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| **طرح نگهداشت و افزایش تولید 27 مخزن** |
| **PIPING MATERIAL SPECIFICATION****نگهداشت و افزایش تولید میدان نفتی بینک** |
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|  |  |  |  |  |  |  |
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**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |  | **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |
| **1** | X | X | X |  |  | **66** |  |  |  |  |  |
| **2** | X | X | X |  |  | **67** |  |  |  |  |  |
| **3** | X |  |  |  |  | **68** |  |  |  |  |  |
| **4** | X |  |  |  |  | **69** |  |  |  |  |  |
| **5** | X | X |  |  |  | **70** |  |  |  |  |  |
| **6** | X | X |  |  |  | **71** |  |  |  |  |  |
| **7** | X |  |  |  |  | **72** |  |  |  |  |  |
| **8** | X |  |  |  |  | **73** |  |  |  |  |  |
| **9** | X | X |  |  |  | **74** |  |  |  |  |  |
| **10** | X |  |  |  |  | **75** |  |  |  |  |  |
| **11** | X |  |  |  |  | **76** |  |  |  |  |  |
| **12** | X |  |  |  |  | **77** |  |  |  |  |  |
| **13** | X |  | X |  |  | **78** |  |  |  |  |  |
| **14** | X | X | X |  |  | **79** |  |  |  |  |  |
| **15** | X |  | X |  |  | **80** |  |  |  |  |  |
| **16** | X |  |  |  |  | **81** |  |  |  |  |  |
| **17** | X |  | X |  |  | **82** |  |  |  |  |  |
| **18** | X |  | X |  |  | **83** |  |  |  |  |  |
| **19** | X |  | X |  |  | **84** |  |  |  |  |  |
| **20** | X |  |  |  |  | **85** |  |  |  |  |  |
| **21** | X | X | X |  |  | **86** |  |  |  |  |  |
| **22** | X |  | X |  |  | **87** |  |  |  |  |  |
| **23** | X |  |  |  |  | **88** |  |  |  |  |  |
| **24** | X | X | X |  |  | **89** |  |  |  |  |  |
| **25** | X | X | X |  |  | **90** |  |  |  |  |  |
| **26** | X |  |  |  |  | **91** |  |  |  |  |  |
| **27** |  | X | X |  |  | **92** |  |  |  |  |  |
| **28** |  | X | X |  |  | **93** |  |  |  |  |  |
| **29** |  |  |  |  |  | **94** |  |  |  |  |  |
| **30** |  |  |  |  |  | **95** |  |  |  |  |  |
| **31** |  |  |  |  |  | **96** |  |  |  |  |  |
| **32** |  |  |  |  |  | **97** |  |  |  |  |  |
| **33** |  |  |  |  |  | **98** |  |  |  |  |  |
| **34** |  |  |  |  |  | **99** |  |  |  |  |  |
| **35** |  |  |  |  |  | **100** |  |  |  |  |  |
| **36** |  |  |  |  |  | **101** |  |  |  |  |  |
| **37** |  |  |  |  |  | **102** |  |  |  |  |  |
| **38** |  |  |  |  |  | **103** |  |  |  |  |  |
| **39** |  |  |  |  |  | **104** |  |  |  |  |  |
| **40** |  |  |  |  |  | **105** |  |  |  |  |  |
| **41** |  |  |  |  |  | **106** |  |  |  |  |  |
| **42** |  |  |  |  |  | **107** |  |  |  |  |  |
| **43** |  |  |  |  |  | **108** |  |  |  |  |  |
| **44** |  |  |  |  |  | **109** |  |  |  |  |  |
| **45** |  |  |  |  |  | **110** |  |  |  |  |  |
| **46** |  |  |  |  |  | **111** |  |  |  |  |  |
| **47** |  |  |  |  |  | **112** |  |  |  |  |  |
| **48** |  |  |  |  |  | **113** |  |  |  |  |  |
| **49** |  |  |  |  |  | **114** |  |  |  |  |  |
| **50** |  |  |  |  |  | **115** |  |  |  |  |  |
| **51** |  |  |  |  |  | **116** |  |  |  |  |  |
| **52** |  |  |  |  |  | **117** |  |  |  |  |  |
| **53** |  |  |  |  |  | **118** |  |  |  |  |  |
| **54** |  |  |  |  |  | **119** |  |  |  |  |  |
| **55** |  |  |  |  |  | **120** |  |  |  |  |  |
| **56** |  |  |  |  |  | **121** |  |  |  |  |  |
| **57** |  |  |  |  |  | **122** |  |  |  |  |  |
| **58** |  |  |  |  |  | **123** |  |  |  |  |  |
| **59** |  |  |  |  |  | **124** |  |  |  |  |  |
| **60** |  |  |  |  |  | **125** |  |  |  |  |  |
| **61** |  |  |  |  |  | **126** |  |  |  |  |  |
| **62** |  |  |  |  |  | **127** |  |  |  |  |  |
| **63** |  |  |  |  |  | **128** |  |  |  |  |  |
| **64** |  |  |  |  |  | **129** |  |  |  |  |  |
| **65** |  |  |  |  |  | **130** |  |  |  |  |  |

