**PIPING MATERIAL SPECIFICATION**

Discipline : Piping Team

Project Title : Moorim Steam Piping Project

Location : Ulsan, Korea

Client : MOORIM P&P

텍스트, 스크린샷, 폰트, 번호이(가) 표시된 사진

자동 생성된 설명

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| B | 2024.12.16 | Issue For Approval | J.G.KIM | G.T.LEE | S.M.PARK | K.C.ROH | Y.J.HWANG |  |
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**REVISION LOG**

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| REV. NO. | REV. DATE | REVISED PAGE | REVISION DESCRIPTION |
| B | 2024.12.16 | 6 | - Minimum Wall Thickness 기준 변경(#3RB 기준 준수)  DN 50 and Smaller : Sch.40 → Sch.80  DN 300 and Larger : Sch.20 → STD |
|  |  | 37 | - P & ID 및 Line Condition 설계에 따른, 관련 내용 수정 |
|  |  | 38 ~ 46 | - Minimum Wall Thickness 기준 변경에 따른 Schedule 수정  - Line Condition 변경에 따른, 압력 / 온도 수정 |
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ATTACHMENTS

#1 Piping Material Classification

1. **GENERAL** 
   1. The selection of materials shall be accordance with chapter III of ASME B31.1 and shall be based on the fluid conveyed and the design temperature and pressure. The material of special elements. Such as strainers and steam traps shall be conformed to the requirements of manufacturer’s standards for the design conditions. The piping material within the package and/or skid of equipment manufacturers shall be in accordance with the supplier’s manufacturing standard.
   2. Pipe and fitting wall thickness shall be calculated in accordance with paragraph 104.1.2 of ASME B31.1. Wall thickness calculations shall be based on the lowest strength component in the system considering all factors including the possibility of pipe and fittings having difference maximum allowable stress value. And/or manufacturer’s minus tolerance. Pipe wall thickness calculation shall be based on the design pressure and temperature conditions of the individual line. The same shall be applied to reinforcing.

For Low pressure piping, Pipe schedule / rating should be followed as defined in piping class and branch type according to branch table in 11.2.

* 1. Material used in piping shall be equal to or better than the following;

A. For design metal temperatures below 405℃, carbon steel

B. For design metal temperatures above and including 405℃ an approved low alloy steel of the chrome molybdenum type.

C. In case of the intermittent design metal temperature rise of 405℃ & higher, carbon steel can be used if requirements of paragraph 102.2.4, ASME B31.1 are met.

* 1. This specification shall be applied to piping materials indicated on P&ID. Piping systems, however, which are furnished, as a regular part of proprietary or standard equipment(or package facility) shall be in accordance with the equipment suppliers standard.
  2. When the piping is connected to equipment, this specification shall be applied to the extent indicated below;
     + 1. Companion flanges, gaskets, bolts and nuts at the equipment nozzle.
       2. First block valve with companion flanges, gaskets, bolts and nuts in the instrument connecting line.
       3. Companion flanges, gaskets, bolts and nuts for relief valves.
       4. Companion flanges, gasket, bolts and nuts at the matching point between the piping furnished as a part of equipment by its supplier and that provided by purchaser.

**Note :** “First block valve” in instrument connecting line as used here in shall mean the nearest valve to the instrument.

* 1. This specification shall not be applied to specially designed companion flanges, gaskets, bolts and nuts at the equipment nozzles.

1. **CODE & STANDARDS** 
   1. Design, fabrication, testing and inspection of piping material shall be accomplished in accordance with the following listed codes and standards including revision and addenda in effect at the time of execution of the contract;

|  |  |
| --- | --- |
| ASME | American Society of Mechanical Engineers |
| ASME B31.1 | Power piping |
| ASME B31.3 | Process piping |
| ASTM | American Society of Testing and Material |
| PFI | Pipe Fabrication Institute |
| API | American Petroleum Institute |
| MSS | Manufacturers Standardization Society of the Valve and Fitting Industry Inc. |
| ANSI | American National Standards Institute |
| AWWA | American Water Works Association |
| AISC | American Institute of Steel Construction |
| AWS | American Welding Society |
| SSPC | Steel Structures Painting Council |
| ISO | International Standardization for Organization |
| JIS | Japanese Industrial Standards |
| ISA | Instrument Society of American |
| EJMA | Expansion Joint Manufacturers Association |
| TEMA | Tubular Exchanger Manufacturers Association |
| KBC | Korean Building Code |
| KS | Korean Industrial Standards |

* 1. Unless otherwise indicated, all piping design is in accordance with the requirements of ASME B31.1 for Power piping as a main design code.
  2. Related code for non-metallic materials.

A. HDPE : KS M3408

B. UPVC : ASTM D1874

C. GRP : AWWA M45, C905, ASTM D2996

D. CPVC : ASTM D1785

1. **GENERAL REQUIREMENT**
   1. Unit

Unless otherwise specified, metric, celsius and kilogram units shall be applied as asurement system except for following;

* 1. Wall thicknesses are expressed as schedule number, unit weight or where no schedule number exists, in millimeters.
  2. Nominal pipe size(NPS) express in millimeters or both inches and millimeters.
  3. Flanges bolt diameter express in inches and bolt length in millimeters(ex U5/8 250mmL).
  4. Nominal pressure ratings for flanges, valves, socket and thread fittings, etc. are express in pounds.
  5. Standard material

Material for individual piping components shall conform to the requirements of the applicable Codes and Standards in paragraph. 2.0.

* 1. Pipes
     1. The buried pipes for carbon steel shall be 3 layer high density PE coated and tape wrapped(for field welding points) or shrinkage sheet based on applicable code and standard
     2. Dimensions of pipes shall be in accordance with the following standard.

|  |  |
| --- | --- |
| Welded and seamless steel pipe | : ASME B36.10M: |
| Stainless steel pipe | : ASME B36.19M |
| Other materials | : Relevant code & Standard |

* + 1. The standard pipe sizes shall be used in nominal diameter (DN) as below.

Diameter in DN : 10,15, 20, 25, 40, 50, 65, 80, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, etc.

* + 1. Minimum wall thickness of pipe shall be in accordance with the following.

|  |  |  |
| --- | --- | --- |
| Pipe Size | Minimum Wall Thickness | |
| Carbon & Alloy steel | Stainless Steel |
| DN 50 and Smaller | Sch.80 | Sch.40s |
| DN 65 Through 250 | Sch.40 / STD | Sch.10s |
| DN 300 and Larger | STD | Sch.10s |

* 1. Fittings
     1. Fitting construction shall be as follows.

|  |  |
| --- | --- |
| DN 50 and smaller | : Socket weld/Screwed /Flanged |
| DN 65 and larger | : Butt weld / Flanged |

* + 1. All screwed connections shall have taper threads in accordance with ASME B1.20.1 Pipe threads, General purpose.
    2. Unions shall be used only for DN50 and smaller threaded line such as utility water and air system including instrument air and other unless otherwise specified.
    3. Long radius elbows shall be generally used for all piping, unless otherwise noted.
    4. Dimension shall be as follows;

|  |  |
| --- | --- |
| Factory-made wrought steel buttwelding fittings | : ASME B16.9 |
| Forged fitting socket-welding and threaded | : ASME B16.11 |
| Buttwelding ends | : ASME B16.25 |
| Malleable iron threaded fitting | : ASME B16.3 |
| Wrought steel buttwelding short radius elbows and return | : ASME B16.28 |
| Non metallic fitting | : Maker’s standard |

