



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



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Piping Material Specification

| | | | | | M.Ro | S.M | M.A. | | |
|------|-----------|---------------------|-------|----|---------------|------------|----------|---------------|--|
| 01 | 07-Jun-21 | Issued for Approval | IOEC | - | M.Rouhi | S.Movahedi | M.Aghaei | - | |
| 00 | 17-Feb-21 | Issued for Comment | IOEC | - | A.Forouzandeh | S.Movahedi | M.Aghaei | - | |
| REV. | Date | Purpose of Issue | ORIG. | BY | PREP'D | CHECK'D | APP'D | COMPANY APP'D | |



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|-------|-----------|----|----|----|----|----|-------|-----------|----|----|----|----|----|-------|-----------|----|----|----|----|----|
| | 00 | 01 | 02 | 03 | 04 | 05 | | 00 | 01 | 02 | 03 | 04 | 05 | | 00 | 01 | 02 | 03 | 04 | 05 |
| 1 | X | X | | | | | 40 | X | | | | | | 79 | X | X | | | | |
| 2 | X | X | | | | | 41 | X | X | | | | | 80 | X | X | | | | |
| 3 | X | X | | | | | 42 | X | X | | | | | 81 | X | | | | | |
| 4 | X | X | | | | | 43 | X | | | | | | 82 | X | X | | | | |
| 5 | X | X | | | | | 44 | X | X | | | | | 83 | X | X | | | | |
| 6 | X | | | | | | 45 | X | X | | | | | 84 | X | | | | | |
| 7 | X | | | | | | 46 | X | | | | | | 85 | X | X | | | | |
| 8 | X | | | | | | 47 | X | X | | | | | 86 | X | X | | | | |
| 9 | X | X | | | | | 48 | X | X | | | | | 87 | X | X | | | | |
| 10 | X | X | | | | | 49 | X | X | | | | | 88 | X | X | | | | |
| 11 | X | X | | | | | 50 | X | X | | | | | 89 | | X | | | | |
| 12 | X | | | | | | 51 | X | X | | | | | 90 | | X | | | | |
| 13 | X | | | | | | 52 | X | | | | | | 91 | | | | | | |
| 14 | X | X | | | | | 53 | X | X | | | | | 92 | | X | | | | |
| 15 | X | X | | | | | 54 | X | X | | | | | 93 | | X | | | | |
| 16 | X | X | | | | | 55 | X | X | | | | | 94 | | X | | | | |
| 17 | X | X | | | | | 56 | X | X | | | | | 95 | | X | | | | |
| 18 | X | X | | | | | 57 | X | X | | | | | 96 | | X | | | | |
| 19 | X | X | | | | | 58 | X | X | | | | | 97 | | X | | | | |
| 20 | X | X | | | | | 59 | X | X | | | | | 98 | | X | | | | |
| 21 | X | X | | | | | 60 | X | X | | | | | 99 | | X | | | | |
| 22 | X | X | | | | | 61 | X | X | | | | | 100 | | X | | | | |
| 23 | X | X | | | | | 62 | X | X | | | | | 101 | | X | | | | |
| 24 | X | X | | | | | 63 | X | X | | | | | 102 | | X | | | | |
| 25 | X | X | | | | | 64 | X | X | | | | | 103 | | X | | | | |
| 26 | X | X | | | | | 65 | X | | | | | | 104 | | X | | | | |
| 27 | X | X | | | | | 66 | X | X | | | | | 105 | | X | | | | |
| 28 | X | X | | | | | 67 | X | X | | | | | 106 | | | | | | |
| 29 | X | X | | | | | 68 | X | X | | | | | 107 | | | | | | |
| 30 | X | X | | | | | 69 | X | | | | | | 108 | | X | | | | |
| 31 | X | | | | | | 70 | X | X | | | | | 109 | | X | | | | |
| 32 | X | X | | | | | 71 | X | | | | | | 110 | | | | | | |
| 33 | X | X | | | | | 72 | X | X | | | | | 111 | | X | | | | |
| 34 | X | X | | | | | 73 | X | X | | | | | 112 | | X | | | | |
| 35 | X | X | | | | | 74 | X | X | | | | | 113 | | X | | | | |
| 36 | X | X | | | | | 75 | X | | | | | | 114 | | X | | | | |
| 37 | X | | | | | | 76 | X | X | | | | | 115 | | X | | | | |
| 38 | X | X | | | | | 77 | X | X | | | | | 116 | | X | | | | |
| 39 | X | X | | | | | 78 | X | X | | | | | 117 | | X | | | | |



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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.

