PIPING CLASS: B31

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE (Note-1,2)					
1	12	GLASS REINFORCING EPOXY, FILAMENT WOUND, UV RESISTANT	BELL & SPIGOT, ADHESIVE BONDED JOINT	MFR STD	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP, CON. REDUCER, ECC. REDUCER (Note-1,2)					
1	12	GLASS REINFORCING EPOXY, FILAMENT WOUND, UV RESISTANT	BELL, ADHESIVE BONDED JOINT	MFR STD	
FLANGE (Note-1,2)					
1	12	GLASS REINFORCING EPOXY, FILAMENT WOUND, UV RESISTANT, TO SUIT ASME B16.5 FLANGES	FLG*BELL, FF, 150#, 300# (Note-3)	MFR STD	
BLIND FLANGE (Note-2)					
1	12	GLASS REINFORCING EPOXY, FILAMENT WOUND, UV RESISTANT, TO SUIT ASME B16.5 FLANGES	FLG, FF, 150#, 300# (Note-3)	MFR STD	
1	1	BLIND FLANGE WITH HOLE 1/2", ASTM A105 NORMALIZED OVERLAY 90 Cu/10 Ni, TO SUIT ASME B16.5 FLANGES	FLG, FF, 150#	MFR STD	Note-16
SPECTACLE BLIND, BLANK & SPACER					
1	4	SPECTACLE BLIND, ASTM B 171 UNS C70600-ANNILED, TO SUIT ASME B16.5 FLANGES	FF, 150#	ASME B16.48 STD DRAWING	Note-9
6	12	BLANK & SPACER, ASTM B 171 UNS C70600-ANNILED, TO SUIT ASME B16.5 FLANGES	FF, 150#	STD DRAWING	Note-9
GATE VALVE					



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PIPING CLASS: B31

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
1	1	ASTM B 148 UNS C95800, SOLID WEDGE, BB, ISNRS, HO	FLGD, FF, 150#	API 602/MFR STD	
2	12	ASTM B 148 UNS C95800, FLEX. WEDGE, BB, ISNRS, HO	FLGD, FF, 150#	API 600/MFR STD	
GLOBE VALVE					
1	1	ASTM B 148 UNS C95800, PISTON, STP, BB, OS&Y, HO	FLGD, FF, 150#	API 602/MFR STD	
2	12	ASTM B 148 UNS C95800, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, FF, 150#	BS 1873/MFR STD	
BUTTERFLY VALVE					
2	12	ASTM B 148 UNS C95800, CONCENTRIC DESIGN, CATEGORY A, G.O. FOR DIA. 6" AND ABOVE	LUG, FF, 150#	API 609	
CHECK VALVE					
1	1	ASTM B 148 UNS C95800, BALL TYPE, BC	FLGD, FF, 150#	API 602/MFR STD	Note-7
2	12	ASTM B 148 UNS C95800, DUAL PLATE	WAFER, FF, 150#	API 594/MFR STD	Note-7
GASKET					
1	6	NEOPRENE, FULL FACE, 3 MM THK, SHORE HARDNESS (60 TO 70 MAXIMUM), TO SUIT ASME B16.5 FLANGES	FF, 150#, 300# (Note-3)	ASME B16.21	
8	12	NEOPRENE, FULL FACE, 5 MM THK, SHORE HARDNESS (60 TO 70 MAXIMUM), TO SUIT ASME B16.5 FLANGES	FF, 150#, 300# (Note-3)	ASME B16.21	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7 WITH TWO HEAVY HEX NUTS ASTM A194-2H, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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Notes:

- 1- Based on line design condition all material specifications and items' characteristics (including material, equivalent outside diameters, joint type, thicknesses, safety factor, outside diameters, **minimum available size ,type of branch connection,** etc.) shall be specified by Manufacturer..
- 2- Above ground RTR piping to be UV resistant.
- 3- Only for matching 300# flanged connections.
- 4- NA
- 5- NA
- 6- NA
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- NA
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Requisition to state 'For Fire-fighting Water service including Seawater'.
- 11- NA
- 12- NA
- 13- NA
- 14- NA
- 15- NA
- 16- Just to be used where specified in "Piping Assembly Drawing","LRSL-R1X-PI-DR-005".



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PIPING CLASS: C06

Base Material	KILLED CARBON STEEL (FOR AMINE SERVICE)	Additional Requirements:						
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature) For all welded items, PWHT is required regardless of thickness.						
Corrosion Allowance	3 mm							
Rating	300 #	Services:						
Finishing	RF (125-250 AARH)	Lean Amine						
PWHT	YES							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	51.1	50.1	46.6	45.1	43.8		
	External Pressure	FV@85°C						

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	160	160	160	160	80	80	40	40	40	40	40				
Thk. (mm)	4.78	5.56	6.35	7.14	5.54	7.62	6.02	7.11	8.18	9.27	10.31				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	XXS	XXS	XXS	XXS
Thk. (mm)	7.47	7.82	9.09	10.15



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PIPING CLASS: C06

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PE	ASME B36.10M	
2	12	ASTM A106 GR.B, SMLS	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A106 GR.B, SMLS	PBE, POE/TOE, TBE	ASME B36.10M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A234 WPB, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A105 <u>NORMALIZED</u>	SW-F, 6000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A105 <u>NORMALIZED</u>	SW-F, 6000#	ASME B16.11	
2	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S	BW	ASME B16.9	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A105 NORMALIZED	SW-F, 6000#	MSS-SP 97	
2	4	WELDOLET, ASTM A105 NORMALIZED	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A105 NORMALIZED	SW-F, RF, 300#	ASME B16.5	
2	12	ASTM A105 NORMALIZED	WN, RF, 300#	ASME B16.5	
6	12	ASTM A105 NORMALIZED , WITH JACK SCREW	WN, RF, 300#	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A105 NORMALIZED	RF, 300#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	10	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED , TO SUIT ASME B16.5 FLANGES	RF, 300#	ASME B16.48 STD DRAWING	Note-9
12	12	BLANK & SPACER, ASTM A516 GR.70 NORMALIZED , TO SUIT ASME B16.5 FLANGES	RF, 300#	STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A105, SOLID WEDGE, BB, ISNRS , HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS , G.O. FOR DIA. 10" AND ABOVE	FLGD, RF, 300#	API 600	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
GLOBE VALVE					
1/2	1 1/2	ASTM A105, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 300#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A105, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A216 WCB, DUAL PLATE	WAFER, RF, 300#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A105, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 4" AND TRUNNION MOUNTED FOR DIA. 6" AND ABOVE, G.O. FOR DIA. 6" AND ABOVE	FLGD, RF, 300#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 4" AND TRUNNION MOUNTED FOR DIA. 6" AND ABOVE, G.O. FOR DIA. 6" AND ABOVE	FLGD, RF, 300#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1/2	2	SBB / DBB, ASTM A105, FB, With Vent (Needle), HO	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A105, SCREEN SS 316	SW-F, 800#	MFR STD	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
2	2	Y-TYPE, ASTM A216 WCB, SCREEN SS 316	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN SS 316	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., CS OUTER RING, SS 316 INNER RING (TO SUIT ASME B16.5)	RF, 300#	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- NA
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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Base Material	STAINLESS STEEL 316L	Additional Requirements: -						
Design Code	ASME B31.3							
Corrosion Allowance	0							
Rating	300 #	Services:						
Finishing	RF (125-250 AARH)	Chemical						
PWHT	-							
Design Limits	Temperature (°C)	-29	50	100	150	200		
	Pressure (barg)	41.4	40.0	34.8	31.4	29.2		
	External Pressure	-						