**TABLE OF CONTENTS**

[1.0 INTRODUCTION 4](#_Toc88581436)

[2.0 SCOPE 4](#_Toc88581437)

[3.0 NORMATIVE REFERENCES 5](#_Toc88581438)

[4.0 ABBREVIATIONS 7](#_Toc88581439)

[5.0 PIPING COMPONENTS 9](#_Toc88581440)

[6.0 GENERAL TESTING REQUIRMENTS 10](#_Toc88581441)

[7.0 PIPING AND PIPELINE CLASSES 10](#_Toc88581442)

[8.0 CLASSES DESCRIPTION 13](#_Toc88581443)

1. **INTRODUCTION**

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

As a part of the Project, New Gas/Condensate Pipelines (from Binak New GCS to Siahmakan GIS/Binak PU) shall be constructed.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT:  | National Iranian South Oilfields Company (NISOC)  |
| PROJECT: | Binak Oilfield Development – Surface Facilities; Gas & Gas-Condensate Pipelines |
| EPD/EPC CONTRACTOR (GC): | Petro Iran Development Company (PEDCO) |
| EPC CONTRACTOR: | Joint Venture of : Hirgan Energy – Design & Inspection (D&I) Companies |
| VENDOR: | The firm or person who will fabricate the equipment or material. |
| EXECUTOR:  | Executor is the party which carries out all or part of construction and/or commissioning for the project. |
| THIRD PARTY INSPECTOR (TPI): | The firm appointed by EPD/EPC CONTRACTOR (GC) and approved by CLIENT (in writing) for the inspection of goods. |
| SHALL: | Is used where a provision is mandatory. |
| SHOULD: | Is used where a provision is advisory only. |
| WILL:  | Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR. |
| MAY:  | Is used where a provision is completely discretionary. |

1. **SCOPE**

This specification covers the general requirements to be implemented in the design of piping materials of pipes, fittings, flanges, valves and other components to be used for piping work of BINAK Gas & Gas-Condensate Pipelines which is designed by ASME B31.3.

1. **NORMATIVE REFERENCES**
	1. **LOCAL CODES AND STANDARDS**

|  |  |
| --- | --- |
| * IPS-E-TP-350(1)
 | Engineering Standard for Linings |
| * IPS-M-PI-110(1)
 | Material and Equipment Standard for Valves |
| * IPS-M-PI-150(2)
 | Material Standard for Flanges and Fittings |
| * IPS-M-PI-190(3)
 | Material and Equipment Standard for Line Pipe |
| * IPS-E-PI-140(1)
 | Engineering Standard for Onshore Transportation Pipelines |
| * IPS-E-PI-221(1)
 | Engineering Standard for Piping Material Selection |
| * IPS-E-PI-240(2)
 | Engineering Standard for Plant Piping System |