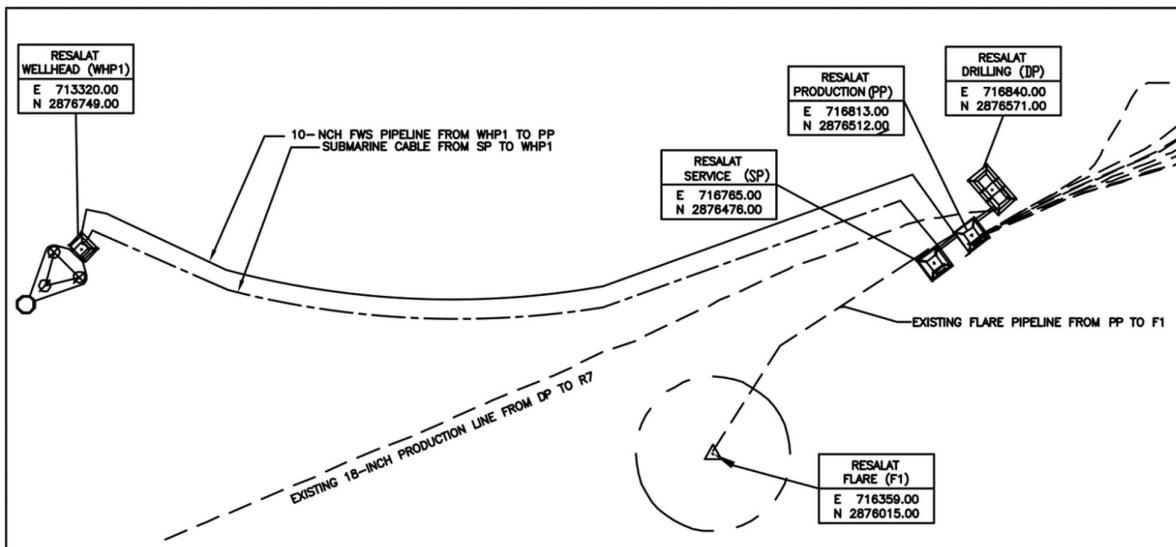


Figure 1: Resalat Development Field Layout (Datum ED 77, Zone 39, Cent. Meridian 51° East)



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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

| | |
|--------------------|---|
| LRSL-R1X-MW-CR-001 | Corrosion study and Material Selection Report |
| LRSL-000-PI-SP-684 | Specification for Pipe |
| LRSL-000-PI-SP-685 | Specification for Flange |
| LRSL-000-PI-SP-686 | Specification for Fitting |
| LRSL-000-PI-SP-687 | Specification for Valve |
| LRSL-000-PI-SP-689 | Specification for Bolt & Nut |
| LRSL-000-PI-DB-676 | Piping Design criteria |
| LRSL-R1X-PI-CC-001 | Wall Thickness calculation |
| LRSL-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 | SUBMEREGED 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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| | | | | | | | | | | |
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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 1½”, 2½”, 3½”, 5”, 7”, 9” and 22” shall not be used, unless specifically dictated by process licensers.
- 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 \geq 6 | NPS \geq 3" | NPS \geq 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 \leq 12” | NPS \geq 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; LRSI-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 | | | | | | | | |
| Corrosion Allowance | 3 | | | | | | | | |
| Rating | 150 # | | Services: Instrument Air | | | | | | |
| 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. | 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 To | | Material, Description | End, Finishing, Rating | Standard | Note |
|-----------------------------|---|---|------------------------|------------------------------|-------------|
| 3 | 4 | ASTM A216 WCB, DUAL PLATE | | WAFER, RF, 150# | API 594 |
| 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 |
| 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 "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: B02

| | | | | | | | | |
|---------------------|---------------------|--|------|------|------|------|--|--|
| Base Material | KILLED CARBON STEEL | Additional Requirements: Sour Service According To NACE MR0175/ISO 15156 Impact Test As Per Code (Based on thickness and minimum design temperature) | | | | | | |
| Design Code | ASME B31.3 | | | | | | | |
| 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 | | | | |
| Thk. (mm) | 7.47 | NOT TO BE USED | | | |



Resalat Oil Field Development Project
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Piping Material Specification

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|----------|------|-------|------|------|------|
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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 | |



Resalat Oil Field Development Project
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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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PIPING CLASS: B02

| 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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|----------|------|-------|------|------|------|
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PIPING CLASS: B02

| Size From | 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 | |



Resalat Oil Field Development Project
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| | | | | | | | | | | |
|--------------------------|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
| Consulting Engineers | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 36 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