Thickness – BW / PE

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	80S	80S	80S	80S	40S	40S	40S	40S	20	20	40S				
Thk. (mm)	3.73	3.91	4.55	5.08	3.91	5.49	6.02	7.11	6.35	6.35	9.53				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	80S	80S	80S	80S
Thk. (mm)	3.73	3.91	4.55	5.08



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Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1/2	1 1/2	ASTM A312 TP316L, SMLS	PE	ASME B36.19M	
2	6	ASTM A312 TP316L, SMLS	BE	ASME B36.19M	
8	10	ASTM A358 GR.316L, CL.1, EFW, 100%RT	BE	ASME B36.10M	
12	12	ASTM A358 GR.316L, CL.1, EFW, 100%RT	BE	ASME B36.19M	
NIPPLE, 100mm LONG, 150 mm LONG					
1/2	1 1/2	ASTM A312 TP316L, SMLS	PBE, POE/TOE, TBE	ASME B36.F19M	Note-11
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1/2	2	ASTM A403 WP316L, WROUGHT-S	PBE, PLE/TSE, BLE/PSE	MSS-SP 95	Note-11
FULL COUPLING					
1/2	1 1/2	ASTM A182 F316L	SW-F, 3000#	ASME B16.11	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1/2	1 1/2	ASTM A182 F316L	SW-F, 3000#	ASME B16.11	
2	6	ASTM A403 WP316L, WROUGHT-S	BW	ASME B16.9	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	6	ASTM A403 WP316L, WROUGHT-S	BW	ASME B16.9	
8	12	ASTM A403 WP316L, WROUGHT-W, 100%RT	BW	ASME B16.9	
OLET (Note-1)					
1/2	1 1/2	SOCKOLET, ASTM A182 F316L	SW-F, 3000#	MSS-SP 97	
2	4	WELDOLET, ASTM A182 F316L	BW	MSS-SP 97	
FLANGE (Note-1)					
1/2	1 1/2	ASTM A182 F316L	SW-F, RF, 300#	ASME B16.5	
2	12	ASTM A182 F316L	WN, RF, 300#	ASME B16.5	
6	12	ASTM A182 F316L, WITH JACK SCREW	WN, RF, 300#	ASME B16.5	
BLIND FLANGE					
1/2	12	ASTM A182 F316L	RF, 300#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1/2	10	SPECTACLE BLIND, ASTM A240 TP316L, TO SUIT ASME B16.5 FLANGES	RF, 300#	ASME B16.48 STD DRAWING	Note-9



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Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
12	12	BLANK & SPACER, ASTM A240 TP316L, TO SUIT ASME B16.5 FLANGES	RF, 300#	STD DRAWING	Note-9
GATE VALVE					
1/2	1 1/2	ASTM A182 F316L, SOLID WEDGE, BB, ISNRS, HO	SW-F, 800#	API 602	
2	12	ASTM A351 CF3M, FLEX. WEDGE, BB, ISNRS, G.O. FOR DIA. 10" AND ABOVE	FLGD, RF, 300#	API 600	
GLOBE VALVE					
1/2	1 1/2	ASTM A182 F316L, PISTON, BB, OS&Y, HO	SW-F, 800#	API 602	
2	12	ASTM A351 CF3M, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 8" AND ABOVE	FLGD, RF, 300#	BS 1873	
CHECK VALVE					
1/2	1 1/2	ASTM A182 F316L, BALL TYPE, BC	SW-F, 800#	API 602	Note-7
2	12	ASTM A351 CF3M, DUAL PLATE	WAFER, RF, 300#	API 594	Note-7
BALL VALVE					
1/2	1 1/2	ASTM A182 F316L, FB, FLOATING BALL, SOFT SEAT, HO	SW + 2 NIP, 800#	ISO 17292	Note-4, 5, 6
2	12	ASTM A351 CF3M, RB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 4" AND TRUNNION MOUNTED FOR DIA. 6" AND ABOVE, G.O. FOR DIA. 6" AND ABOVE	FLGD, RF, 300#	API 6D/ISO 14313	Note-5
2	12	ASTM A351 CF3M, FB, SOFT SEAT, FLOATING BALL FOR DIA. UP TO 4" AND TRUNNION MOUNTED FOR DIA. 6" AND ABOVE, G.O. FOR DIA. 6" AND ABOVE	FLGD, RF, 300#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					



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Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
1/2	2	SBB / DBB, ASTM A182 F316L, FB, With Vent (Needle), HO	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1/2	1 1/2	Y-TYPE, ASTM A182 F316L, SCREEN SS 316(L)	SW-F, 800#	MFR STD	
2	2	Y-TYPE, ASTM A351 CF3M, SCREEN SS 316(L)	BW	MFR STD	
3	6	T-TYPE, ASTM A403 WP316L, WROUGHT-S, SCREEN SS 316(L)	BW	MFR STD	
8	12	T-TYPE, ASTM A403 WP316L, WROUGHT-W, 100%RT, SCREEN SS 316(L)	BW	MFR STD	
GASKET					
1/2	12	SPIRAL WOUND, HOOP: SS 316, FILLER: GRAPHITE, 4.5 mm THK., SS 316 INNER & OUTER RING (TO SUIT ASME B16.5)	RF, 300#	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B8M CL.2 WITH TWO HEAVY HEX NUTS ASTM A194-8MA, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- NA
- 4- All Socket weld ball valves of nominal sizes 1/2" to 1 1/2" shall have extended end with the overall length of 100 mm on each side.
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- To use threaded connection, paragraph 5.4 shall be considered.