* + 1. Miter bend can be used for DN650 & larger size in ASME CL.150 and lower classes based on requirement of ASME B31.1
    2. Swage nipples shall be manufactured in accordance with MSS SP-95, and O-let shall be manufactured in accordance with MSS SP-97.
  1. Flanges
     1. Flange ratings, facing, face finish and manufacture shall be as per ASME B16.5 unless otherwise noted. Flanges DN650 & above size shall be manufactured as per ASME B16.47 Series A. For circulating cooling water system, AWWA C207 Class D (Ring type) flange shall only be used.
     2. The bore of welding neck flanges shall correspond to the inside diameter of the connecting pipe or fitting.
     3. All raised face flanges shall be serrated spiral finished having resultant surface finish 125 ~ 250 AARH.
     4. Dimensions of blanks (i.e. Spectacle Blinds), paddle blanks (i.e. Spades or Blind) and paddle spacers (i.e. spacers) shall comply with the requirements of ASME B16.48 for the applicable flange class and facing.
     5. For large diameter spacers and blinds not covered by ASME B16.48, the item shall be sized to the requirement of ASME B31.1, Clause 104.5.3, with due allowance for corrosion of the wetted surfaces. All other applicable requirements shall be in accordance with ASME B16.48.
     6. Non metallic flange shall be manufactured in accordance with maker’s standard except that bolt related dimension and outside diameter of flange shall conform to paragraph 3.9.1.
     7. Dimension shall be as follows ;

|  |  |
| --- | --- |
| ASME Class 150 to 2500 (DN600 and under) | : ASME B16.5 |
| ASME Class 150 to 900 (DN650 & over) | : ASME B16.47 Series A |
| ASME Cast Iron Class 125, 250 | : ASME B16.1 |
| AWWA Class D (DN650 to 3000) for CW system | : AWWA C207 |

* 1. Gaskets
     1. Limitation dimensions of gaskets other than ring joint suitable for ASME flanges shall be in accordance with ASME B16.5, ANNEX C.
     2. Gasket dimensions for flanges larger than DN600 shall be in accordance with the flange standard specified in the individual specification class.
     3. All gasket materials shall be asbestos free.
     4. Dimensions shall be as follows :

|  |  |
| --- | --- |
| Spiral wound gaskets | : ASME B16.20 |
| Ring joint gasket and grooves | : ASME B16.20 |
| Non-metallic flat gaskets | : ASME B16.21 |

* 1. Bolts and Nuts for Flange
     1. Bolting materials shall be as specified in each piping material class.
     2. The bolts shall have full-length thread and the tips shall be flat finished.
     3. Bolts and nuts shall be free burrs, seams, laps, loose scale, irregular surface and any defects affecting their service ability.
     4. Dimensional requirements of bolts and nuts for flange connection shall be in accordance with ASME B16.5 Table 1C as follows ;

|  |  |
| --- | --- |
| Square and Hex Bolts and Screws (Inch Series) | : ASME B18.2.1 |
| Square and Hex Nuts (Inch Series) | : ASME B18.2.2 |
| Continuous and Double End Studs (Inch Series) | : ASME B18.31.2 |

* 1. Valve
     1. General

1. Valve assemblies shall be designed for the pressure and temperature ratings of the class specified in the piping material classes and valve list.

B. Valves shall be tested to comply with the applicable section of ASME B16.34.

C. Unless otherwise specified, socket weld & screw bores shall conform to ASME B16.11.

D. Valves DN65 and larger shall be designed so that it shall be possible to replace all packing rings with the operator and yoke in place.

E. Flanged valves may be used in place of socket welded or screwed valves in DN50 and smaller sizes when mounted directly to vessels and other equipment which has been furnished with flanged connections. Rating of valve(s) must match nozzle connection.

F. DN25 bleed valve is to be installed between upstream block valve and control valve if the control valve fails open, and two bleed valves (one each side of the control valve) if the control valve fails closed.

G. Ball, Plug & Butterfly valves even with wrench or Lever operators shall have open position indicators.

H. All lug type of butterfly and check valves shall be supplied with connection bolts & nuts by supplier.

I. For wedge type gate valve at 900# and higher pressure ratings, overpressure protection, for example, small relief holes or equalizing line, etc., shall be furnished for discharge of entrapped water

J. Unless otherwise specified, the bodies of valves shall be forged or cast steel. Gun metal or cast iron valves shall not be used in any fuel or oil/gas system or any feed water or similar system where shock loads could result in sudden fracture.

K. Valves shall be legibly marked in accordance with MSS SP-25. Each valve shall have a durable metal tag attached to the valve yoke by stainless steel wire, or riveted strap, indicating tag number.

L. Valve labels shall be circular and fitted under the hand wheel captive nut. For check valves and small valves the Supplier may provide rectangular fitted to the valve or secured close by the valve.

M. Any valve which is designed uni-directional flow shall have an arrow embossed or cast on the valve body clearly indicating the required flow direction.

N. All valves shall be fitted with indicators to identify open or shut position of the valves.

O. Hand-gear operation shall be required for the following valve size and rating.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ASME  Class | Gate | Globe | Ball | Butterfly |
| 150#  300#  600#  900#  1500#  2500# | DN300 & larger  DN300 & larger  DN250 & larger  DN250 & larger  DN150 & larger  DN150 & larger | DN300 & larger  DN300 & larger  DN200 & larger  DN200 & larger  DN150 & larger  DN80 & larger | DN250 & larger  DN200 & larger  DN200 & larger  DN200 & larger | DN300 & larger  DN300 & larger |

P. Gate valves and globe valves shall be equipped with renewable, integral type hard-faced seats. Seating surfaces of plugs and discs shall be hard-faced. Gate and globe valves shall be arranged for back seating, with surfaces hard faced, to permit repacking under full line pressure with the valve open.

Q. Double isolating valve for instrument, drain, vent shall be provided on the line of which rating is ASME CL.600 & the above.

R. Gate valves (600# & above, 2.5” & above) except equipped with relief hole or By-pass valve shall be subjected to both side water tightness test.

S. Valves shall be fitted with indicators to identify open or shut position of the valves. In the case of valves being fitted with extended spindles, indicators shall be fitted to both the extended spindles and to the valve spindles.

* + 1. Valve Trim Materials

A. For carbon steel, carbon molybdenum and low chrome alloy steel valves shall normally be provided with 13-chrome trim (i.e. seat and disc).

B. Main seats and discs seats shall be hard faced for the gate, globe and check valves unless otherwise specified. The hardfacing material shall be of stellite number 6 or equal composition.

* + 1. Valve Bonnet or Cover

Bonnet type of gate, globe and Cover type of check valve shall be as follows, unless otherwise specified in applicable Piping Material Class and the Valve List.

|  |  |  |
| --- | --- | --- |
| Valve Class | DN 65 and Larger | DN 50 and Smaller |
| ASME 300 Class and Below | Bolted Bonnet | Bolted Bonnet |
| ASME 600 Class | Pressure Seal Type | Bolted Bonnet |
| ASME 900 Class and Higher | Pressure Seal Type | Welded Bonnet |

* + 1. Valve Packing for Vacuum Service

Reverse “V” Graphite Packing shall be applied for all vacuum service valves.

* + 1. Packing material shall be graphite. Packing shall contain suitable corrosion inhibitor to prevent stem pitting.
    2. Gate Valve

Disc types of gate valve shall be as follows, unless otherwise specified in applicable Piping Material Class and the Valve List.

|  |  |
| --- | --- |
| DN 50 and Smaller | : Solid Wedge |
| DN 65 and Larger | : Flexible Wedge |

* + 1. Globe Valve

Disc types of globe valve shall be as follows, unless otherwise specified in applicable Piping Material Class and the Valve List

|  |  |
| --- | --- |
| DN 50 and Smaller | : Plug type |
| DN 65 and Larger | : Cone type |

* + 1. Check Valve

Disc types of check valve shall be as follows, unless otherwise specified in applicable Piping Material Class and the Valve List.

|  |  |
| --- | --- |
| DN 50 and Smaller | : Lift type for ASME CL.600 and under,  Y-Lift with spring type for ASME CL.900 and above |
| DN 65 and Larger | : Swing type for ASME CL.600 and under,  Tilting type for ASME CL.900 and above |

* + 1. Plug Valve

1. Normally, Non-lubricated plug valves shall be used, unless otherwise specified in applicable Piping Material Class and the Valve List.
2. All plug valves shall be a type of flanged end.