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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| | | | | | | | | | | |
|--------------------------|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 37 of 127 | | |
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| PIPING CLASS: B05 | | | | | | | | | | |
|---------------------|---------------------|--|--|--|------|------|------|------|--|--|
| Base Material | KILLED CARBON STEEL | | | Additional Requirements: - Impact Test As Per Code (Based on thickness and minimum design temperature) | | | | | | |
| Design Code | ASME B31.3 | | | | | | | | | |
| Corrosion Allowance | 3 mm | | | Services: Fuel Gas | | | | | | |
| 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 – 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 | 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 | |



Resalat Oil Field Development Project
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| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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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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| | | | | | | | | | | |
|--------------------------|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
| Consulting Engineers | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
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| PIPING CLASS: B06 | | | | | | | | | | |
|---------------------|--|--|--|---|---------|------|------|------|------|--|
| Base Material | KILLED CARBON STEEL (FOR AMINE SERVICE) | | | Additional Requirements: - Impact Test As Per Code (Based on thickness and minimum design temperature) For all welded items, PWHT is required regardless of thickness. | | | | | | |
| Design Code | ASME B31.3 | | | | | | | | | |
| Corrosion Allowance | 3 mm | | | Services: Rich Amine, Lean Amine, Amine Closed Drain | | | | | | |
| Rating | 150 # | | | Temperature (°C) | -29 | 50 | 100 | 150 | 200 | |
| Finishing | RF (125-250 AARH) | | | Pressure (barg) | 19.6 | 19.2 | 17.7 | 15.8 | 13.8 | |
| PWHT | YES | | | 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 |



Resalat Oil Field Development Project
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|----------|------|-------|------|------|------|
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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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Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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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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|----------|------|-------|------|------|------|
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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 | 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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| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 48 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

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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| | | | | | | | | | | |
|---|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
|  | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 49 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

| PIPING CLASS: B07 | | | | | | | | | | |
|---------------------|-------------------|--|--|--|------|------|------|------|--|--|
| Base Material | CARBON STEEL | | | Additional Requirements: - Impact Test As Per Code (Based on thickness and minimum design temperature) | | | | | | |
| Design Code | ASME B31.3 | | | | | | | | | |
| Corrosion Allowance | 1.5 mm | | | | | | | | | |
| Rating | 150 # | | | Services: Nitrogen, Fuel Oil | | | | | | |
| 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 | | | 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 |



Resalat Oil Field Development Project
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| | | | | | | | | | | |
|--------------------------|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

PIPING CLASS: B07

| 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, 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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PIPING CLASS: B07

| 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 | 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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| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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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 "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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| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

| 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 AARIH) | 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. | - | - | XXS | XXS | 160 | 160 | 80 | 80 | 60 | 60 | 40 | | | |
| Thk. (mm) | - | - | 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 | BEE | ASME B36.10M | |
| CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE | | | | | |
| 1 | 2 | ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156 | BEE | 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



Resalat Oil Field Development Project
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Piping Material Specification

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| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
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PIPING CLASS: B08

| Size 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/DOMBLE 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 | |
|---|---|---|--|--------------|--|



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| | | | | | | | | | | |
|---|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
|  | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 59 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

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 "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: B09

| | | | | | | | | | |
|----------------------------|----------------------------|--|-----------------------------------|------|------|------|------|------|--|
| Base Material | CARBON STEEL GALVANIZED | | Additional Requirements: - | | | | | | |
| Design Code | ASME B31.3 | | | | | | | | |
| Corrosion Allowance | 1.5 | | | | | | | | |
| Rating | 150 # | | Services: | | | | | | |
| Finishing | RF (125-250 AARH) | | Potable Water | | | | | | |
| 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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|----------|------|-------|------|------|------|
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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 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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| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
| | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 64 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

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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| | | | | | | | | | | |
|--------------------------|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
| Consulting Engineers | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 65 of 127 | | |
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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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|----------|------|-------|------|------|------|
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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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|----------|------|-------|------|------|------|
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PIPING CLASS: B11

| 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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PIPING CLASS: B11

| 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 | |
|---|---|--|--|------------------------------|--|



Resalat Oil Field Development Project
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| | | | | | | | | | | |
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PIPING CLASS: B11

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 -

Temperature (°C)

-29

50

100

150

200

Design Limits

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 | NOT TO BE USED |
| Sch. | 80S | | | | |
| 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 | BEE | ASME B36.19M | |
| CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE | | | | | |
| 1/2 | 2 | ASTM A403 WP316L, WROUGHT-S, NACE MR0175/ISO 15156 | BEE | 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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PIPING CLASS: B12

| 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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PIPING CLASS: B12

| Size From | 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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PIPING CLASS: B12

| Size From | 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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| | | | | | | | | | | |
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PIPING CLASS: B12

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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PIPING CLASS: B31