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Base Material	KILLED CARBON STEEL	Additional Requirements: Sever sour Service According To NACE MR0175/ISO 15156 + HIC Test for welded pipes & fittings									
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)									
Corrosion Allowance	6 mm										
Rating	900 #	Services:									
Finishing	RTJ (63 AARH)	Hydrocarbon- Well Fluid									
PWHT	YES										
Design Limits	Temperature (°C)	-29	50	100							
	Pressure (barg)	153.2	150.4	139.8							
	External Pressure										

Thickness – BW / PE (Note-13)

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	1	1	XXS	XXS	XXS	XXS	XXS	160	140	140	140				
Thk. (mm)	1	1	9.09	10.15	11.07	15.24	17.12	18.26	20.62	25.4	28.58				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	NOT TO BE USED			
Thk. (mm)	(Note-12)			



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Size From To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE				
1 12	API 5L GR.B, PSL2, SMLS, NACE MR0175/ISO 15156	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG				
1 1 1/2	API 5L GR.B, PSL2, SMLS, NACE MR0175/ISO 15156	BBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE				
1 2	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BBE	MSS-SP 95	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)				
1 12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.				
3 12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
OLET (Note-1)				
1 4	WELDOLET, ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	BW	MSS-SP 97	
FLANGE (Note-1)				
1 2	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	WN, RTJ, 1500#	ASME B16.5	
3 12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	WN, RTJ, 900#	ASME B16.5	



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
2	2	ASTM A105 NORMALIZED, WITH JACK SCREW, NACE MR0175/ISO 15156	WN, RTJ, 1500#	ASME B16.5	
3	12	ASTM A105 NORMALIZED, WITH JACK SCREW, NACE MR0175/ISO 15156	WN, RTJ, 900#	ASME B16.5	
BLIND FLANGE					
1	2	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	RTJ, 1500#	ASME B16.5	
3	12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	RTJ, 900#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER					
1	2	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RTJ, FEMALE, 1500#	ASME B16.48 STD DRAWING	Note-9
3	3	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RTJ, FEMALE, 900#	ASME B16.48 STD DRAWING	Note-9
4	12	BLANK & SPACER, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RTJ, FEMALE, 900#	STD DRAWING	Note-9
GATE VALVE					
1	1 1/2	ASTM A105 NORMALIZED, SOLID WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	
2	2	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 600	



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3 12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, G.O. FOR DIA. 6" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 900#	API 600	
GLOBE VALVE				
1 1 1/2	ASTM A105 NORMALIZED, PISTON, BB, OS&Y, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	
2 2	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, H.O, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	BS 1873	
3 12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 4" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 900#	BS 1873	
CHECK VALVE				
1 1 1/2	ASTM A105 NORMALIZED, BALL TYPE, BC, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	Note-7
2 2	ASTM A216 WCB, DUAL PLATE, NACE MR0175/ISO 15156	LUG, RTJ, 1500#	API 594	Note-7
3 12	ASTM A216 WCB, DUAL PLATE, NACE MR0175/ISO 15156	LUG, RTJ, 900#	API 594	Note-7
BALL VALVE				
1 1 1/2	ASTM A105 NORMALIZED, FB, TRUNNION MOUNTED, SOFT SEAT, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5, 6
2 2	ASTM A216 WCB, RB, SOFT SEAT, TRUNNION MOUNTED, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5



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Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
2	2	ASTM A216 WCB, FB, SOFT SEAT, TRUNNION MOUNTED, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5, 6
3	12	ASTM A216 WCB, RB, SOFT SEAT, TRUNNION MOUNTED, G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 900#	API 6D/ISO 14313	Note-5
3	12	ASTM A216 WCB, FB, SOFT SEAT, TRUNNION MOUNTED, G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 900#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1	3	SBB / DBB, ASTM A105 NORMALIZED, FB, With Vent (Needle), G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1	1 1/2	Y-TYPE, ASTM A105 NORMALIZED, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
GASKET					
1	2	OCTAGONAL RING GASKET, SOFT IRON, TYPE R, (TO SUIT ASME B16.5)	RTJ, 1500#	ASME B16.20	



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PIPING CLASS: G08

Size		Material, Description	End, Finishing, Rating	Standard	Note
From	To				
3	12	OCTAGONAL RING GASKET, SOFT IRON, TYPE R, (TO SUIT ASME B16.5)	RTJ, 900#	ASME B16.20	
BOLT & NUT					
-	-	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICHROMATE TREATED, THREADED AS PER ASME B1.1		ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: G08

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- NA
- 4- NA
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- NA
- 12- Threaded connection shall not be used in any case. If there is no other way for orifice flange tap points' connections, a nipple BOE/TOE SCH.XXS could be used but it shall Be replaced with a new one every 5 years.
- 13- The minimum line size in this class is 1".



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PIPING CLASS: H08

Base Material	KILLED CARBON STEEL	Additional Requirements: Sever sour Service According To NACE MR0175/ISO 15156 + HIC Test for welded pipes & fittings												
Design Code	ASME B31.3	Impact Test As Per Code (Based on thickness and minimum design temperature)												
Corrosion Allowance	6 mm													
Rating	1500 #	Services:												
Finishing	RTJ (63 AARH)	Hydrocarbon- Well Fluid												
PWHT	YES													
Design Limits	Temperature (°C)	85												
	Pressure (barg)	173												
	External Pressure													

Thickness – BW / PE (Note-13)

Size (Inch)	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12				
Sch.	1	1	1	XXS	XXS	XXS	XXS	XXS	XXS	160	1				
Thk. (mm)	1	1	1	10.15	11.07	15.24	17.12	21.95	22.23	28.58	31.75				

Thickness – Threaded

Size (Inch)	1/2	3/4	1	1 1/2
Sch.	NOT TO BE USED			
Thk. (mm)	(Note-12)			



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PIPING CLASS: H08

Size From	To	Material, Description	End, Finishing, Rating	Standard	Note
PIPE					
1 1/2	12	API 5L GR.B, PSL2, SMLS, NACE MR0175/ISO 15156	BE	ASME B36.10M	
NIPPLE, 100mm LONG, 150 mm LONG					
1 1/2	1 1/2	API 5L GR.B, PSL2, SMLS, NACE MR0175/ISO 15156	BBE	ASME B36.10M	
CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE					
1 1/2	2	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BBE	MSS-SP 95	
90 ELBOW (LR), 45 ELBOW (LR), TEE, RED. TEE, CAP (Note-1, 2)					
1 1/2	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
CON. REDUCER, ECC. REDUCER (Note-1) – “FROM” & “TO” SPECIFY THE RANGE OF HEADER SIZES. BRANCH SIZES COULD BE ANY SMALLER SIZE AS PER ASME B16.9.					
3	12	ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156	BW	ASME B16.9	
OLET (Note-1)					
1 1/2	4	WELDOLET, ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	BW	MSS-SP 97	
FLANGE (Note-1)					
1 1/2	12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	WN, RTJ, 1500#	ASME B16.5	
2	12	ASTM A105 NORMALIZED, WITH JACK SCREW, NACE MR0175/ISO 15156	WN, RTJ, 1500#	ASME B16.5	