* + 1. Ball Valve

1. All ball valves shall be furnished in full bore, unless otherwise specified in applicable Piping Material Class and the Valve List.
2. Ball valve shall be disassembled prior to welding to prevent heat damage to stem packing and seats, when required welding.
   * 1. For Safety Valves
3. Unless otherwise specified all safety valves shall generally be of a proven spring loaded type and make. Pilot operated safety valves are accepted for special applications.
4. The safety valves shall be of the full lift spring-loaded relief angle type. The open spring casing type shall be restricted to applications for air and saturated steam service. Liquids and high pressure steam shall be relieved by encased relief valves.
5. All safety valves shall have a test certificate issued by an approved authority.
6. In Situ pop test (hot conditions with steam pressure reaching the safety valve opening pressure) to be witnessed by the Owner’s Representative and by a competent and independent control organism, of all safety valves of at least steam systems (LP, IP, HP, etc) shall be carried out.
7. The valves shall be fitted with easing gear, wherever applicable
   * 1. Code and Standard

|  |  |
| --- | --- |
| Face-to-Face and End-to-End dimensions of valves | : ASME B16.10 |
| Buttwelding Ends | : ASME B16.25 |
| Valves-Flanged, Threaded and Welding End | : ASME B16.34 |
| Fire Test for Soft-Seated Ball Valves | : API 607 |

* 1. Joints
     1. Pipe to pipe joints shall be made as follows.

|  |  |
| --- | --- |
| Threaded end pipe | : Use threaded coupling |
| Plain end pipe | : Use socket welding coupling |
| Beveled end pipe | : Buttweld |

* + 1. All field welding parts for galvanized items shall be touched up with zinc rich epoxy as following procedure.

|  |
| --- |
| Grinding work with power tool |
| Welding work |
| Surface preparation with power tool (SSPC-SP 3) |
| Painting with metallic zinc rich epoxy primer (DFT 80 ~ 100microns) |

* 1. Branches

Branch connections for individual line classification shall be made in accordance with table of Paragraph 11.2

* 1. Line Reductions

1. When reducing in to or from a screwed or socket-weld fitting, use a swage nipple or reduction coupling.
2. When reducing in Butt-Welding construction, use a butt-welding reducer.
   1. Post Weld Heat Treatment (PWHT) shall be carried out as required by ASME B31.1.
   2. All carbon-steel pipes shall have a minimum corrosion allowance of 1.6 mm. low alloy steel pipes shall have a minimum corrosion allowance of 0.25mm. Stainless steel pipe and Non-metallic pipe lines does not need any corrosion allowance..
   3. Galvanized items shall be only hot dip galvanized as per ASTM A153.
   4. All valves shall be hydrostatic tested in accordance with ASME B16.34 and the acceptance criteria shall be in accordance with MSS SP-61 except that seat leakage shall not exceed 2cc/hr per inch of nominal valve size(NPS). Butterfly valves size 26” and larger shall be hydrostatic tested and acceptance criteria in accordance with AWWA C504.
   5. All P22 materials shall be performed 10% PMI test as following materials at the vendor shop;

|  |
| --- |
| Pipes |
| Fittings |
| Flanges |
| Steam Trap |
| Valves (Body, Bonnet, Cover, Stem) |

* 1. PE coating thickness for U/G piping shall be min. 3mm.
  2. All high and intermediate pressure piping shall be manufactured from hot finished, seamless alloy steel tubing.
  3. All castings are to be homogeneous and as free from blowholes, porosity, voids, under sizing, shrinkage, cracks or other flaws as is practicable. No "burn in", welding, filling, plugging or other repair of defective parts is to be carried out without the prior written approval of the owner’s representative.

1. **CONNECTIONS** 
   1. Vent and Drain Connection

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|  |  |  |
| --- | --- | --- |
|  | Main Line Size | Valve Size |
| General Piping | DN50A & Smaller | DN20 (Except for DN15 Line) |
| DN65 ~ DN250 | DN25 |
| DN300 & Larger | DN25 |
| Lined Piping | DN65 & Larger | DN50 |

**Notes :**

|  |
| --- |
| 1. Detail specification of valves shall be in compliance with the applicable Piping Material Specification. |
| 1. Double valve shall be used on all piping classes with pressure temperature rating of 600# & over unless otherwise specified. |
| 1. The design drawings will indicate where valve sizes other than the specified size are required. |
| 1. Valves smaller than DN25 shall be used only where the size of main line is DN20 & smaller. |
| 1. Connections for lined piping shall be in accordance with “Lined Piping Connections” 2. The vent and drain pipe have to install Nipple and Cap(Screw). |

1. **INSTRUMENT CONNECTION DETAILS**
   1. Pressure & Temperature Instrument Connections

|  |  |  |
| --- | --- | --- |
| Main Pipe Line Class | Pressure Instrument Connection | Temperature Instrument Connection |
| 2500# and Higher | DN20 Socket welding Half coupling  (Note.3,4) | - Pipe wall thickness greater than  19.05mm(Note.1)  - Pipe wall thickness 19.05mm&Less  (Note.2,3,4)  - DN80 and Smaller(Note.2,3,4,5) |
| 1500# and 900# | DN20 Socket welding Half coupling  (Note.3,4) |
| 600# and Lower | DN20 Socket welding Half coupling  (Note.3,4) | - Threaded half-coupling(Note.3,4)  - DN80 & smaller(Note.5) |
| Lined Pipe | See Para 5.9 “Lined piping connection(for rubber or lined piping)” | |

Notes :

1. Para 5.2 : Thermowell installation detail for nominal pipe wall thickness

greater than 19.05mm

1. Para 5.3 : Thermowell installation detail for nominal pipe wall thickness

19.05mm & less

1. Para 5.4 : Half coupling fabrication detail
2. Para 5.5 : Half coupling installation detail
3. Para 5.6 : Thermowell installation in DN80 & smaller lines
4. Para 5.7 : Thermowell installation in DN50 & smaller lines
5. Para 5.8 : Thermowell material selection chart

General Notes :

* 1. Half coupling or sockolet material in accordance with piping class sheet.
  2. Threaded connections may be used only where permitted by piping class sheet.
  3. Calculations showing adequate reinforcement are required for half-couplings whose nominal size exceeds 1/4 the nominal size of the run for ASME B31.1 piping.
  4. Pressure class of fitting(i.e., 3000#, 6000#, OR 9000#)in accordance with applicable class sheet.
  5. Pressure and temperature instrument connections for lined pipe shall be applied in accordance with Para 5.9, Lined piping connection(for rubber or lined piping)
  6. Thermowell installation detail for nominal pipe wall thickness greater than 19.05 mm

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General Notes :

* 1. Weld all around and stress relieve according to the applicable code & standards.
  2. Thermowell material to the same “P” number of ASME sectionⅨ as pipe material.
  3. Refer to pressure and temperature instrument connection (Para. 5.1)
  4. Thermowell Installation detail for nominal pipe wall thickness 19.05mm & less

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DN250 & above

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DN100 to DN200

General Notes :

1. For use on : Nominal pipe wall thickness with 19.05 maximum wall.
2. Half Coupling : DN25 fabricated per Para. 5.4, soket Type
3. Thermowell : Material per sheet Para. 5.8
4. Installation : See Para. 5.5 for drill sequence and welding requirements.

Dimension per ASME B16.11 except dimension “D” finish bore Dia=23.01mm

1. Special : Heat treatment per applicable codes & standards.
   1. Half coupling fabrication detail

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General Notes:

* 1. Socket type half coupling are purchased as blanks. (I,e, no fitting bore “D”)
  2. Fitting dimensions per ASME B16.11 except as shown above.
  3. Pilot bore diameter(P) equals fitting bore diameter(D) minus 3.2mm
  4. See installation detail Para. 5.5 for drilling sequence of “P” and “D” dimensions.
  5. Threaded type half couplings are purchased as standard ASME B16.11 fittings.
  6. Half coupling installation detail

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* + 1. Description of Parts
    2. Bore pilot hole “P” in half coupling prior to fit-up.
    3. Drill thru finish bore diameter “D” after full penetration weld.(Socket type only)
    4. Full penetration weld, Gas tungsten arc welding(GTAW) not mandatory.

tn = Nominal thickness of half coupling wall

tc = 0.7tn or 6.35mm whichever is less

* 1. Thermowell installation in DN80 & smaller lines

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자동 생성된 설명

* + 1. Description of Parts

1. Material per Para. 5.8
2. Half coupling per Para. 5.4 & 5.5
3. Eccentric or concentric reducer DN100 to run size, butt weld, material per piping class sheet
4. Pipe – DN100 per class sheet, minimum length 150mm
5. Line pipe, butt weld
6. Fillet/socket weld per Para. 5.5
7. Full penetration weld per Para. 5.5
   * 1. Description of Parts

Vertical lines : Concentric

Horizontal lines : Concentric or eccentric

* 1. Thermowell installation in DN80 & smaller lines

스케치, 도표, 그림, 기술 도면이(가) 표시된 사진

자동 생성된 설명

* + 1. Description of Parts

1. Material per Para. 5.8
2. Bushing, threaded type to suit thermowell and line size..
3. Threaded tee, material per piping class sheet, size DN50
4. Threaded nipple, used in conjunction with required size reducing coupling.
5. Reducing coupling, as applicable.
6. Insertion length (U) = 75mm max.