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: Impact Test As Per Code (Based on thickness and minimum design temperature) For all welded items, PWHT is required regardless of thickness. | | | | | | |
| Design Code | ASME B31.3 | | | | | | | |
| Corrosion Allowance | 3 mm | | | | | | | |
| Rating | 300 # | Services: Lean Amine | | | | | | |
| Finishing | RF (125-250 AARH) | | | | | | | |
| 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 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: C06

| 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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PIPING CLASS: C06

| 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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PIPING CLASS: C06

| 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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| | | | | | | | | | | |
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PIPING CLASS: C06

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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PIPING CLASS: C11

| | | | | | | | | | |
|---------------------|----------------------|----------------------------|------|------|------|------|--|--|--|
| Base Material | STAINLESS STEEL 316L | Additional Requirements: - | | | | | | | |
| Design Code | ASME B31.3 | | | | | | | | |
| Corrosion Allowance | 0 | | | | | | | | |
| Rating | 300 # | Services: Chemical | | | | | | | |
| Finishing | RF (125-250 AARH) | | | | | | | | |
| 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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PIPING CLASS: C11

| 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 | 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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PIPING CLASS: C11

| 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 | 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/DIUBLE BLOCK AND BLEED VALVE (Note-10) | | | | | |



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| Size From | 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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| | | | | | | | | | | |
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PIPING CLASS: C11

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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PIPING CLASS: G08

| | | | | | | | | | | | | | | | |
|----------------------------|---------------------|--|--|-------|-------|-------|--|--|--|--|--|--|--|--|--|
| 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. | - | - | XXS | XXS | XXS | XXS | XXS | 160 | 140 | 140 | 140 | | | | |
| Thk. (mm) | - | - | 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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|---|-------|---|------------------------|--------------|------|
| 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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PIPING CLASS: G08

| Size From | To | Material, Description | End, Finishing, Rating | Standard | Note |
|--------------|----|--|------------------------|----------|------|
| 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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| Size From To | | Material, Description | End, Finishing, Rating | Standard | Note |
|-----------------------|--|---|------------------------|------------------------------|------|
| 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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| | | | | | | | | | | |
|---|--------------|-------------------------------|------|-------|------|------|------|----------------|---|--|
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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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|--|--------------|-------------------------------|------|-------|------|-----|------|-----------------|---|--|
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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. | - | - | - | XXS | XXS | XXS | XXS | XXS | 160 | - | - | - | - | - |
| Thk. (mm) | - | - | - | 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 | BEE | ASME B36.10M | |
| CON. SWAGED NIPPLE, ECC. SWAGE NIPPLE | | | | | |
| 1 1/2 | 2 | ASTM A234 WPB, WROUGHT-S, NACE MR0175/ISO 15156 | BEE | 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 | 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 + BICHROMATE TREATED, THREADED AS PER ASME B1.1 | | ASME B18.2.1 ASME B18.2.2 | |



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| | | | | | | | | | | |
|---|--------------|-------------------------------|------|-------|------|------|------|-----------------|---|--|
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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 | TR | T |
| 8 | S | S | S | S | W | W | TR | TR | TR | T | |
| 6 | S | S | S | S | W | TR | TR | TR | T | | |
| 4 | S | S | S | S | TR | TR | TR | T | | | |
| 3 | S | S | S | S | TR | TR | T | | | | |
| 2 | S | S | S | S | T | | | | | | |
| 1 1/2 | TR | TR | TR | TR | T | | | | | | |
| 1 | TR | 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 |



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



Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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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 |



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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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 |
| 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 | TR | T | | | | | | |
| 1 | TR | 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 (EQL/REDUCING) |
| PO: | PIPE TO PIPE WITH REINFORCING PAD (45 DEGREE) |



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



| | | | | | | | | |
|---|--------------|-------------------------------|------|-------|------|------|-------|-----------------|
|  Consulting Engineers | Contract No. | Piping Material Specification | | | | | Class | 1 |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 112 of 127 |
| | | LRSL | 000 | PI | SP | 697 | 01 | |

ATTACHMENT # 1
PIPING MATERIAL SPECIFICATION WPH1, DESIGNED BY PEEC

For Piping Classes just used in WPH1



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



| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|-----------------|---|--|
| | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 113 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

PIPE CLASS B04

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



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



Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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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

| RUN | 20 | 40 | 80 | 150 | 250 | DN | SCHEDULE |
|------|-----------------------|----|----|-----|-----|-----|----------|
| SIZE | 15 | 25 | 50 | 100 | 200 | 300 | |
| 300 | C C C C D D D B B B A | | | | | 15 | XXS |
| 250 | C C C C D D D B B B A | | | | | 20 | XXS |
| 200 | C C C C D D D B B B A | | | | | 25 | XXS |
| 150 | C C C C D B B B A | | | | | 40 | 160 |
| 100 | C C C C B B A | | | | | 50 | 160 |
| 80 | C C C C B A | | | | | 80 | 80 |
| 50 | C C C C A | | | | | 100 | 80 |
| 40 | B B B A | | | | | 150 | 40 |
| 25 | B B A | | | | | 200 | 40 |
| 20 | B A | | | | | 250 | 30 |
| 15 | A | | | | | 300 | 30 |

| CODE | EXPLAINATION 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 |



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



TR
Consulting Engineers

Contract No.