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PIPING CLASS: H08

Size From To	Material, Description	End, Finishing, Rating	Standard	Note
BLIND FLANGE				
1 1/2 12	ASTM A105 NORMALIZED, NACE MR0175/ISO 15156	RTJ, 1500#	ASME B16.5	
SPECTACLE BLIND, BLANK & SPACER				
1 1/2 2	SPECTACLE BLIND, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RTJ, FEMALE, 1500#	ASME B16.48 STD DRAWING	Note-9
3 12	BLANK & SPACER, ASTM A516 GR.70 NORMALIZED, TO SUIT ASME B16.5 FLANGES, NACE MR0175/ISO 15156	RTJ, FEMALE, 1500#	STD DRAWING	Note-9
GATE VALVE				
1 1/2 1 1/2	ASTM A105 NORMALIZED, SOLID WEDGE, BB, ISNRS, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	
2 12	ASTM A216 WCB, FLEX. WEDGE, BB, ISNRS, G.O. FOR DIA. 4" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 600	
GLOBE VALVE				
1 1/2 1 1/2	ASTM A105 NORMALIZED, PISTON, BB, OS&Y, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	
2 12	ASTM A216 WCB, SWIVEL PLUG DISK, STP, BB, OS&Y, G.O. FOR DIA. 4" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	BS 1873	
CHECK VALVE				
1 1/2 1 1/2	ASTM A105 NORMALIZED, BALL TYPE, BC, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 602	Note-7



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PIPING CLASS: H08

Size From	Size To	Material, Description	End, Finishing, Rating	Standard	Note
2	12	ASTM A216 WCB, DUAL PLATE, NACE MR0175/ISO 15156	LUG, RTJ, 1500#	API 594	Note-7
BALL VALVE					
1 1/2	1 1/2	ASTM A105 NORMALIZED, FB, TRUNNION MOUNTED, SOFT SEAT, HO, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5, 6
2	12	ASTM A216 WCB, RB, SOFT SEAT, TRUNNION MOUNTED, G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5
2	12	ASTM A216 WCB, FB, SOFT SEAT, TRUNNION MOUNTED, G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	FLGD, RTJ, 1500#	API 6D/ISO 14313	Note-5, 6
SINGLE BLOCK AND BLEED/DOUBLE BLOCK AND BLEED VALVE (Note-10)					
1 1/2	3	SBB / DBB, ASTM A105 NORMALIZED, FB, With Vent (Needle), G.O. FOR DIA. 3" AND ABOVE, NACE MR0175/ISO 15156	Note-10	MFR STD	
STRAINER (Note-1, 8)					
1 1/2	1 1/2	Y-TYPE, ASTM A105 NORMALIZED, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
2	2	Y-TYPE, ASTM A216 WCB, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
3	12	T-TYPE, ASTM A234 WPB, WROUGHT-S, SCREEN ALLOY 625, NACE MR0175/ISO 15156	BW	MFR STD	
GASKET					
1 1/2	12	OCTAGONAL RING GASKET, SOFT IRON, TYPE R, (TO SUIT ASME B16.5)	RTJ, 1500#	ASME B16.20	



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Size From To	Material, Description	End, Finishing, Rating	Standard	Note
BOLT & NUT				
—	—	STUD BOLT, ASTM A193-B7M WITH TWO HEAVY HEX NUTS ASTM A194-2HM, ZINC PLATED + BICROMATE TREATED, THREADED AS PER ASME B1.1	ASME B18.2.1 ASME B18.2.2	



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PIPING CLASS: H08

Notes:

- 1- Thickness of BW connection points of fittings, flanges and strainers shall match the pipe thickness.
- 2- Short radius elbow may be used where space is restricted, subject to EPC's approval. Wrought Caps in all sizes are WROUGHT-S type.
- 3- NA
- 4- NA
- 5- Using "soft seat" ball valve shall be restricted to operating temperature up to 200 °C.
- 6- Full bore ball valves shall only be used when indicated in P&ID except the ones with size 1 1/2" and smaller which are all FB type.
- 7- Check valves shall be installed horizontally. Just dual plate type could be used vertically if flow direction is upward or it is specified in data sheet.
- 8- Mesh size shall be specified in related strainer data sheet.
- 9- Thickness of spectacle blinds, blanks & spacers shall be according to "LRSL-000-PI-DR-677, piping standard drawing". Other data of spectacle blinds and blanks & spacers shall be according to ASME B16.48 and "LRSL-000-PI-DR-677, piping standard drawing".
- 10- Isolating valves for instrument connections if it is required. For ending, finishing and rating refer to "Piping Assembly Drawing", "LRSL-R1X-PI-DR-005".
- 11- NA
- 12- Threaded connection shall not be used in any case. If there is no other way for orifice flange tap points' connections, a nipple BOE/TOE SCH.XXS could be used but it shall Be replaced with a new one every 5 years.
- 13- The minimum line size in this class is 1 1/2".



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BRANCH TABLES

Note-1: Designer may select a different type of branch connection based on stress analysis of piping system.



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BRANCH TABLE-1

FOR: B05, B06, B07, B11, C06, C11

BRANCH SIZE

RUN
SIZE

SIZE	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12
12	S	S	S	S	W	W	W	TR	TR	TR	T
10	S	S	S	S	W	W	W	TR	TR	T	
8	S	S	S	S	W	W	TR	TR	T		
6	S	S	S	S	W	TR	TR	T			
4	S	S	S	S	TR	TR	T				
3	S	S	S	S	TR	T					
2	S	S	S	S	T						
1 1/2	TR	TR	TR	T							
1	TR	TR	T								
3/4	TR	T									
1/2	T										

S:	SOCKOLET
W:	WELDOLET
T:	TEE EQUAL
TR:	RED. TEE



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BRANCH TABLE-2

FOR: B02, B08, B12, G08, H08

BRANCH SIZE

RUN
SIZE

SIZE	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12
12	W	W	W	W	W	W	W	TR	TR	TR	T
10	W	W	W	W	W	W	W	TR	TR	T	
8	W	W	W	W	W	W	TR	TR	T		
6	W	W	W	W	W	TR	TR	T			
4	W	W	W	W	TR	TR	T				
3	W	W	W	W	TR	T					
2	W	W	W	W	T						
1 1/2	TR	TR	TR	T							
1	TR	TR	T								
3/4	TR	T									
1/2	T										

S:	SOCKOLET
W:	WELDOLET
T:	TEE EQUAL
TR:	RED. TEE



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BRANCH TABLE-3

FOR: B01, B09

BRANCH SIZE

RUN
SIZE

SIZE	1/2	3/4	1	1 1/2	2	3	4
4	TR*	TR*	TR*	TR	TR	TR	T
3	TR*	TR*	TR*	TR	TR	T	
2	TR*	TR	TR	TR	T		
1 1/2	TR	TR	TR	T			
1	TR	TR	T				
3/4	TR	T					
1/2	T						

T:	TEE EQUAL
TR:	RED. TEE
TR*:	RED. TEE + REDUCER/SWAGE



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BRANCH TABLE-4

FOR: B31

SIZE	2	3	4	6	8	10	12
12	TR	TR	TR	TR	TR	TR	T
10	TR	TR	TR	TR	TR	T	
8	TR	TR	TR	TR	T		
6	TR	TR	TR	T			
4	TR	TR	T				
3	TR	T					
2	T						