* 1. Thermowell material selection chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pipe material specification | | Fitting | Thermowell | |
| Bar | Forging |
| Carbon  Steel | A53 Gr.B,  A106 Gr.B,  A106 Gr.C,  A672 Gr.C60 CL.13,  KS D3562 | A105,  A234 Gr.WPB,  KS B1542/B1533 PH420 | A675 Gr.70,  A479 Gr.316/316L  (Threaded Joint Only) | A105,  A182 Gr.F316/316L  (Threaded Joint Only) |
| Low Alloy  Steel | A335 Gr.P11,  A335 Gr.P22, | A182 Gr.F11,  A182 Gr.F22 | Not Applicable | A182 Gr.F11,  A182 Gr.F22, |
| Stainless  Steel | A312 Gr.TP304/304L  A312 Gr.TP316/316L  A358 Gr.TP304l CL.1 | A182 Gr.F304/304L  A182 Gr.F316/316L | A479 Gr.316/316L | A182 Gr.F316/316L, |

Notes :

All materials of the above table will be substituted by ASME SA Material For ASME Section Ⅰ and Ⅲ application

* 1. Lined piping connection(for rubber or lined piping)

텍스트, 도표, 스케치, 기술 도면이(가) 표시된 사진

자동 생성된 설명

도표, 라인, 텍스트, 스케치이(가) 표시된 사진

자동 생성된 설명

**Notes :**

|  |
| --- |
| 1. Sharp corners shall be removed before lining. |
| 1. The standard shall be submitted to purchaser for approval prior to application. |

1. **SAMPLE NOZZLE INSTALLATION DETAIL**

도표, 텍스트, 기술 도면, 평면도이(가) 표시된 사진

자동 생성된 설명

텍스트, 도표, 라인이(가) 표시된 사진

자동 생성된 설명

텍스트, 도표, 평행, 라인이(가) 표시된 사진

자동 생성된 설명

**Notes :**

|  |
| --- |
| 1. For sample nozzle detail, refer to sample nozzle data sheets. |
| 1. Nozzle should be installed in lower half of pipe, 45° from bottom and dead center. |
| 1. All dimensions are in millimeters. |

1. **ABBREVIATIONS**

Abbreviations used in this specification are defined as follows.

| CODE | ABBREVIATION | DESCRIPTION |
| --- | --- | --- |
| A | A/G  ANGL GLB  AS | Above Ground  Angle Globe Type  Alloy Steel |
| B | BB  BE  BHN  BW  B-FLY  BALL  B&S | Bolted Bonnet  Beveled Ends  Brinelled Hardness Number  Butt Weld  Butterfly Valve  Ball Type  Bell & Spigot |
| C | CL  CPVC  CS | Class  Chlorinate Polyvinyle Chloride  Carbon Steel |
| D | DWG | Drawing |
| E | EFW  ERW | Electric Fusion Welding  Electric Resistance Welding |
| F | FB  FF  FLG  FLGD  F to F  FLX DSC  FP  F.V | Full Bore Type  Full Face (Flat Face)  Flange  Flanged  Face to Face  Flexible Wedge Disc  Full Port  Full Vacuum |
| G | GALV  GR  GR OP  GRP  GRE | Galvanized  Grade  Gear Operator  Glassfibre Reinforced Thermosetting Plastics  Glass Reinforced Epoxy |
| H | HB  HD  HEX. NUT  HF  HOR | Brinell Hardness Number symbol per ASTM E10  (formerly BHN)  Hardened  Hexagonal Nut  Hard-faced  Horizontal Installation |
| I | ID  ISNS  ISRS  INTM | Inside Diameter  Inside Screw and Non-Rising Stem  Inside Screw and Rising Stem  Intermittent |
| L | LIFT  LJ  L. DSC  LVR OP  LR | Lift type  Lapped (Loose) Joint  Loose Disc  Lever Operator  Long Radius |
| M | MAT’L  MAX  MIN  M. BOLT  M & F  MFR  MJ  MTL ST | Material  Maximum  Minimum  Machine Bolt  Large Male and Female Face  Manufacture  Mechanical Joint  Metal seat |
| N | NB  NO  NOM | Non-Bonnet  Number  Nominal |
| O | OD  OSND  OS & Y | Outside Diameter  Outside Screw Non-Bonnet  Outside Screw and Yoke rawing |
| P | PSB  PSC  PE  PL  PLG DSC  PSTN  PPL  PVC | Pressure Seal Bonnet  Pressure Seal Cap/Cover  Plain End  Plate  Plug Disc  Piston Type Disc  Polypropylene Lined  Polyvinyl Chloride |
| R | R  RF  RL  RP  RTJ  RTFE | Radius  Raised Face  Rubber Lined  Reduction Port  Ring Type Joint Face  Reinforced Teflon |
| S | SB  SC  S. BOLT  S. CHECK  SCR’D  SCH  SMLS  SO  SW  SWING  SLD WDG  SR  SS  STL  STD  SWB | Screwed Bonnet  Screwed Cap/Cover  Stud Bolt  Stop Check Valve  Screwed  Schedule  Seamless  Slip-on Weld  Socket Weld  Swing Type  Solid Wedge Disc  Stress Relieve  Stainless Steel  Stellite  Standard  Seal Welded Bonnet |
| T | T or THK  t & g  T & G  TE  TFE  TFE SLV  TFE ST  TFEL  TBE  THRD  TOE | Thickness (Inch, mm)  Small Tongue and Groove Face  Large Tongue and Groove Face  Threaded End  Tetra Fluoro Ethylene  TFE Sleeve  TFE seats  TFE Lining  Threaded Both Side End  Thread  Threaded One Side End |
| U | UB  UC  U/G(UG) | Union Bonnet  Union Cap/Cover  Under Ground |
| V | VRT | Vertical Installation |
| W | W  WC  WN  WB  W. S GATE | Welded Product  Welded Cap/Cover  Welded Neck  Welded Bonnet  Water Seal Gate Valve |
| Y | Y TYPE | Y-Type / Y-Pattern |

1. **MATERIAL CLASS IDENTIFICATION**

원, 도표, 스크린샷, 라인이(가) 표시된 사진

자동 생성된 설명

|  |
| --- |
| ① Class / Rating |
| ② Material |
| * + 1. Material Grade Sequence Number |

* 1. Class / Rating

|  |  |  |  |
| --- | --- | --- | --- |
| 2500 | : | 2500# | ASME B16.5 |
| 1500 | : | 1500# | ASME B16.5 |
| 900 | : | 900# | ASME B16.5 |
| 600 | : | 600# | ASME B16.5 |
| 300 | : | 300# | ASME B16.5 |
| 150 | : | 150# | ASME B16.5/ B16.47/AWWA C207 |

* 1. Material

|  |  |
| --- | --- |
| A | : Alloy Steel |
| C | : Carbon Steel |
| S | : Stainless Steel |
| D | : DUPLEX S.S (S32205) |
| H | : HDPE |
| F | : PVC / UPVC / CPVC |
| G | : GRP |
| N | : Carbon Steel – Galvanized |
| Q  R  Z | : Carbon Steel – PE Coated  : Carbon Steel – PTFE Lined  : Stainless Steel – PE Coated |

* 1. Material Grade Sequence Number

This is a sequential number for the piping material classification.