Piping Material Specification

Class

1

5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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COMPONENT / MATERIAL DESCRIPTIONS

| * PIPE | | DESIGN LIMITS | | * VALVES | | | |
|---|--|---------------|---|----------------------|-------------|--|--|
| PIPE | | DN 15 - 300 | ASME B36.10M, ASTM A106 GR.B. SMLS, NACE MR 0175/ISO 15156 | BALL VALVE 800# | DN 15 - 40 | BS 5351, ASTM A105N BODY, ASTM A182 GR.F316L BALL, PTFE SEAT, SW (SW sides shall be supplied with welded nipple), BC, FLOATING BALL, NACE, RED. BORE, MR 0175/ISO 15156 | |
| * FLANGES | | | | BALL VALVE 150#,300# | DN 50 - 300 | API 6D, ASTM A216 GR.WCB BODY, ASTM A182 GR. F316L BALL, PTFE SEAT , FLGD, BC, FLOATING BALL FOR DIA. UP TO 6" AND TRUNNION MOUNTED FOR DIA. 8" AND ABOVE, RED. BORE , SPLIT BODY,NACE MR 0175/ISO 15156 | |
| BLIND FLANGE 150# | | DN 15 - 300 | ASTM A105N ,ASME B16.5,RF,NACE MR 0175/ISO 15156 | GATE VALVE 800# | DN 15 - 40 | BS 5352, ASTM A105N BODY, A105N, TRIM 316L, SW, OS&Y, BB, NACE MR 0175/ISO 15156 | |
| SPECTACLE BLIND FLANGE,SPADE,SPACER 150#,300# | | DN 15 - 300 | ASTM A516-Gr.70, ASME B16.48, RF, NACE MR 0175/ISO 15156 | GATE VALVE 150# | DN50 - 300 | API 600, A216 GR.WCB BODY, TRIM 316L, OS&Y, BB, G.O. FOR DIA. 14" AND ABOVE, NACE MR 0175/ISO 15156 | |
| SOCKET WELDING FLANGE 150#,300# | | DN 15-40 | ASTM A105N,ASME B16.5,RF,SW, NACE MR 0175/ISO 15156 | CHECK VALVE 800# | DN 15 - 40 | BS 5352, ASTM A105N BODY, TRIM 316L, SW, BC, BALL TYPE, NACE MR 0175/ISO 15156 | |
| WELDING NECK FLANGE 150#,300# | | DN 50 - 300 | ASTMA105N ,ASME B16.5,RF,WN,NACE MR 0175/ISO 15156 | CHECK VALVE 150# | DN 50 - 300 | BS 1868, ASTM A216 GR.WCB BODYTRIM 316L, DUAL PLATE, WAFER TYPE, NACE MR 0175/ISO 15156, RF | |
| * FITTINGS | | | | | | | |
| SOCKETWELD 45° OR 90° ELBOWS, COUPLINGS, TEES, CAPS,SOCKOLETS (TO MSS SP-97), UNIONS (TO MSS SP-83) | | DN 15 - 40 | ASTM A105N-ASME B16.11,NACE,SW 300#, MR 0175/ISO 15156 | | | | |
| 45° OR 90° LONG RADIUS ELBOWS, EQUAL/REDUCING TEES ,CAPS, WELDOLETS (ASTM A105 TO MSS SP-97) | | DN 50 - 300 | ASME B16.9, ASTM A234 GR.WPB, SMLS,NACE MR 0175/ISO 15156 | GLOBE VALVE 800# | DN 15 - 40 | BS 5352, ASTM A105N BODY, TRIM 316L, SW, OS&Y, BB, NACE MR 0175/ISO 15156 | |
| SWAGE NIPPLE LARGE END | | DN 15-40 | MSS SP-95, ASTM A234 GR.WPB, ECC/CONC SWAGE, PBE, PLE SMALL END 1 1/2" AND BELOW, NACE MR | GLOBE VALVE 150# | DN 50 - 300 | BS 1873, A216 GRWCB BODY, TRIM 316L, OS&Y, BB, NACE MR 0175/ISO 15156 | |
| CON. And ECC. REDUCER | | DN 50-300 | ASME B16.9, ASTM A234 GR.WPB, SMLS, BW, NACE. MR 0175/ISO 15156 | * MISCELLANEOUS | | | |
| STUDBOLT WITH NUTS FLANGED JOINTS | | ----- | ASTMA193-B7M/A194-2HMPTE COATED | GASKET, RF 150#,300# | DN 15 - 300 | ASME B16.20 ,SPIRAL WOUND, SS 316, WINDINGS & INNER RING, C.S. OUTER RING, 4.5 mm THK, LOW STRESS | |