* 1. **INTERNATIONAL CODES AND STANDARDS**

|  |  |
| --- | --- |
| * ASME B1.20.1
 | Pipe Threads General Purpose (Inch) |
| * ASME B16.5
 | Steel Pipe Flanges And Flanged Fittings |
| * ASME B16.9
 | Factory–Made Wrought Steel Buttwelding Fittings |
| * ASME B16.10
 | Face To Face And End To End Dimension Of Valve |
| * ASME B16.11
 | Forged Steel Fittings, Socket Welding And Threaded |
| * ASME B16.21
 | Nonmetallic Flat Gaskets For Pipe Flanges |
| * ASME B16.25
 | Butt-Welding Ends |
| * ASME B16.34
 | Steel Valves, Flanged And Buttwelding Ends |
| * ASME B16.48
 | Steel Line Blanks |
| * ASME B18.2.1
 | Square And Hex. Bolts And Screws, Inch Series |
| * ASME B18.2.2
 | Square And Hex. Nuts |
| * ASME B31.3
 | Process Piping |
| * ASME B31.4
 | Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids |
| * ASME B36.10M
 | Welded and Seamless Wrought Steel Pipe |
| * ASME B36.19M
 | Stainless Steel Pipe |
| * ASME B31.8
 | Gas Transmission and Distribution Piping Systems |
| * ASME B16.20
 | Metallic Gaskets for Pipe Flanges |
| * ASME B16.36
 | Orifice Flanges |
| * BS EN 10204
 | Metallic products. Types of inspection documents |
| * ISO 4427
 | Plastic piping systems – Polyethylene (PE) pipes and fittings for water supply  |
| * BS 5154
 | Specification for copper alloy globe, globe stop and check, check and gate valves |
| * API 6FA
 | Specification for Fire Test For Valves |
| * API 608
 | Metal Ball Valves-Flanged, Threaded, and Welding End |
| * BS-1868
 | Flanged And Butt-Welding Ends Steel Check Valves For Petroleum And Petrochemical Industries |
| * BS-1873
 | Flanged And Butt-Welding Ends Steel Globe Valves For Petroleum And Petrochemical Industries |
| * BS EN ISO 17292:2015
 | Metal ball valves for petroleum, petrochemical and allied industries |
| * BS EN ISO 15761:2002
 | Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries |
| * BS 6775 (PART 2)
 | Testing Of Valve Specification For Fire Type Testing Requirement |
| * MSS SP-83
 | Class 300 and 6000 pipe unions, socket welding and threaded |
| * MSS SP-80
 | Bronze Gate, globe angle and check valves |
| * MSS SP-95
 | Swage Nipples And Ball Plugs |
| * MSS SP-97
 | Forged Carbon Steel Branch Olet Fittings |
| * MSS SP-120
 | Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends |
| * ANSI/NACE MR0175/ ISO 15156-1:2009(E)
 | Petroleum And Natural Gas Industries - Materials For Use In H2S Containing Environments In Oil And Gas Production |
| * NACE TM-0284
 | Standard Test Method - Evaluation Of Pipeline And Pressure Vessel Steels For Resistance To Hydrogen-Induced Cracking |
| * NACE TM-0177
 | Laboratory Testing Of Metals For Resistance To Sulfide Stress Cracking And Stress Corrosion Cracking In H2s Environments |

* 1. **THE PROJECT DOCUMENTS**

|  |  |
| --- | --- |
| * + BK-PPL-PEDCO-320-PI-RT-0002
 | Wall Thickness Calculation Report |
| * + BK-PPL-PEDCO-320-PI-RT-0001
 | Corrosion Study & Material Selection Report |
| * + BK-GNRAL-PEDCO-000-PI-DC-0001
 | Piping Design Criteria  |
| * + BK-GNRAL-PEDCO-000-PI-SP-0008
 | Specification For Material Requirements in Sour service |

* 1. **ENVIRONMENTAL DATA**

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001”.

* 1. **ORDER OF PRECEDENCE**

In case of any conflict between requirements specified herein & the requirements of any other referenced document, this subject shall be reflected to CLIENT and the final decision will be made by CLIENT.