1. **VALVE MATERIAL CODE NUMBERING**

AA - A A AA – A

5. Suffix(If Necessary)

4. Valve Material

3. End Connection Type

2. Rating

1. Valve Type

* 1. Valve Type

GAV Gate Valve

GLV Globe Valve

CHD Check Valve

BAV Ball Valve

BFV Butterfly Valve

ANV Angle Valve

PLV Plug Valve

DPV Diaphragm Valve

SAV Safety Valve

REV Relief Valve

* 1. Rating

A Special rating as Designated on Class Sheet

B 2500# ASME B16.5

C 1500# ASME B16.5

D 900# ASME B16.5

E 600# ASME B16.5

F 400# ASME B16.5

G 300# ASME B16.5

H 150# ASME B16.5

X General use as designated on class sheet

Y General use as designated on class sheet

Z General use as designated on class sheet

* 1. End Connection Type

B Butt Welding

S Socket Welding

Z Socket Welding x Thread

P Plane End x Thread

R Flange(RF)

F Flange(FF)

T Thread

W Wafer

J RTJ

L LUG

* 1. Valve Material

F01 A105 Forged Carbon Steel

F02 A182 F11 Forged Alloy Steel

F03 A182 F22 Forged Alloy Steel

F04 A182 F91 Forged Alloy Steel

F05 A182 F304 Forged Stainless Steel

F06 A182 F304L Forged Stainless Steel

F07 A182 F316 Forged Stainless Steel

F08 A182 F316L Forged Stainless Steel

F11 SF440A Forged Carbon Steel

F12 STS304 Forged Stainless Steel

F13 STS316 Forged Stainless Steel

F51 SA105 Forged Carbon Steel

F52 SA182 F11 Forged Alloy Steel

F53 SA182 F22 Forged Alloy Steel

F54 SA182 F91 Forged Alloy Steel

F55 SA182 F304 Forged Stainless Steel

F56 SA182 F304L Forged Stainless Steel

F57 SA182 F316 Forged Stainless Steel

F58 SA182 F316L Forged Stainless Steel

C01 A216 WCB Cast Carbon Steel

C02 A216 WCC Cast Carbon Steel

C03 A217 WC1 Cast Alloy Steel

C04 A217 WC6 Cast Alloy Steel

C05 A217 WC9 Cast Alloy Steel

C06 A217 C12A Cast Alloy Steel

C07 A351 CF8 Cast Stainless Steel

C08 A351 CF8M Cast Stainless Steel

C11 SCPH2 Cast Carbon Steel

C12 SSC 13A Cast Stainless Steel

C13 SSC 14A Cast Stainless Steel

C51 SA216 WCB Cast Carbon Steel

C52 SA216 WCC Cast Carbon Steel

C53 SA217 WC1 Cast Alloy Steel

C54 SA217 WC6 Cast Alloy Steel

C55 SA217 WC9 Cast Alloy Steel

C56 SA217 C12A Cast Alloy Steel

C57 SA351 CF8 Cast Stainless Steel

C58 SA351 CF8M Cast Stainless Steel

P01 PVC Poly Vinyl Chloride

P02 CPVC Chlorinated Poly Vinyl Chloride

D01 A395 Duct Iron

D02 GC200 Gray Cast Iron

D03 A126 CL.B Cast Iron

Z01 Others Special Material

* 1. Suffix(if necessary)

A Metal to Metal Seat (Inconel Material Seat Ring) Type Butterfly Valve

B PTFE Seat Type Butterfly Valve

C EPDM Seat Type Butterfly Valve

D Rubber Seat Type Butterfly Valve

E Non Slam Check Valve with Hydraulic Cylinder Type Dampening Device

and Counter Weight

F Dual Plate Check Vale

G Water Seal Type

H with Limit Switch

J Bellows Seal Type or Reversed “V” Packing Type

K Ball Valve for LNG Piping System, Metal Seat Type Ball Valve

(The Valves Shall Be of Approved Product by KOREA GAS SAFETY CORPORATION)

L Ball Valve for LNG Piping System (The Valves Shall Be of Approved Product by KOREA GAS SAFETY CORPORATION)

M MSS SP-44 Flanged Valve

N Check Valve for LNG Piping System (The Valves Shall Be of Approved Product by KOREA GAS SAFETY CORPORATION)

S Swing Type Check Valve (DN50 and Smaller

1. **SHORT CODE LIST**

| **SHORT CODE** | **DESIGNATION** |  | **SHORT CODE** | **DESIGNATION** |
| --- | --- | --- | --- | --- |
| P | Pipe |  | RC | Reducer Concentric. |
|  |  |  | RE | Reducer Eccentric. |
| NPP(3/4/6) | Nipple PBE (? inch) Long |  | C | Cap |
| NTT(3/4/6) | Nipple TBE (? inch) Long |  | FC | Full Coupling |
| NPT(3/4/6) | Nipple TOE (? inch) Long |  | HC | Half Coupling |
| CPT | Swage Con. PLE x TSE |  | CT | Cap Threaded |
| CBT | Swage Con. BLE x TSE |  | PL | Plug |
| CBP | Swage Con. BLE x PSE |  | U | Union |
| CPP | Swage Con. PE |  | SO | Sockolet |
| CTT | Swage Con. TE |  | TO | Thredolet |
| EPT | Swage PLE x TSE(NPT-M) |  | EO | Elbolet |
| EBT | Swage Ecc. BLE x TSE |  | WO | Weldolet. |
| EBP | Swage Ecc. BLE x PSE |  | LO | Latrolet |
| EPP | Swage Ecc. PE |  | NO | Nipolet |
| ETT | Swage Ecc. TE |  | B95 | 90 DEG Bend, 5D |
| E4 | Elbow 45 Deg. |  | B48 | 45 DEG Bend, 8D |
| E9 | Elbow 90 Deg. |  | 18L | Elbow 180 Deg.(LR) |
| T | Tee Equal |  | 18S | Elbow 180 Deg.(SR) |
| TR | Tee Reducing |  |  |  |
| L | Lateral Equal |  | F | Flange |
| LR | Lateral Reducing |  | F1 | Flange for Higher Rating |
| SE | Stub End |  | F2 | Flange for Higher Rating |
| FB | Flange Blind |  | AN | Angle Valve |
| FB1 | Flange Blind for Higher Rating |  | BA | Ball Valve |
| FF | Flange for Flat Face Type |  | CW | Check Valve Wafer Type |
| FJ | Flange with Jack Screw |  | CH | Check Valve |
| FJ1 | Flange with Jack Screw for Higher Rating |  | GA | Gate Valve |
| FR | Flange Reducing |  | GAF | Gate Valve Flanged Ends |
| FSB | Figure-8 Blank or Paddle Spacer & Blank |  | GAX | Gate Valve SW x TE |
| FSO | Flange Slip-On |  | GL | Globe Valve |
| FSW | Flange Socket Weld |  | GLF | Globe Valve Flanged Ends |
| FTH | Flange Screwed |  | NE | Needle Valve |
| FWN | Flange Welding Neck |  | PA | Plug Valve |
|  |  |  | BU | Butterfly Valve |
| G | Gasket |  | DA | Diaphragm Valve |
| G1 | Gasket for Higher Rating |  | FV | Foot Valve |
| G2 | Gasket for Higher Rating |  | BDV | Blow Down Valve |
| GF | Gasket for Full Face Type |  | BDC | Blow Down Valve (Continue Type) |
| GI | Isolation Kit Set |  | BDI | Blow Down Valve (Intermittent Type) |
|  |  |  | SV | Sampling Valve |
| B | Bolt & Nut |  | TDV | Tank Bottom Valve |
|  |  |  | CHS |  |
| STM | Steam Trap |  | EXT | Extension Stem |
| STL | Steam Trap for Line |  | EXH | Exhaust Head |
| STS | Steam Trap for Tracing |  | DIF | Non-Clog Diffuser |
| STE | Steam Trap for Equipment |  | SPN | Spray Nozzle |
| AT | Air Trap |  | CHN | Chain Wheel |
| STR | Strainer |  | PIN | Plastic Insulator(Smoother) |
| SRB | Strainer Bucket Type |  | IMB | Isolation Mono Block |
| SRC | Strainer Cone Type(Temp.) |  | DCO | Dur-O Lock Coupling |
| SRT | Strainer T-Type |  | DP | Drip Funnel |
| SRY | Strainer Y-Type |  | CLO | Clean Out |
| SRS | Strainer Special Type |  |  |  |
| EXP | Expansion Joint |  | TUB | Tube |
| FLX | Flexible Hose |  | TUI | Pre-Insulated Tube |
| QCU | Quick Conn. for Utility Sys |  | T9E | Tube 90 DEG Elbow |
| QC | Quick Connector |  | T4E | Tube 45 DEG Elbow |
| QCF | Quick Conn. Female |  | TTT | Tube All Tee |
| QCM | Quick Conn. Male |  | TRT | Tube Reducing Tee |
| ESW | Safety Shower w/Eye Washer |  | TCR | Tube Concentric Reducer |
| ES | Safety Shower only |  | TER | Tube Eccentric Reducer |
| EW | Eye Washer only |  | TFC | Female Tube CONN |
| CSS | Closed Sampling System |  | TMC | Male Tube CONN |
| SC | Sample Cooler |  | TBU | Tube Union |