| DN | NR | INCH | * | MM |
|-----|----|------|---|-----|
| 15 | 4 | 1/2 | * | 60 |
| 20 | 4 | 1/2 | * | 70 |
| 25 | 4 | 1/2 | * | 70 |
| 40 | 4 | 1/2 | * | 80 |
| 50 | 4 | 5/8 | * | 80 |
| 80 | 4 | 5/8 | * | 100 |
| 100 | 8 | 5/8 | * | 100 |
| 150 | 8 | 3/4 | * | 100 |

| DN | NR | INCH | * | MM |
|-----|----|------|---|-----|
| 200 | 8 | 3/4 | * | 110 |
| 250 | 12 | 7/8 | * | 120 |
| 300 | 12 | 7/8 | * | 120 |

| | |
|--------------|---------|
| PIPING CLASS | B04 |
| RATING | 150# |
| MATERIAL | CS NACE |
| C.A. | 6.0 MM |



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



| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|-----------------|---|--|
| | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 116 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

PIPE CLASS B32
PLOYPROPYLENE (PP)
CLASS 150#



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



Contract No.

Piping Material Specification

Class

1



5365

Pr. Code

Area

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LRSL

000

PI

SP

697

01

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 | 80 | 150 | 250 |
|----------|----|----|-----|-----|
| | 25 | 50 | 100 | 200 |
| 250 | B | B | B | B |
| 200 | B | B | B | B |
| 150 | B | B | B | B |
| 100 | B | B | B | A |
| 80 | B | B | B | A |
| 50 | B | 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 |



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



Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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COMPONENT / MATERIAL DESCRIPTIONS

* PIPE

PIPE, PLAIN END

DN 15 - 100

DIN 8077/DIN 8078

* VALVES

BALL VALVE 150#, 300# DN 15-100

BS5351 OR API6D, SOLID PP BODY B148 C95800 TRIM, SOCKET FUSION

* FLANGES

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

FITTING

DN 15 - 100

DIN19962

CHECK VALVE 150# DN50 - 100

MSS SP-80, SOLID PP BODY B148 C95800 TRIM, DUAL PLATE, WAFER TYPE

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 PTFE COATED

PIPING CLASS B32

RATING 150#

MATERIAL PP

C. A. 0 MM



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



Contract No.

Piping Material Specification

Class

1



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| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
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PIPE CLASS G01
CARBON STEEL
CLASS 900#



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



Contract No.

Piping Material Specification

Class

1



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| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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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

| RUN SIZE | 15 | 20 | 25 | 40 | 50 | 80 | 100 | 150 | 200 | 250 | 300 | DN | SCHEDULE |
|----------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|----------|
| 300 | D | D | D | D | D | D | B | B | B | A | | 20 | XXS |
| 250 | D | D | D | D | D | D | B | B | B | A | | 25 | XXS |
| 200 | D | D | D | D | D | D | B | B | A | | | 40 | XXS |
| 150 | D | D | D | D | D | D | B | B | A | | | 50 | 160 |
| 100 | D | D | D | D | B | B | A | | | | | 80 | 160 |
| 80 | D | D | D | B | B | B | A | | | | | 100 | 160 |
| 50 | D | D | B | B | B | | | | | | | 150 | 160 |
| 40 | B | B | B | B | A | | | | | | | 200 | 140 |
| 25 | B | B | B | A | | | | | | | | 250 | 140 |
| 20 | B | A | | | | | | | | | | 300 | 140 |
| 15 | A | | | | | | | | | | | | |

| CODE | EXPLAINATION OF CHARACTERS | PIPING CLASS | G01 |
|------|----------------------------|--------------|---------|
| A | EQUAL TEE | RATING | 900# |
| B | REDUCING TEE | MATERIAL | CS NACE |
| D | WELDOLET | C.A. | 6.0 MM |



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



Contract No.