T:	TEE EQUAL
TR:	RED. TEE



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**BRANCH TABLE-5
FOR: FLARE LINES IN B02**

		BRANCH SIZE											
		SIZE	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12
RUN SIZE	12	W	W	W	W	W	LO	LO	PO	LT	LT	LT	
	10	W	W	W	W	W	LO	LO	LT	LT	LT		
	8	W	W	W	W	W	LO	LT	LT	LT			
	6	W	W	W	W	W	LT	LT	LT				
	4	W	W	W	W	TR	LT	LT					
	3	W	W	W	W	TR	LT						
	2	W	W	W	W	T							
	1 1/2	TR	TR	TR	T								
	1	TR	TR	T									
	3/4	TR	T										
1/2	T												

W:	WELDOLET
T	TEE EQUAL (90 DEGREE)
TR	RED. TEE (90 DEGREE)
LO	LATROLET (45 DEGREE)
LT	LATERAL (45 DEGREE) TEE (EQU/REDUCING)
PO:	PIPE TO PIPE WITH REINFORCING PAD (45 DEGREE)



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ATTACHMENT # 1

PIPING MATERIAL SPECIFICATION WPH1, DESIGNED BY PEEC

For Piping Classes just used in WPH1



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PIPE CLASS B04
CARBON STEEL (NACE) WITH 6.0MM CORROSION ALLOWANCE
CLASS 150#



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BRANCH CONNECTION 90 DEGREES

TABLE OF SCHEDULES

DESIGN LIMITS

TEMPERATURE IN DEGREES CELCIUS

-29 TO 85

PRESSURE BAR GA

DN15-300 3.5

NOTES

- DESIGN LIMITS ACC. TO ASME B16.5 FLANGE RATING MAT. GRP 1.1
- THE USE OF RED. BALL VALVES IS PREFERRED, USE FULL BORE BALL VALVES ONLY WHEN NECESSARY FOR PROCESS/OPERATING REQUIREMENTS
- THE USE OF DUAL PLATE CHECK VALVES IS PREFERRED, ONLY USE SWING TYPE CHECK VALVES WHEN REQUIRED.
- PISTON TYPE CHECK VALVES FOR HORIZONTAL MOUNTING ONLY.
- ALL MATERIAL SHALL BE IN ACCORDANCE TO NACE MR0175/ISO 15156

<u>RUN</u>	<u>20</u>	<u>40</u>	<u>80</u>	<u>150</u>	<u>250</u>	<u>DN</u>	<u>SCHEDULE</u>
<u>SIZE</u>	15	25	50	100	200	15	XXS
300	C C C C	D D	D B B B	A	20	XXS	
250	C C C C	D D	B B B A	25	XXS		
200	C C C C	D D	B B A	40	160		
150	C C C C	D B B A	50	160			
100	C C C C	B B A	80	80			
80	C C C C	B A	100	80			
50	C C C C	A	150	40			
40	B B B A	200	40				
25	B B A	250	30				
20	B A	300	30				
15	A						

CODE EXPLANATION OF CHARACTERS

A EQUAL TEE
 B REDUCING TEE
 C SOCKOLET
 D WELDOLET

PIPING CLASS

B04
 RATING 150#
 MATERIAL CS NACE
 C.A. 6.0 MM



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PIPE CLASS B32
PLOYPROPYLENE (PP)
CLASS 150#



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BRANCH CONNECTION 90 DEGREES

DESIGN LIMITS

TEMPERATURE IN DEGREES CELCIUS

-29 TO 85

PRESSURE BAR GA

DN15-100 5

NOTES

- PIPE VENDOR SHALL VERIFY THE DESIGN CONDITION AND PROVIDE.

THE WALL THICKNESS CALCULATION

- ALL FITTING SHALL BE MANUFACTURED USING THE SAME TYPE MATERIAL AS THE PIPE.

RUN SIZE	40	50	80	100	150	200	250
250	B	B	B	B	B	B	A
200	B	B	B	B	B	A	
150	B	B	B	B	A		
100	B	B	B	A			
80	B	B	A				
50	B	A					
40	B	A					
25	A						

TABLE OF SCHEDULES

DN	SCHEDULE
25	-mm
40	-mm
50	-mm
80	-mm
100	-mm

CODE	EXPLANATION OF CHARACTERS
A	EQUAL TEE
B	REDUCING TEE

PIPING CLASS	B32
RATING	150#
MATERIAL	PP
C.A.	0 MM



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COMPONENT / MATERIAL DESCRIPTIONS

* PIPE				* VALVES		
PIPE, PLAIN END	DN 15 - 100	DIN 8077/DIN 8078		BALL VALVE 150# , 300#	DN 15-100	BS5351 OR API6D, SOLID PP BODY B148 C95800 TRIM, SOCKET FUSION
* FLANGES				BUTTERFLY VALVE 150#	DN 80 - 100	API 609 SOLID PP BODY B148 C95800 TRIM, STEM F53 DUPLEX, SEAT RPTFE, GEARBOX FOR DIA 6" AND ABOVE, LUG TYPE, SOCKET FUSION
BLIND FLANGE 150# , 300#	DN 15 - 100	DIN 2501 MATCH ASME B16.1 & ASME B16.5 BOLT HOLE PATTERN AND FACE-TO-FACE DIM. FOR ANSI 150LB FLANGES,FF.		GATE VALVE 150# , 300#	DN 15 - 100	MSS SP-80, SOLID PP BODY B148 C95800 TRIM, OS & Y, BB, SOCKET FUSION
FLANGE AND BACKING RING, FLAT FACE150# , 300#	DN 15 - 100	DIN 2501 MATCH ASME B16.1 & ASME B16.5 BOLT HOLE PATTERN AND FACE-TO-FACE DIM. FOR ANSI 150LB FLANGES,FF.		CHECK VALVE 150#	DN 15 - 40	MSS SP-80, SOLID PP BODY B148 C95800 TRIM, BALL TYPE, SOCKET FUSION
* FITTINGS				CHECK VALVE 150#	DN50 - 100	MSS SP-80, SOLID PP BODY B148 C95800 TRIM, DUAL PLATE, WAFER TYPE
FITTING	DN 15 - 100	DIN19962				
GASKET FF. 150# , 300#	DN 15 - 100	FLAT RING TO ANSI B16.21, FULL FACE NEOPRENE 3.0 MM THICK SYNTHETIC ELASTOMER DIMENSION TO ASME B16.21				
STUDBOLT WITH NUTS		ASTM A193-B7 / A194-2H WITH WASHER PIPE COATED				

PIPING CLASS B32
RATING 150#
MATERIAL PP
C. A. 0 MM



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PIPE CLASS G01
CARBON STEEL
CLASS 900#



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BRANCH CONNECTION 90 DEGREES