1. **REDUCING AND BRANCH TABLE**
   1. REDUCING TABLE

Using a range of swages shall be applied DN100 and smaller by MSS SP-95.

Reduction coupling (SW) shall be applied up to DN50 as per ASME B16.11.

Reducers(BW) shall be in accordance with Table 12 of ASME B16.9 for using size range.

* 1. Branch Table

Branch table shall be as following:

 BR-1 : Steam and Condensate, Water, Utility for 150# and over

The used code (alphabet) in branch table shall be followed to below criteria

F = Socket Tee

B = Butt Weld Tee

C = Coupling

W = Weldolet

S = Sockolet or Half Coupling

\* = Butt Weld Tee + Swage Nipple

T = Thread Tee

* **BR-1 : Steam and Condensate, Water, Utility for 150# and over**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RUN SIZE | 15 | F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 | F | F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 | F | F | F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | F | F | F | F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 65 | S | S | S | \* | B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 | S | S | S | S | B | B |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 100 | S | S | S | S | B | B | B |  |  |  |  |  |  |  |  |  |  |  |  |
| 150 | S | S | S | S | B | B | B | B |  |  |  |  |  |  |  |  |  |  |  |
| 200 | S | S | S | S | W | W | B | B | B |  |  |  |  |  |  |  |  |  |  |
| 250 | S | S | S | S | W | W | B | B | B | B |  |  |  |  |  |  |  |  |  |
| 300 | S | S | S | S | W | W | W | B | B | B | B |  |  |  |  |  |  |  |  |
| 350 | S | S | S | S | W | W | W | B | B | B | B | B |  |  |  |  |  |  |  |
| 400 | S | S | S | S | W | W | W | B | B | B | B | B | B |  |  |  |  |  |  |
| 450 | S | S | S | S | W | W | W | W | B | B | B | B | B | B |  |  |  |  |  |
| 500 | S | S | S | S | W | W | W | W | B | B | B | B | B | B | B |  |  |  |  |
| 550 | S | S | S | S | W | W | W | W | W | B | B | B | B | B | B | B |  |  |  |
| 600 | S | S | S | S | W | W | W | W | W | B | B | B | B | B | B | B | B |  |  |
| ~ | S | S | S | S | W | W | W | W | W | W | The criteria is ASME B 16.9 for TEE size range | | | | | | | |  |
|  | | 15 | 20 | 25 | 50 | 65 | 80 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | ~ |  |
| BRANCH SIZE | | | | | | | | | | | | | | | | | | |