Piping Material Specification

Class

1

5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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COMPONENT / MATERIAL

* PIPE

DESIGN LIMITS

PIPE

DN 15 - 300 ASME B36.10M, ASTM API 5L GR.B,
SMLS, NACE MR 0175/ISO 15156

PIPE

DN 15 - 300 ASME B36.10M, ASTM API 5L GR.X60.
SMLS, NACE MR 0175/ISO 15156

* FLANGES

BLIND FLANGE 1500# RTJ

DN 15 - 300 ASTM A105N ,ASME B16.5 ,RTJ,NACE
MR 0175/ISO 15156

SPECTACLE BLIND FLANGE 900#

DN 15 - 300 ASTM A516-Gr.65, ASME B16.48, 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

WELDING NECK FLANGE 900#

DN 150 - 300 ASTM A694 GR F60 ,ASME B16.5,
RTJ,WN, NACE MR 0175/ISO 15156

* FITTINGS

45° OR 90° LONG RADIUS ELBOWS,
EQUAL/REDUCING TEES ,CAPS
EQUAL/REDUCING TEESDN 15 - 300 ASME B16.9, ASTM A234 GR.WPB,
SMLS,BW, NACE MR 0175/ISO 15156DN 150 - 300 ASME B16.9, ASTM A860 GR.WPHY60,
SMLS,BW, NACE MR 0175/ISO 15156WELDOLETS, FLANGOLET,NIPOLET
(ASTM A105N TO MSS SP- 97)

REDUCER

DN 15 - 300 ASME B16.9, ASTM A105N, SMLS,BW,
NACE MR 0175/ISO 15156DN 15-300 MSS SP-95, ASTM A234 GR.WPB,
ECC/CONC REDUCER ,BBE,BW, NACE
MR 0175/ISO 15156

STUD BOLT WITH NUTS

----- ASTMA193-B7M/A194-2HM PTFE COATED

FLANGED JOINTS

| DN | NR | INCH | * | MM | DN | NR | INCH | MM |
|-----|----|-------|---|-----|-----|----|-------|-----|
| 15 | 4 | 3/4 | * | 110 | 150 | 12 | 1 3/8 | 270 |
| 20 | 4 | 3/4 | * | 120 | 200 | 12 | 1 5/8 | 330 |
| 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 | | * | | |
| 80 | 8 | 1 1/8 | * | 180 | | | | |
| 100 | 8 | 1 1/4 | * | 200 | | | | |

* VALVES

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

BALL VALVE 900#

DN 15 - 40

API6D,ASTMA105N BODY,ASTMA182GR.F316LBALL,PTFE SEAT,FLGD,RTJ,
BC,TRUNNION MOUNTED,NACE MR 0175/ISO 15156,FULL BORE

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

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 BODYINTEGRAL 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 15156INTEGRAL 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

GATE VALVE 1500#

DN 15 - 40

BS 5352, ASTM A105N BODY, TRIM 316L, FLGD,RTJ, OS&Y, BB, NACE
MR 0175/ISO 15156

GATE VALVE 900#

DN 50 - 300

API 600,A105N BODY,TRIM 316L,RTJ, OS&Y, BB, NACE MR 0175/ISO 15156
BS 1868, ASTM A105N BODY, TRIM 316L, BC, BALL TYPE, NACE MR
0175/ISO 15156,RTJ

CHECK VALVE 900#

DN 15 - 40

API 594, ASTM A105N BODY, TRIM 316L, DUAL PLATE, LUG TYPE ,
NACE MR 0175/ISO 15156,RTJ

CHECK VALVE 900#

DN 50 - 300

API 594,ASTM A105N BODY,TRIM 316L,RTJ, BB, NACE MR 0175/ISO 15156
BS 1873, A105N BODY, TRIM 316L,RTJ, STELLITED SEAT, OS&Y, BB,
NACE MR 0175/ISO 15156

* MISCELLANEOUS

GASKET, RING TYPE JOINT (RTJ)

DN 15 - 300

ASME B16.20,SS 316 ,OVAL RING

INSULATING KIT, RTJ, 900#

DN 15 - 300

ASME B16.20, WITH WASHER & SLEEVES FOR BOLTS

PIPING CLASS

G01

RATING

900#

MATERIAL

CS NACE

CA

6.0 MM



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



| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|-----------------|---|--|
| | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 122 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

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

Class

1



5365

Pr. Code

Area

Disc.

Type

Seq.

Rev.