TABLE OF SCHEDULES

DESIGN LIMITS

TEMPERATURE IN DEGREES CELCIUS

-29 TO 85

PRESSURE BAR GA

DN15-300 139.8

NOTES

- DESIGN LIMITS SHALL NOT EXCEED THE ABOVE VLAUE
- THE USE OF RED. BALL VALVES IS PREFERRED, USE FULL BORE
- BALL VALVES ONLY WHEN NECESSARY FOR PROCESS/OPERATING REQUIREMENTS
- THE USE OF DUAL PLATE CHECK VALVES IS PREFERRED, ONLY USE SWING TYPE CHECK VALVES WHEN REQUIRED.
- PISTON TYPE CHECK VALVES FOR HORIZONTAL MOUNTING ONLY.
- ALL MATERIAL SHALL BE IN ACCORDANCE TO NACE MR0175/ISO 15156

<u>RUN SIZE</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>40</u>	<u>50</u>	<u>80</u>	<u>100</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>DN</u>	<u>SCHEDULE</u>
300	D	D	D	D	D	D	D	B	B	B	A	15	XXS
250	D	D	D	D	D	D	D	B	B	A		20	XXS
200	D	D	D	D	D	D	B	B	A			25	XXS
150	D	D	D	D	D	D	B	A				40	XXS
100	D	D	D	D	B	B	A					50	160
80	D	D	D	B	B	A						80	160
50	D	D	B	B	A							100	160
40	B	B	B	A								150	160
25	B	B	A									200	140
20	B	A										250	140
15	A											300	140

CODE EXPLANATION OF CHARACTERS

A EQUAL TEE
B REDUCING TEE
D WELDOLET

PIPING CLASS

G01
RATING 900#
MATERIAL CS NACE
C.A. 6.0 MM



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



	Contract No.	Piping Material Specification						Class	1
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		LRSL	000	PI	SP	697	01		

COMPONENT / MATERIAL		DESIGN LIMITS		* VALVES		
* PIPE	PIPE	DN 15 - 300	ASME B36.10M, ASTM API 5L GR.B, SMLS, NACE MR 0175/ISO 15156	BALL VALVE 900#	DN 15 - 40	API6D, ASTM A105N BODY, ASTM A182 GR.F316L BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, NACE MR 0175/ISO 15156,RED.BORE
PIPE	PIPE	DN 15 - 300	ASME B36.10M, ASTM API 5L GR.X60, SMLS, NACE MR 0175/ISO 15156	BALL VALVE 900#	DN 15 - 40	API6D, ASTM A105N BODY, ASTM A182 GR.F316L BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, NACE MR 0175/ISO 15156, FULL BORE
* FLANGES				BALL VALVE 900#	DN 50 - 300	API 6D, ASTM A105N BODY, ASTM A182 GR. F316L BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, RED.BORE, NACE MR 0175/ISO 15156, SPLIT BODY
BLIND FLANGE 1500# RTJ		DN 15 - 300	ASTM A105N, ASME B16.5, RTJ, NACE MR 0175/ISO 15156	BALL VALVE 900#	DN 50 - 300	API 6D, ASTM A105N BODY, ASTM A182 GR. F316L BALL, PTFE SEAT, FLGD, RTJ, BC, TRUNNION MOUNTED, FULL BORE, NACE MR 0175/ISO 15156, SPLIT BODY
SPECTACLE BLIND FLANGE 900#		DN 15 - 300	ASTM A516-Gr.65, ASME B16.48, RTJ, NACE MR 0175/ISO 15156	INTEGRAL DOUBLE BLOCK AND BLEED VALVES 900#	DN 15 - 50	API 6D, ASTM A105N BODY, ASTM A182 GR.F316L TRIM, STELLITED SEAT,, RED. BORE BALL, FLGD, RTJ, NACE MR 0175/ISO 15156
WELDING NECK FLANGE 900#		DN 15 - 300	ASTM A105N, ASME B16.5, RTJ,WN, NACE MR 0175/ISO 15156	INTEGRAL DOUBLE BLOCK AND BLEED VALVES 900#	DN 15 - 50	API 6D, ASTM A105N BODY, ASTM A182 GR.F316L TRIM, STELLITED SEAT,, FULL BORE BALL, FLGD, RTJ, NACE MR 0175/ISO 15156
WELDING NECK FLANGE 900#		DN 150 - 300	ASTM A694 GR F60, ASME B16.5, RTJ,WN, NACE MR 0175/ISO 15156	GATE VALVE 1500#	DN 15 - 40	BS 5352, ASTM A105N BODY, TRIM 316L, FLGD,RTJ, OS&Y, BB, NACE MR 0175/ISO 15156
* FITTINGS				GATE VALVE 900#	DN50 - 300	API 600, A105N BODY, TRIM 316L,RTJ, OS&Y, BB, NACE MR 0175/ISO 15156
45° OR 90° LONG RADIUS ELBOWS, EQUAL/REDUCING TEES, CAPS		DN 15 - 300	ASME B16.9, ASTM A234 GR.WPB, SMLS,BW, NACE MR 0175/ISO 15156	CHECK VALVE 900#	DN 15 - 40	BS 1868, ASTM A105N BODY, TRIM 316L, BC, BALL TYPE, NACE MR 0175/ISO 15156,RTJ
EQUAL/REDUCING TEES		DN 150 - 300	ASME B16.9, ASTM A860 GR.WPHY60, SMLS,BW, NACE MR 0175/ISO 15156			
WELDOLETS, FLANGOLET,NIPOLET (ASTM A105N TO MSS SP- 97)		DN 15 - 300	ASME B16.9, ASTM A105N, SMLS,BW, NACE MR 0175/ISO 15156			
REDUCER		DN 15-300	MSS SP-95, ASTM A234 GR.WPB, ECC/CONC REDUCER, BBE,BW, NACE MR 0175/ISO 15156	CHECK VALVE 900#	DN 50 - 300	API 594, ASTM A105N BODY, TRIM 316L, DUAL PLATE, LUG TYPE, NACE MR 0175/ISO 15156,RTJ
STUD BOLT WITH NUTS		-----	ASTMA193-B7M/A194-2HMP PIPE COATED	GLOBE VALVE 900#	DN 15 - 40	BS 5352, ASTM A105N BODY, TRIM 316L, RTJ, BB, NACE MR 0175/ISO 15156
				GLOBE VALVE 900#	DN 50 - 200	BS 1873, A105N BODY, TRIM 316L,RTJ, STELLITED SEAT, OS&Y, BB, NACE MR 0175/ISO 15156
FLANGED JOINTS				* MISCELLANEOUS		
DN	NR	INCH	MM	GASKET, RING TYPE JOINT (RTJ)	DN 15 - 300	ASME B16.20,SS 316, OVAL RING
15	4	3/4	110	INSULATING KIT, RTJ, 900#	DN 15 - 300	ASME B16.20, WITH WASHER & SLEEVES FOR BOLTS
20	4	3/4	120			
25	4	7/8	130			
40	4	1	140	PIPING CLASS	G01	
50	8	1 1/8	150	RATING	900#	
80	8	1 1/8	180	MATERIAL	CS NACE	
100	8	1 1/4	200	C.A	6.0 MM	



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



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PIPE CLASS H01
CARBON STEEL (NACE MR 0175/ISO 15156) WITH 6.0MM CORROSION ALLOWANCE
CLASS 1500#



**Resalat Oil Field Development Project
Phase 1 (EPC-EPD)**



Contract No.