**Attachment**

#1 Piping Material Classification

**SERVICE SYSTEM INDEX**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Piping Material Class** | **Basic Material** | **Class Rating** | **Appli- cable Code** | **C.A (mm)** | **Line Service** | **Design Condition** | | **Service** | **Branch** | **Remark** |
| **Press (barg)** | **Temp (℃)** |
|
| 150C2A | A106-B SMLS | 150 | ASME B31.1 | 1.6 | LSC | 5.0 | 130.0 | Condensate Tank to Pump Suction | BR-1 |  |
|  | 9.7 | 130.0 | Condensate Return from S-Oil to TK |  |  |
|  | 9.7 | 130.0 | Condensate after Pump Discharge |  |  |
| HSC | 5.0 | 270.0 | Reducing Valve Drain after Steam Trap  (HPS 3-1) |  |  |
|  | 5.0 | 230.0 | MP Steam Main Line Drain to Trench |  |  |
| 300C2A | A106-B SMLS | 300 | ASME B31.1 | 1.6 | HPS | 20.0 | 370.0 | MP Stem (to S-Oil) | BR-1 |  |
| 20.0 | 370.0 | HPS Reducing Valve Downstream  (Transition Piece / HPS 3-1) |  |  |
| 20.0 | 300.0 | MP Steam to Silencer |  |  |
| 20.0 | 300.0 | MP Steam Main Line Drain to Steam Trap |  |  |
| 600C2A | A106-B SMLS | 600 | ASME B31.1 | 1.6 | HPS2 | 41.0 | 390.0 | TBN Extraction Steam (from #RB3) | BR-1 |  |
|  | 41.0 | 390.0 | Reducing Valve Drain to Steam Trap  (HPS 3-1) |  |  |
| LFW | 80.0 | 163.0 | BFP Interstaged Bleed Off (Spray Water) (from #3RB / HPS 3-1 & 2) |  |  |
|  | 55.0 | 163.0 | BFP Interstaged Bleed Off (Spray Water) (from #1RB / HPS 3-3) |  |  |
| 300A2H | A335-P22 SMLS | 300 | ASME B31.1 | 0.25 | HPS | 20.0 | 370.0 | HPS Reducing Valve Downstream  (Transition Piece / HPS 3-2 & 3) | BR-1 |  |
| BSC | 5.0 | 310.0 | Reducing Valve Drain to Trench  (HPS 3-3) |  |  |
| 600A2H | A335-P22 SMLS | 600 | ASME B31.1 | 0.25 | HHS3 | 43.2 | 413.0 | HP Steam (to S-Oil) | BR-1 |  |
| BSC | 50.0 | 480.0 | Main Steam Drain to #3RB Flash Tank |  |  |
|  | 5.0 | 330.0 | Reducing Valve Drain to Trench  (HPS 3-2) |  |  |
| 900A1A | A335-P22 SMLS | 900 | ASME B31.1 | 0.25 | HHS | 75.0 | 470.0 | Main Steam (from #PB1 Boiler) | BR-1 |  |
|  | 75.0 | 470.0 | Reducing Valve Drain to Steam Trap  (HPS 3-3) |  |  |
| 1500A2H | A335-P22 SMLS | 1500 | ASME B31.1 | 0.25 | HHS2 | 101.0 | 505.0 | Main Steam (from #RB3 Boiler) | BR-1 |  |
|  | 101.0 | 505.0 | Main Steam Drain to MOV |  |  |
|  | 101.0 | 505.0 | Reducing Valve Drain to Steam Trap  (HPS 3.2) |  |  |
| 150S1A | A312-TP304 SMLS | 150 | ASME B31.1 | 0 | DMW | 5.0 | 70.0 | Demi. Water Tank to Pump Suction | BR-1 |  |
|  | 15.0 | 70.0 | Demi. Water after Pump Discharge  (to S-Oil) |  |  |
|  | 15.0 | 70.0 | Demi. Water Min. Flow to Tank |  |  |
|  | 15.0 | 70.0 | Samples from Demi. Water |  |  |
|  | 15.0 | 70.0 | Cooling Water to Sample Cooler |  |  |
|  | 10.0 | 70.0 | Cooling Water Collect. Tank |  |  |
|  | 5.0 | 70.0 | CW Transfer Pump Suction |  |  |
|  | 15.0 | 70.0 | CW Transfer Pump Discharge |  |  |
|  | 10.0 | 70.0 | Sampling Rack Drain to Trench |  |  |
| INA | 9.7 | 70.0 | Instrument Air form #3RB INA HDR |  |  |
|  | 9.7 | 70.0 | Instrument Air form #1PB INA HDR |  |  |
| LSC | 9.7 | 130.0 | Samples from Condensate |  |  |
| 300S1A | A312-TP304 SMLS | 300 | ASME B31.1 | 0 | HPS | 20.0 | 300.0 | Samples from MP Steam | BR-1 |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PIPING CLASS – 150C2A** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 150# | |
| LSC | | | 5.8 | 103.0 | | Base Material | CARBON STEEL | |
| LSC | | | 9.7 | 130.0 | | Design Code | ASME B31.1 | |
| HSC | | | 5.0 | 270.0 | | Corrosion Allowance | 1.6 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | A106 Gr. B | | SMLS PE | | |  |
| 65 ~ 200 | STD WT | A106 Gr. B | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 ~ 200 | Acc. to pipe | A234 WPB | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 & OVER | Acc. to pipe | A105 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.150 | A105 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 200 | CL.150 | A105 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 200 | CL.150 | 304SS Strip with Graphite filler | | Spiral Wound Gasket, C/S Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | A193 B7 / A194 2H | | Stud Bolt /Heavy Hex Nuts with Hot-Dip Galvanized. | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, BW, BB, OS & Y | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, RF, BB, OS & Y | | | | |  |
| **GLOBE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, SWxSCRD, BB, OS & Y | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 150#, BW, BB, OS & Y | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, RF, BB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A105 | ASME 600#, SW, BC, Lift | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, BW, BC, Swing | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, RF, BC, Swing | | | | |  |
| **BALL** | 15 ~ 50 | A105 | ASME 600#, SW(NIPP), BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, SW(NIPP)xSCRD, BB, OS & Y | | | | |  |
| 65 ~ 200 | A216 WCB | ASME 150#, RF, FB, Floating | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 300C2A** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 300# | |
| HPS | | | 20.0 | 370 | | Base Material | CARBON STEEL | |
| HPS | | | 20.0 | 300 | | Design Code | ASME B31.1 | |
|  | | |  |  | | Corrosion Allowance | 1.6 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | A106 Gr. B | | SMLS PE | | |  |
| 65 ~ 250 | STD WT | A106 Gr. B | | SMLS BE | | |  |
|  | 300 ~ 300 | STD WT | A106 Gr. B | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 ~ 300 | Acc. to pipe | A234 WPB | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 & OVER | Acc. to pipe | A105 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.300 | A105 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 300 | CL.300 | A105 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 300 | CL.300 | 304SS Strip with Graphite filler | | Spiral Wound Gasket, C/S Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | A193 B7 / A194 2H | | Stud Bolt /Heavy Hex Nuts with Hot-Dip Galvanized. | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 300 | A216 WCB | ASME 300#, BW, BB, OS & Y | | | | |  |
| 65 ~ 300 | A216 WCB | ASME 300#, RF, BB, OS & Y | | | | |  |
| **GLOBE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, SWxSCRD, BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, RF, BB, OS & Y | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 300#, BW, BB, OS & Y | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 300#, RF, BB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A105 | ASME 600#, SW, BC, Lift | | | | |  |
| 65 ~ 300 | A216 WCB | ASME 300#, BW, BC, Swing | | | | |  |
| 65 ~ 300 | A216 WCB | ASME 300#, RF, BC, Swing | | | | |  |
| **BALL** | 15 ~ 50 | A105 | ASME 600#, SW(Nipple), FB, Floating | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 300#, BW(Pup-Piece), FB, Trunnion | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, RF FB, Floating | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 300#, RF FB, Trunnion | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 600C2A** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 600# | |
| HPS2 | | | 41.0 | 390.0 | | Base Material | CARBON STEEL | |
| LFW | | | 80.0 | 163.0 | | Design Code | ASME B31.1 | |
| LFW | | | 55.0 | 163.0 | | Corrosion Allowance | 1.6 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | A106 Gr. B | | SMLS PE | | |  |
| 65 ~ 150 | STD WT | A106 Gr. B | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 ~ 150 | Acc. to pipe | A234 WPB | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | A105 | | SW | | |  |
| 65 & OVER | Acc. to pipe | A105 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.600 | A105 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 150 | CL.600 | A105 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 150 | CL.600 | 304SS Strip with Graphite filler | | Spiral Wound Gasket, C/S Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | A193 B7 / A194 2H | | Stud Bolt /Heavy Hex Nuts with Hot-Dip Galvanized. | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
|  | 65 ~ 150 | A216 WCB | ASME 600#, BW, PSB , OS & Y | | | | |  |
|  | 65 ~ 150 | A216 WCB | ASME 600#, RF, PSB , OS & Y | | | | |  |
| **GLOBE** | 15 ~ 50 | A105 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, SWxSCRD, BB, OS & Y | | | | |  |
| 15 ~ 50 | A105 | ASME 600#, RF, BB, OS & Y | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 600#, BW, PSB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A105 | ASME 600#, SW, BC, Lift | | | | |  |
| 65 ~ 150 | A216 WCB | ASME 600#, BW, PSC, Swing | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 300A2H** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 300# | |
| HPS (Reducing V/V Downstream) | | | 20.0 | 370.0 | | Base Material | LOW ALLOY(P22) | |
| BSC (Reducing Valve Drain to Trench) | | | 5.0 | 310.0 | | Design Code | ASME B31.1 | |
|  | | |  |  | | Corrosion Allowance | 0.25 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | SA335 Gr. P22 | | SMLS PE | | |  |
| 65 ~ 250 | STD WT | SA335 Gr. P22 | | SMLS BE | | |  |