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LRSL

000

PI

SP

697

01

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

| RUN | 20 | 40 | 80 | 150 | 250 | DN | SCHEDULE |
|------|----|----|----|-----|-----|-----|----------|
| SIZE | 15 | 25 | 50 | 100 | 200 | 300 | 15 |
| 300 | D | D | D | D | D | B | 20 |
| 250 | D | D | D | D | D | B | 25 |
| 200 | D | D | D | D | D | B | 40 |
| 150 | D | D | D | D | D | B | 50 |
| 100 | D | D | D | B | B | A | 80 |
| 80 | D | D | D | B | B | A | 100 |
| 50 | D | D | B | B | A | | 150 |
| 40 | B | B | B | A | | | 200 |
| 25 | B | B | A | | | | 250 |
| 20 | B | A | | | | | 300 |
| 15 | A | | | | | | 140 |

| COD | EXPLAINATION OF |
|-----|-----------------|
| E | CHARACTERS |
| A | EQUAL TEE |
| B | REDUCING TEE |
| D | WELDOLET |

| | |
|--------------|---------|
| PIPING CLASS | H01 |
| RATING | 1500# |
| MATERIAL | CS NACE |
| C.A. | 6.0 MM |



Resalat Oil Field Development Project

Phase 1 (EPC-EPD)



| | | | | | | | | | | |
|--|--------------|-------------------------------|------|-------|------|------|------|-----------------|---|--|
|  TR Consulting Engineers | Contract No. | Piping Material Specification | | | | | | Class | 1 | |
| | 5365 | Pr. Code | Area | Disc. | Type | Seq. | Rev. | Page 124 of 127 | | |
| | | LRSL | 000 | PI | SP | 697 | 01 | | | |

COMPONENT / MATERIAL DESCRIPTIONS



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



Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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PIPE CLASS H11
STAINLESS STEEL
CLASS 1500#



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



Contract No.

Piping Material Specification

Class

1



5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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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 | B A |
| 80 | D | D | B | B A |
| 50 | D | B | B | A |
| 40 | B | B | B | A |
| 25 | B | B | A | |
| 20 | B | A | | |
| 15 | A | | | |

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

| COD | EXPLAINATION 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
Phase 1 (EPC-EPD)



Contract No.

Piping Material Specification

Class

1

5365

| Pr. Code | Area | Disc. | Type | Seq. | Rev. |
|----------|------|-------|------|------|------|
| LRSL | 000 | PI | SP | 697 | 01 |

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COMPONENT / MATERIAL DESCRIPTIONS

* PIPE

PIPE

DN 15 - 100

ASME B36.19M, ASTM A312
TP 316L, SMLS

* VALVES

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

* FLANGES

BLIND FLANGE 1500#

DN 15 - 100

ASME B16.5, ASTM A182 GR
F316L, RTJ,

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

SPECTACLE BLIND FLANGE 1500#

DN 15 - 100

API 590, ASTM A240
GR.316L, RTJ

GATE VALVE 1500#

DN 15 - 40

API 600, ASTM A182 GR.F316L/A351 GR.CF8M BODY,
TRIM 316L,RTJ, SEAT, OS&Y, BB

WELDING NECK FLANGE 1500#

DN 15-100

ASME B16.5, ASTM A182
GR.F316L, WN, RTJ

GLOBE VALVE 1500#

DN 15 - 40

BS 5352, ASTM A182 GR.F316L/A351 GR.CF8M BODY,
TRIM 316L,RTJ, BB

* FITTINGS

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

CHECK VALVE 1500#

DN 50 - 100

API 594, ASTM A182 GR.F316L/A351 GR.CF8M BODY,
TRIM 316L , DUAL PLATE, DUAL FLANGED,

STUDBOLT WITH NUTS

All

ASTM A193-B8M/A194-8M
PTFE COATEDINTEGRAL DOUBLE BLOCK
AND BLEEDVALVES 1500#

DN 15 - 50

API 6D, ASTM A182 GR.F316L/A351 GR.CF8M
BODY/TRIM, RED. BORE BALL,FLGD, RTJ

FLANGED JOINTS

| DN | NR | INCH | * | MM |
|----|-----|------|---|-----|
| 15 | 4 | 1/2 | * | 60 |
| 20 | 4 | 1/2 | * | 70 |
| 25 | 4 | 1/2 | * | 70 |
| 40 | 4 | 1/2 | * | 80 |
| 50 | 4 | 5/8 | * | 80 |
| 80 | 4 | 5/8 | * | 100 |
| 8 | 5/8 | * | * | 100 |

* MISCELLANEOUS

GASKET, RTJ 1500#

INSULATING KIT, RTJ, 1500#

DN 15 -100

ASME B16.20, SS 316, OVAL RING

DN 15 -300

ASME B16.20, WITH WASHER & SLEEVES FOR BOLTS

| | |
|--------------|-------|
| PIPING CLASS | H11 |
| RATING | 1500# |
| MATERIAL | SS |
| C.A. | 0 MM |