1. **ABBREVIATIONS**

|  |  |
| --- | --- |
| AFC:  | Approved for Construction  |
| AFD:  | Approved for Design |
| # :  | CLASS |
| A/G:  | ABOVE GROUND |
| ASB :  | ASBESTOS |
| BB :  | BOLTED BONNET |
| BC :  | BOLTED COVER |
| BE :  | BEVEL ENDS |
| BLE :  | BEVELED LARGE END |
| BW :  | BUTT WELDING |
| C.A:  | CORROSION ALLOWANCE |
| CONC :  | CONCENTRIC |
| CS :  | CARBON STEEL |
| ECC :  | ECCENTRIC |
| FB:  | FULL BORE |
| FLGD:  | FLANGED |
| FR :  | FLAT RING |
| GJ. :  | GASKET JOINT |
| GO:  | GEAR OPERATED |
| GR. :  | GRADE |
| HEX :  | HEXAGONAL |
| HO:  | HANDWHEEL OPERATED |
| LR :  | LONG RADIUS |
| MO: | MOTOR OPERATED |
| NB :  | NOMINAL BORE |
| NPS :  | NOMINAL PIPE SIZE |
| NPT:  | NOMINAL PIPE THREAD |
| OS&Y :  | OUTSIDE SCREW & YOKE |
| PBE:  | PLAIN BOTH END |
| PSE :  | PLAIN SMALL END |
| PTFE:  | POLYTETRAFLUOROETHYLENE |
| RB :  | REDUCED BORE |
| RED :  | REDUCER/REDUCING |
| RF :  | RAISED FACE |
| S.S.:  | STAINLESS STEEL |
| SB :  | SCREWED BONNET |
| SCH :  | SCHEDULE |
| SCR’D :  | SCREWED |
| SF :  | SERRATED FINISH |
| SG :  | SCREWED GLAND |
| SMLS :  | SEAMLESS |
| SPW :  | SPIRAL WOUND |
| STD : | STANDARD |
| SW :  | SOCKET WELDING |
| TBE :  | THREADED BOTH ENDS |
| THK :  | THICKNESS |
| THRD:  | THREADED |
| TLE :  | THEREADED LARGE END |
| TR :  | TRIM |
| TSE :  | THEREADED SMALL END |
| UB :  | UNION BONNET |
| W.T :  | WALL THICKNESS |
| WB :  | WELDED BONNET |
| WN :  | WELDING NECK |
| XS :  | EXTRA STRONG |
| XXS :  | DOUBLE EXTRA STRONG |

1. **PIPING COMPONENTS**
	1. **PIPE**

## For carbon steel pipes, dimensions shall conform to ASME B36.10M or API 5L where applicable. The nominal thickness for “Stainless Steel Pipe” shall be selected in accordance with ASME B36.19M. Tolerances of pipes shall meet the requirements of IPS-M-PI-190(4).

## End pipe for sizes 1/2” to 1 1/2” shall be plain end, for size 2”and above shall be beveled end. End of galvanized pipe shall be threaded.

## For all Materials Carbon Content and CE=C+ (Mn/6) + (Cu+Ni)/15 + (Cr+Mo+V)/5 shall meet the requirements of IPS-M-PI-190(3). In addition, all the main piping and related materials shall be according to the requirements of NACE MR 0175 / ISO 15156 and IPS-M-PI-190(3) for sour services.

## Pipes with sizes 1/4",3/8",1¼",2½",3½",4½",5",7”,9”,14”,18”,22",shall not be used, except as may be required by equipment connections.

* 1. **FITTING**

## Dimensions and tolerances for butt-weld fitting (be normally used for nominal diameter 2" and larger) shall conform to ASME B16.9.

## Dimensions and tolerances for Socket weld fittings and/or screwed fitting (be normally used for nominal diameter 1 1/2" and smaller) shall conform to ASME B16.11.

## FLANGES

## Machining shall be in accordance with ASME B16.5. Roughness of RF shall be between 3.2 and 6.3 micrometers (125 to 250 micro inches AARH)

## Orifice flanges shall conform to ASME B16.36. Quantities shown on Material Requisition must be understood as "pair" of orifice flanges supplied with assembly bolting.

## VALVES

## All socket welded ball valves of nominal sizes ½” to 1 ½” shall have extended ends (Sch. 160 nipples) with an overall length of 400mm.

## Valve trim numbers for gate, globe and check valves are as API 600 (2015) Table 8.

## GASKETS

## Spiral wound gaskets shall conform to ASME B16.20 and Non-metallic flat gaskets shall conform to ASME B16.21.

## BOLTS AND NUTS

## Thread shall be in accordance with ASME B1.1 and Nuts shall conform to ASME B18.2.2.

## Stud bolts shall be threaded full length and chamfered both ends. Length for standard flange assembly shall be in accordance with ASME B16.5. Stud bolts shall be supplied with 2 Heavy Hex nuts.