| 300 ~ 300 | STD WT | SA335 Gr. P22 | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 ~ 300 | Acc. to pipe | SA234WP22CL.1 | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 & OVER | Acc. to pipe | SA182 F22 CL.3 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.300 | SA182 F22 CL.3 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 300 | CL.300 | SA182 F22 CL.3 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 300 | CL.300 | 304SS Strip with Thermiculite filler | | Spiral Wound Gasket, 304SS Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | SA193-B16/ SA194-3 | | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 250 | A217 WC9 | ASME 300#, BW, BB, OS & Y | | | | |  |
| 300 ~ 300 | A217 WC9 | ASME 300#, BW, BB, OS & Y, GO | | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 150 | A217 WC9 | ASME 300#, BW, BB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BC, Lift | | | | |  |
| 65 ~ 300 | A216 WC9 | ASME 300#, BW, BC, Swing | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 600A2H** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 600# | |
| HHS3 (HP Steam to S-Oil) | | | 43.2 | 413.0 | | Base Material | LOW ALLOY(P22) | |
| BSC (Main Steam Drain) | | | 50.0 | 480.0 | | Design Code | ASME B31.1 | |
| BSC (Reducing Valve Drain to Trench) | | | 5.0 | 330.0 | | Corrosion Allowance | 0.25 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | SA335 Gr. P22 | | SMLS PE | | |  |
| 65 ~ 200 | STD WT | SA335 Gr. P22 | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP /SWAGE** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 ~ 200 | Acc. to pipe | SA234WP22CL.1 | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 & OVER | Acc. to pipe | SA182 F22 CL.3 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.600 | SA182 F22 CL.3 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 200 | CL.600 | SA182 F22 CL.3 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 200 | CL.600 | 304SS Strip with Thermiculite filler | | Spiral Wound Gasket, 304SS Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | SA193-B16/ SA194-3 | | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 200 | A217 WC9 | ASME 600#, BW, PSB, OS & Y | | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BB, OS & Y | | | | |  |
| 65 ~ 150 | A217 WC9 | ASME 600#, BW, PSB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A182 F22 CL3 | ASME 600#, SW, BC, Lift | | | | |  |
| 65 ~ 200 | A216 WC9 | ASME 600#, BW, PSC, Swing | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 900A1A** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 900# | |
| HHS (Main Steam from #1PB Boiler)C | | | 75.0 | 470.0 | | Base Material | LOW ALLOY(P22) | |
|  | | |  |  | | Design Code | ASME B31.1 | |
|  | | |  |  | | Corrosion Allowance | 0.25 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | SA335 Gr. P22 | | SMLS PE | | |  |
| 65 ~ 100 | STD WT | SA335 Gr. P22 | | SMLS BE | | |  |
| 150 ~ 200 | SCH.80 | SA335 Gr. P22 | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 ~ 200 | Acc. to pipe | SA234WP22CL.1 | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 & OVER | Acc. to pipe | SA182 F22 CL.3 | | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.900 | SA182 F22 CL.3 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 200 | CL.900 | SA182 F22 CL.3 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 200 | CL.900 | 304SS Strip with Thermiculite filler | | Spiral Wound Gasket, 304SS Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | SA193-B16/ SA194-3 | | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F22 CL3 | ASME 900#, SW, WB, OS & Y | | | | |  |
| 65 ~ 200 | A217 WC9 | ASME 900#, BW, PSB, OS & Y | | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F22 CL3 | ASME 900#, SW, WB, OS & Y | | | | |  |
| 65 ~ 150 | A217 WC9 | ASME 900#, BW, PSB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A182 F22 CL3 | ASME 900#, SW, WC, Y-Lift | | | | |  |
| 65 ~ 200 | A216 WC9 | ASME 900#, BW, PSC, Tilting | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 1500A2H** | | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | | Flange Rating | ASME 1500# | |
| HHS2 (Main Steam from #RB3 Boiler) | | | 101.0 | 505.0 | | Base Material | LOW ALLOY(P22) | |
|  | | |  |  | | Design Code | ASME B31.1 | |
|  | | |  |  | | Corrosion Allowance | 0.25 mm | |
|  | | |  |  | | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.80 | SA335 Gr. P22 | | SMLS PE | | |  |
| 65 ~ 100 | SCH.80 | SA335 Gr. P22 | | SMLS BE | | |  |
| 150 ~ 200 | SCH.120 | SA335 Gr. P22 | | SMLS BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 ~ 200 | Acc. to pipe | SA234WP22CL.1 | | SMLS BW | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15~ 50 | CL 3000 | SA182 F22 CL.3 | | SW | | |  |
| 65 & OVER | Acc. to pipe | SA182 F22 CL.3 | | BW | | |  |
| **FLANGE** | 15~ 50 | CL.1500 | SA182 F22 CL.3 | | SWRF, ASME B16.5 | | |  |
| 65 ~ 200 | CL.1500 | SA182 F22 CL.3 | | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 200 | CL.1500 | 304SS Strip with Thermiculite filler | | Spiral Wound Gasket, 304SS Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | SA193-B16/ SA194-3 | | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F22 CL3 | ASME 1500#, SW, WB, OS & Y | | | | |  |
| 65 ~ 100 | A217 WC9 | ASME 1500#, BW, PSB, OS & Y | | | | |  |
| 150 ~ 200 | A217 WC9 | ASME 1500#, BW, PSB, OS & Y, GO | | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F22 CL3 | ASME 1500#, SW, WB, OS & Y | | | | |  |
| 65 ~ 100 | A217 WC9 | ASME 1500#, BW, PSB, OS & Y | | | | |  |
| **CHECK** | 15 ~ 50 | A182 F22 CL3 | ASME 1500#, SW, WC, Y-Lift | | | | |  |
| 65 ~ 200 | A216 WC9 | ASME 1500#, BW, PSC, Tilting | | | | |  |
| **NOTE** | | | | | | | | |
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| **PIPING CLASS – 150S1A** | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | Flange Rating | ASME 150# | |
| DMW | | | 15.0 | 70.0 | Base Material | STAINLESS STEEL | |
| INA | | | 9.7 | 70.0 | Design Code | ASME B31.1 | |
| LSC | | | 9.7 | 130.0 | Corrosion Allowance | 0.0 mm | |
|  | | |  |  | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 10 ~ 50 | SCH.40S | A312-TP304 | SMLS PE | | |  |
|  | 65 ~ 150 | SCH.40S | A312-TP304 | WLD BE | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 10 ~ 50 | CL 3000 | A182 F304or304L | SW | | |  |
| 65 ~ 150 | Acc. to pipe | A403-WP304 | WLD BE | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 10 ~ 50 | CL 3000 | A182 F304 | SW | | |  |
| 65 & OVER | Acc. to pipe | A182 F304 | BW | | |  |
| **FLANGE** | 15 ~ 50 | CL.150 | A182 F304 | SWRF, ASME B16.5 | | |  |
| 65 ~ 150 | CL.150 | A182 F304 | WNRF, ASME B16.5 | | |  |
| **GASKET** | 15 ~ 150 | CL.150 | 304SS Strip with Graphite filler | Spiral Wound Gasket, S/S Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | A193-B8CL.2/ A194-8 | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BB, OS & Y | | | |  |
| 65 ~ 150 | A351 CF8 | ASME 150#, RF, BB , OS & Y | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BB, OS & Y | | | |  |
| 65 ~ 150 | A351 CF8 | ASME 150#, RF, BB , OS & Y | | | |  |
| **CHECK** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BC, Lift | | | |  |
| 65 ~ 150 | A351 CF8 | ASME 150#, RF, BC, Swing | | | |  |
| **BALL** | 15 ~ 50 | A182 F304 | ASME 600#, SW(NiPP), FB, Floating | | | |  |
| 15 ~ 50 | A182 F304 | ASME 150#, RF, FB, Floating | | | |  |
| 65 ~ 150 | A351 CF8 | ASME 150#, RF, FB, Trunnion | | | |  |
| **NOTE** | | | | | | | |
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| **PIPING CLASS – 300S1A** | | | | | | | |
| SERVICE | | | PRESS. (barg) | TEMP. (℃) | Flange Rating | ASME 300# | |
| HPS (MP Steam Sampling) | | | 20.4 | 300.0 | Base Material | STAINLESS STEEL | |
|  | | |  |  | Design Code | ASME B31.1 | |
|  | | |  |  | Corrosion Allowance | 0.0 mm | |
|  | | |  |  | Branch Table | BR-1 | |
| **PIPE AND FITTINGS** | | | | | | | |
| **ITEM** | **SIZE (DN)** | **SCHEDULE/ RATING** | **MATERIAL** | **DESCRIPTION** | | | **NOTE** |
| **PIPE** | 15 ~ 50 | SCH.40S | A312-TP304or304L | SMLS PE | | |  |
|  |  |  |  |  | | |  |
| **ELBOW**  **REDUCER TEE**  **CAP / SWAGE** | 15 ~ 50 | CL 3000 | A182 F304or304L | SW | | |  |
|  |  |  |  | | |  |
| **UNION**  **CPLG**  **O’LET / BOSS** | 15 ~ 50 | CL 3000 | A182 F304or304L | SW | | |  |
|  |  |  |  | | |  |
| **FLANGE** | 15 ~ 50 | CL.300 | A182 F304or304L | SWRF, ASME B16.5 | | |  |
|  |  |  |  | | |  |
| **GASKET** | 15 ~ 50 | CL.300 | 304SS Strip with Graphite filler | Spiral Wound Gasket, S/S Outer Ring 4.5mm Thk, RF, ASME B16.20 | | |  |
| **BOLTING** | All |  | A193-B8CL.2/ A194-8 | Stud Bolt /Heavy Hex Nuts | | |  |
| **VALVES** | | | | | | | |
| **TYPE** | **SIZE (inch)** | **BODY MATERIAL** | **DESCRIPTION** | | | | **NOTE** |
| **GATE** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BB, OS & Y | | | |  |
|  |  |  | | | |  |
| **GLOBE** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BB, OS & Y | | | |  |
|  |  |  | | | |  |
| **CHECK** | 15 ~ 50 | A182 F304 | ASME 600#, SW, BC, Lift | | | |  |
|  |  |  | | | |  |
| **BALL** | 15 ~ 50 | A182 F304 | ASME 600#, SW(Nipple), FB, Floating | | | | RPTFE  SEAT |
| 15 ~ 50 | A182 F304 | ASME 600#, SW(Nipple)xSCRD, FB, Floating | | | | RPTFE  SEAT |
|  |  |  | | | |  |
| **NOTE** | | | | | | | |
|  | | | | | | | |
|  | | | | | | | |
|  | | | | | | | |