Piping Material Specification

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BRANCH CONNECTION 90 DEGREES

TABLE OF SCHEDULES

DESIGN LIMITS

TEMPERATURE IN DEGREES CELCIUS

-29 TO 85

PRESSURE BAR GA

DN15-300 173

NOTES

- DESIGN LIMITS SHALL NOT EXCEED THE ABOVE VLAUE
- THE USE OF RED. BALL VALVES IS PREFERRED, USE FULL BORE
- BALL VALVES ONLY WHEN NECESSARY FOR PROCESS/OPERATING REQUIREMENTS
- THE USE OF DUAL PLATE CHECK VALVES IS PREFERRED, ONLY USE SWING TYPE CHECK VALVES WHEN REQUIRED.
- PISTON TYPE CHECK VALVES FOR HORIZONTAL MOUNTING ONLY.
- ALL MATERIAL SHALL BE IN ACCORDANCE TO NACE MR0175/ISO 15156

<u>RUN</u>	<u>20</u>	<u>40</u>	<u>80</u>	<u>150</u>	<u>250</u>	<u>300</u>	<u>DN</u>	<u>SCHEDULE</u>
<u>SIZE</u>	15	25	50	100	200	300	15	XXS
300	D	D	D	D	D	A	20	XXS
250	D	D	D	D	D	A	25	XXS
200	D	D	D	D	B	A	40	XXS
150	D	D	D	D	B	A	50	160
100	D	D	D	B	B	A	80	160
80	D	D	D	B	B	A	100	160
50	D	D	B	B	A		150	160
40	B	B	B	A			200	140
25	B	B	A				250	140
20	B	A					300	140
15	A							

<u>COD</u>	<u>EXPLANATION OF</u>
E	<u>CHARACTERS</u>
A	<u>EQUAL TEE</u>
B	<u>REDUCING TEE</u>
D	<u>WELDOLET</u>

<u>PIPING CLASS</u>	<u>H01</u>
<u>RATING</u>	<u>1500#</u>
<u>MATERIAL</u>	<u>CS NACE</u>
<u>C.A.</u>	<u>6.0 MM</u>



**Resalat Oil Field Development Project
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 Consulting Engineers	Contract No.	Piping Material Specification						Class	1
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COMPONENT / MATERIAL DESCRIPTIONS		DESIGN LIMITS		* VALVES							
PIPE	DN 15 - 300	ASME B36.10M, ASTM API 5L GR.B, SMLS, NACE MR 0175/ISO 15156		BALL VALVE 1500#	DN 15 - 40	API6D, ASTM A105N BODY, ASTM A182 GR.F316L BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, NACE MR 0175/ISO 15156,RED.BORE					
PIPE	DN 15 - 300	ASME B36.10M, ASTM API 5L GR.X60, SMLS, NACE MR 0175/ISO 15156		BALL VALVE 1500#	DN 15 - 40	API6D, ASTM A105N BODY, ASTM A182 GR.F316L BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, NACE MR 0175/ISO 15156,FULL BORE					
* FLANGES				BALL VALVE 1500#	DN 50 - 300	API 6D, ASTM A105N BODY, ASTM A182 GR. F316L BALL, PTFE SEAT , FLGD,RTJ, BC, TRUNNION MOUNTED ,RED.BORE, NACE MR 0175/ISO 15156 , SPLIT BODY					
BLIND FLANGE 1500# RTJ	DN 15 - 300	ASTM A105N ,ASME B16.5 ,RTJ,NACE MR 0175/ISO 15156		BALL VALVE 1500#	DN 50 - 300	API 6D, ASTM A105N BODY, ASTM A182 GR. F316L BALL, PTFE SEAT , FLGD, RTJ, BC, TRUNNION MOUNTED, FULLBORE, NACE MR 0175/ISO 15156 , SPLIT BODY					
SPECTACLE BLIND FLANGE 1500#	DN 15 - 300	ASTM A516-Gr.65, ASME B16.48, RTJ, NACE MR 0175/ISO 15156		INTEGRAL DOUBLE BLOCK AND BLEED VALVES 1500#	DN 15 - 50	API 6D, ASTM A105N BODY, ASTM A182 GR.F316L TRIM, STELLITED SEAT, RED. BORE BALL,FLGD, RTJ, NACE MR 0175/ISO 15156					
WELDING NECK FLANGE 1500#	DN 15 - 300	ASTM A105N ,ASME B16.5, RTJ,WN, NACE MR 0175/ISO 15156		INTEGRAL DOUBLE BLOCK AND BLEED VALVES 1500#	DN 15 - 50	API 6D, ASTM A105N BODY, ASTM A182 GR.F316L TRIM, STELLITED SEAT, FULL. BORE BALL,FLGD, RTJ, NACE MR 0175/ISO 15156					
WELDING NECK FLANGE 1500#	DN 150 - 300	ASTM A694 GR F60 ,ASME B16.5, RTJ,WN, NACE MR 0175/ISO 15156		GATE VALVE 1500#	DN 15 - 40	BS 5352, ASTM A105N BODY, TRIM 316L, FLGD,RTJ, OS&Y, BB, NACE MR 0175/ISO 15156					
* FITTINGS				GATE VALVE 1500#	DN50 - 300	API 600, A105N BODY, TRIM 316L, RTJ, OS&Y, BB, NACE MR 0175/ISO 15156					
45° OR 90° LONG RADIUS ELBOWS, EQUAL/REDUCING TEES , CAPS	DN 15 - 300	ASME B16.9, ASTM A234 GR.WPB, SMLS,BW, NACE MR 0175/ISO 15156		CHECK VALVE 1500#	DN 15 - 40	BS 1868, ASTM A105N BODY, TRIM 316L, BC, BALL TYPE, NACE MR 0175/ISO 15156,RTJ					
EQUAL/REDUCING TEES	DN 150 - 300	ASME B16.9, ASTM A860 GR.WPHY60, SMLS,BW, NACE MR 0175/ISO 15156									
WELDOLETS, FLANGOLET,NIPOLET (ASTM A105N TO MSS SP- 97)	DN 15 - 300	ASME B16.9, ASTM A105N, SMLS,BW, NACE MR 0175/ISO 15156									
REDUCER	DN 15-300	MSS SP-95, ASTM A234 GRWPB, ECC/CONC REDUCER, BBE,BW, NACE MR 0175/ISO 15156		CHECK VALVE 1500#	DN 50 - 300	API 594, ASTM A105N BODY, TRIM 316L, DUAL PLATE, LUG TYPE , NACE MR 0175/ISO 15156,RTJ					
STUD BOLT WITH NUTS	-----	ASTM A193-B7M/A194-2HM PTFE COATED		GLOBE VALVE 1500#	DN 15 - 40	BS 5352, ASTM A105N BODY, TRIM 316L, RTJ, BB, NACE MR 0175/ISO 15156					
				GLOBE VALVE 1500#	DN 50 - 200	BS 1873, A105N BODY, TRIM 316L, RTJ, STELLITED SEAT, OS&Y, BB, NACE MR 0175/ISO 15156					
FLANGED JOINTS											
DN	NR	INCH	*	MM	DN	NR	INCH	*	MM	* MISCELLANEOUS	
15	4	3/4	*	110	150	12	1 3/8	*	270	GASKET, RING TYPE JOINT (RTJ)	DN 15 - 300
20	4	3/4	*	120	200	12	1 5/8	*	330	INSULATING KIT, RTJ, 1500#	DN 15 - 300
25	4	7/8	*	130	250	12	1 7/8	*	350		
40	4	1	*	140	300	16	2	*	390		
50	8	1 1/8	*	150		*				PIPING CLASS	H01
80	8	1 1/8	*	180						RATING	1500#
100	8	1 1/4	*	200						MATERIAL	CS NACE
										C.A	6.0 MM