## BRANCH CONNECTIONS

## Branches shall be as specified in the individual line classes.

## For pipe line to be pigged, tee or branch with 40% or more of the main line diameter shall be equipped with scraper guide bars.

## UG SERVICE COATING

## For UG services, all Pipes & Fittings Shall be Solvent Free Epoxy .

1. **GENERAL TESTING REQUIRMENTS**

## Pressure testing of the following piping shall be in accordance with ASME B31.3 test procedures. The test pressure shall be held for a sufficient time to allow detection of any leaks and for a minimum time of 1 hour.

* 1. Metallic piping including carbon steel, lined carbon steel, stainless steel, corrosion resistant alloys and ductile iron but excluding copper shall normally be tested at 1.5 x the design pressure.

## Pipelines designed to ASME B31.8 where the operating pressure results in a hoop stress greater than 30% of the specified minimum yield strength shall be hydrostatically tested or tested with air or gas. The type of test and the test pressure is dependent on Location Class as defined in ASME B31.8 Para. 841.3.2. Test duration shall be a minimum of 2 hours.

1. **PIPING AND PIPELINE CLASSES**

## PIPING CLASSES NUMBERING

Each piping class is identified from two alphabetical characters which precede a two digit figure. The first alphabetical character indicates pressure rating of flange and the second alphabetical character indicates material as follows:

|  |  |
| --- | --- |
| 1st alphabetical character | 2nd alphabetical character |
| A | Class 150  | N | Carbon Steel |
| C | Class 300  | S | Stainless Steel |
| F | Class 600  | X | Non Metal Pipe |
| G | Class 900  | Z | Galvanized Carbon Steel |
| H | Class 1500  |  |  |

The third figure indicates the design code and the forth figure indicates corrosion allowance for metallic as follows

|  |  |  |
| --- | --- | --- |
| 3rd figure | 4th figurefor metal pipe | 4th figure for non-metal pipe |
| **Fig.** | **Design standard** | **Fig.** | **C.A.** | **NACE MR 0175 / ISO 15156 Requirement** | **Fig.** | **Material type** |
| 0 | ASME B 31.3 (For Inside of Plant)  | 0 | 0 mm  | No | 1 | GRE |
| 1 | 1 mm  | No | 2 | PE |
| 1 | ASME B 31.4 (For Liquid Pipeline) | 2 | 1 mm  | Yes | 3 | RTP (Reinforced Thermoplastic pipe) |
| 4 | 3 mm  | No |
| 2 | ASME B 31.8 (For Gas Pipeline) | 5 | 3 mm  | Yes |
| 6 | 6 mm  | No |  |  |
|  |  | 7 | 6 mm  | Yes |  |  |

## SUMMARY OF PIPING AND PIPELINE CLASSES

Table 1: piping classes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Piping Class** | **ANSI Rating****/Facing**  | **Max Pipe Size (In)** | **Base** **Material** | **MAX TEMP. ºC** | **C.A.****(mm)** | **Service** |
| AN01 | 150/RF | 10 | Carbon Steel | 85 | 1 | Oily Water  |
| AN07 | 150/RF | 10" | Carbon SteelNACE MR0175/ISO15156 | 85 | 6 | Hydrocarbon Gas |
| CN05 | 300/RF | 6" | Carbon SteelNACE MR0175/ISO15156 | 85 | 3 | Gas Condensate |
| FN05 | 600/RF | 8" | Carbon SteelNACE MR0175/ISO15156 | 85 | 3 | Gas |
| FN07 | 600/RF | 8" | Carbon SteelNACE MR0175/ISO15156 | 85 | 6 | Gas  |