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PIPE CLASS H11
STAINLESS STEEL
CLASS 1500#



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Contract No.

Piping Material Specification

Class

1

5365

Pr. Code

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Disc.

Type

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Rev.

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BRANCH CONNECTION 90 DEGREES

TABLE OF SCHEDULES

DESIGN LIMITS

TEMPERATURE IN DEGREES CELCIUS

-29 TO 102

PRESSURE BAR GA

DN15-100 173

NOTES

- DESIGN LIMITS SHALL NOT EXCEED THE ABOVE VLAUE
- THE USE OF DUAL PLATE CHECK VALVES IS PREFERRED, ONLY USE SWING TYPE CHECK VALVES WHEN REQUIRED.
- PISTON TYPE CHECK VALVES FOR HORIZONTAL MOUNTING ONLY.
- ALL MATERIAL SHALL BE IN ACCORDANCE TO NACE MR0175/ISO 15156
- RING TYPE JOINT GASKET SHALL BE AS PER ASME B16.20.

RUN	20		40		80		
SIZE	15	25	50	100			
100	D	D	D	D	B	A	
80	D	D	B	B	A		
50	D	B	B	A			
40	B	B	A				
25	B	A					
20	B	A					
15	A						

DN	SCHEDULE
15	40S
20	40S
25	40S
40	80S
50	80S
80	80S
100	120S

COD	EXPLANATION OF
E	CHARACTERS
A	EQUAL TEE
B	REDUCING TEE
D	WELDOLET

PIPING CLASS	H11
RATING	1500#
MATERIAL	S.S
C.A.	0 MM



**Resalat Oil Field Development Project
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COMPONENT / MATERIAL DESCRIPTIONS									
* PIPE				* VALVES					
PIPE	DN 15 - 100	ASME B36.19M, ASTM A312 TP 316L, SMLS		BALL VALVE FLANGED 1500#	DN 15 - 40	API 6D, ASTM A182 GR.F316L/A351 GR.CF8M BODY/BALL, PTFE SEAT, GR.F316L , FLGD,RTJ, BC, TRUNNION MOUNTED, RED.BORE			
				BALL VALVE FLANGED 1500#	DN 50 - 100	API 6D, ASTM A182 GR.F316L/A351 GR.CF8M BODY/BALL, PTFE SEAT, FLGD,RTJ, BC, TRUNNION MOUNTED, RED BORE, SPLIT BODY			
* FLANGES									
BLIND FLANGE 1500#	DN 15 - 100	ASME B16.5, ASTM A182 GR F316L, RTJ.		GATE VALVE 1500#	DN 15 - 40	BS 5352, ASTM A182 GR.F316L BODY/ TRIM 316L316L , RTJ, OS&Y, BB			
SPECTACLE BLIND FLANGE 1500#	DN 15 - 100	API 590, ASTM A240 GR.316L, RTJ		GATE VALVE 1500#	DN 50 - 100	API 600, ASTM A182 GR.F316L/A351 GR.CF8M BODY, TRIM 316L,RTJ, SEAT, OS&Y, BB			
				GLOBE VALVE 1500#	DN 15 - 40	BS 5352, ASTM A182 GR.F316L/A351 GR.CF8M BODY, TRIM 316L,RTJ, BB			
WELDING NECK FLANGE 1500#	DN 15-100	ASME B16.5, ASTM A182 GR.F316L, WN, RTJ		GLOBE VALVE 1500#	DN 50 - 100	BS 1873, ASTM A182 GR.F316L/A351 GR.CF8M BODY, TRIM 316L,RTJ, OS&Y, BB			
				CHECK VALVE 1500#	DN 15 - 40	BS 1868, ASTM A182 GR.F316L/A351 GR.CF8M BODY, TRIM 316L , BC, BALL TYPE, RTJ			
* FITTINGS				CHECK VALVE 1500#	DN 50 - 100	API 594, ASTM A182 GR.F316L/A351 GR.CF8M BODY, TRIM 316L , DUAL PLATE, DUAL FLANGED,			
45° OR 90° LONG RADIUS ELBOWS, CONC/ECC REDUCERS, EQUAL/REDUCING TEES, CAPS, WELDOLETS, FLANGOLET, NIPOLET (ASTM A182 GR. F316L TO MSS SP-97).	DN 15-100	ASME B16.9, ASTM A403 WP316L, SMLS ,BW		INTEGRAL DOUBLE BLOCK AND BLEEDVALVES 1500#	DN 15 - 50	API 6D, ASTM A182 GR.F316L/A351 GR.CF8M BODY/TRIM, RED. BORE BALL,FLGD, RTJ			
				* MISCELLANEOUS					
				GASKET, RTJ 1500#	DN 15 -100	ASME B16.20, SS 316, OVAL RING			
STUDBOLT WITH NUTS	ALL	ASTM A193-B8M/A194-8M PTFE COATED		INSULATING KIT, RTJ, 1500#	DN 15 -300	ASME B16.20, WITH WASHER & SLEEVES FOR BOLTS			
FLANGED JOINTS									
DN	NR	INCH	*	MM		PIPING CLASS	H11		
15	4	1/2	*	60		RATING	1500#		
20	4	1/2	*	70		MATERIAL	SS		
25	4	1/2	*	70		C.A.	0 MM		
40	4	1/2	*	80					
50	4	5/8	*	80					
80	4	5/8	*	100					
	8	5/8	*	100					