1. **CLASSES DESCRIPTION**

D02

| **SERVICES:** Oily Water | **CLASS: AN01** | **C.A.:1 mm** |
| --- | --- | --- |
| **DES. (TEMP.)** | **°C** | 85 | **Basic Material** | **Carbon Steel** | **NACE MR 0175 / ISO 15156 Requirements : No** | **Rating: 150#** |
| **DES. (PRES.)** | **BARG** | 18.2 | **Design Code: ASME B31.3**  |
| **ITEM** | **SIZES (In)** | **END** | **SCH./RATING** | **DESCRIPTION** | **MATERIAL** | **STANDARD** | **NOTE** |
| **FROM** | **TO** |
| PIPES | 1/2 | 1 1/2 | PBE/TOE/TBE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M | NOTE 1 |
| 2 | 6 | BE | SCH.40 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 8 | 10 | BE | SCH.20 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| Nipples | 1/2 | 1 1/2 | PBE/PSE/BLE | Same as Pipe | Nipples | ASTM A106 Gr.B | MSS SP-95 |  |
| FITTINGS | 1/2 | 1 1/2 | SW | 3000# | Cap | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Reducer Conc.&Ecc. | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Union | ASTM A105 | MSS SP-83 |  |
| 1/2 | 1 1/2 | SW | 3000# | Coupling | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Elbow 45° & 90° | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Sockolet | ASTM A105 | MSS SP-97 |  |
| 1/2 | 1 1/2 | THD | 2000# | Hex. Head Plug | ASTM A105 | ASME B16.11 |  |
| 2 | 10 | BW | Same as Pipe | Cap | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Tee Eq. & Red | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Reducer Conc.&Ecc.D02 | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Elbow 45° & 90° , LR, SMLS | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Weldolet | ASTM A105 | MSS SP-97 |  |
| FLANGES | 1/2 | 1 1/2 | SW | 150# | Socket welded, RF,SW,SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 1 1/2 | SW | 300# | Socket welded, RF,SF | ASTM A105 | ASME B16.5 |  |
| 2 | 10 | BW | Same as Pipe 150# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 2 | 10 | BW | Same as Pipe 300# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 10 | - | 150# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 10 | - | 300# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| 2 | 10 | BW | Same as Pipe 300# | Orifice, With 2 Hole ½” NPT Female, RF | ASTM A105 | ASME B16.36 |  |
| CLOUSERS | 1/2 | 10 | - | 150# | Spectacle Blind, RF | ASTM A516-Gr.60 | ASME B16.48 |  |
| GASKETS | 1/2 | 10 | - | 150# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| 1/2 | 10 | - | 300# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| Nut & Bolt | 1/2 | 10 | - | 150# | Stud bolt, Unified threaded | ASTM A 193-B7 | ASME B18.2.1 |  |
| 1/2 | 10 | - | 150# | Nut, two heavy nuts for each bolt | ASTM A 194 -2H | ASME B18.2.2 |
| 1/2 | 10 | - | 300# | Stud bolt, Unified threaded | ASTM A 193-B7 | ASME B18.2.1 |
| 1/2 | 10 | - | 300# | Nut, two heavy nuts for each bolt | ASTM A 194 -2H | ASME B18.2.2 |
| Gate Valve | 1/2 | 1 1/2 | SW/THRD | 800# | Solid wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A105 ,Trim No.8 | API 602 |  |
| 2 | 10 | FLGD | 150# | Flexible wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A216 GR. WCB, Trim No.8 | API 600 |  |
| Globe Valve | 1/2 | 1 1/2 | SW/THRD | 800# | OS&Y,BB, Renewable Seat Ring, HO | Body: A 105 .Trim No.8 | ISO 15761 |  |
| 2 | 6 | FLGD | 150# | OS&Y,BB, Renewable Seat Ring, HO | Body: A216 GR. WCB., Trim No.8 | BS 1873 |  |
| 8 | 10 | FLGD | 150# | OS&Y,BB, Renewable Seat Ring, GO | BS 1873 |  |
| Check Valve | 1/2 | 1 1/2 | SW | 800# | Lift Type, Piston Type, Renewable Seat Ring | Body: A 105 .Trim No.8 | ISO 15761 |  |
| 2 | 10 | FLGD | 150# | Swing Type | Body: A216 GR. WCB., Trim No.8 | BS 1868 |  |
| Ball Valve | 1/2 | 1 1/2 | SW | 800# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A105,Ball: 13CrStem: 13Cr Trim:13Cr+PTFE | ISO 17292 | Note 2 |
| 2 | 3 | FLGD | 150# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A216 Gr. WCB, Ball: 13CrStem: 13Cr Trim:13Cr+PTFE | API 6D | Note 2 |
| 4 | 6 | FLGD | 150# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Lever Operated | API 6D | Note 2 |
| 8 | 10 | FLGD | 150# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, GO | API 6D | Note 2 |
| STRAINER | 1/2 | 1 1/2 | SW | 800# | Y-TYPE | Body: A105 , Screen :A 182 GR. F316L |  |  |
| 2 | 3 | FLGD | 150# | Y-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| 4 | 10 | FLGD | 150# | T-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| Note 1: Thread end will be used just for Orifice flange connections |
| Note 2: Fire Safe per API 6FA Anti-Static, and Blow-Out Proof Stem shall be considered for these valves. |
| Note 3: For UG service, all Pipes & Fittings Shall be Solvent Free Epoxy. |

**PIPE CLASS : AN01**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **10****BRANCH** | T |  |  |  |  |  |  |  |  |  |
| **8** | E | T |  |  |  |  |  |  |  |  |
| **6** | E | E | T |  |  |  |  |  |  |  |
| **4** | E | E | E | T |  |  |  |  |  |  |
| **3** | W | W | E | E | T |  |  |  |  |  |
| **2** | W | W | W | E | E | T |  |  |  |  |
| **11/2** | S | S | S | S | S | S | T |  |  |  |
| **1** | S | S | S | S | S | S | E | T |  |  |
| **3/4** | S | S | S | S | S | S | E | E | T |  |
| **1/2** | S | S | S | S | S | S | E | E | E | T |
| **ND** | **10** | **8** | **6** | **4** | **3** | **2** | **11/2** | **1** | **¾** | **1/2** |

|  |
| --- |
| **LEGEND** |
| S | Sockolet |
| W | Weldolet |
| E | Reducing Tee |
| T | Equal Tee |

 HEADER

| **SERVICES:** HydrocarbonGas D02 | **CLASS: AN07** | **C.A.:6 mm** |
| --- | --- | --- |
| **DES. (TEMP.)** | **°C** | **85** | **Basic Material** | **Carbon Steel** | **NACE MR 0175 / ISO 15156 Requirements : Yes** | **Rating: 150#** |
| **DES. (PRES.)** | **BARG** | **18.2** | **Design Code: ASME B31.3**  |
| **ITEM** | **SIZES (In)** | **END** | **SCH./RATING** | **DESCRIPTION** | **MATERIAL** | **STANDARD** | **NOTE** |
| **FROM** | **TO** |
| PIPES | 1/2 | 1 1/2 | PBE/TOE/TBE | SCH.XXS | Seamless | ASTM A106 Gr.B | ASME B36.10M | NOTE 1 |
|  | 2 | 2 | BE | SCH.160 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
|  | 3 | 6 | BE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
|  | 8 | 8 | BE | SCH.60 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
|  | 10 | 10 | BE | SCH.40 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| Nipples | 1/2 | 1 1/2 | PBE/PSE/BLE | Same as Pipe | Nipples | ASTM A106 Gr.B | MSS SP-95 |  |
| FITTINGS | 1/2 | 1 1/2 | SW | 9000# | Cap | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Reducer Conc.&Ecc. | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Union | ASTM A105 | MSS SP-83 |  |
| 1/2 | 1 1/2 | SW | 9000# | Coupling | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Elbow 45° & 90° | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Sockolet | ASTM A105 | MSS SP-97 |  |
| 1/2 | 1 1/2 | THD |  | Hex. Head Plug | ASTM A105 | ASME B16.11 |  |
| 2 | 10 | BW | Same as Pipe | Cap | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Tee Eq. & Red | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Reducer Conc.&Ecc. | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Elbow 45° & 90°, LR, SMLSD02 | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 10 | BW | Same as Pipe | Weldolet | ASTM A105 | MSS SP-97 |  |
| FLANGES | 1/2 | 1 1/2 | SW | 150# | Socket welded, RF,SW,SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 1 1/2 | SW | 300# | Socket welded, RF,SF | ASTM A105 | ASME B16.5 |  |
| 2 | 10 | BW | Same as Pipe 150# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 10 | - | 150# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 10 | - | 300# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| 2 | 10 | BW | Same as Pipe 300# | Orifice, With 2 Hole ½” NPT Female, RF | ASTM A105 | ASME B16.36 |  |
| CLOUSERS | 1/2 | 10 | - | 150# | Spectacle Blind, RF | ASTM A516-Gr.60 | ASME B16.48 |  |
| GASKETS | 1/2 | 10 | - | 150# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| 1/2 | 20 | - | 300# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| Nut & Bolt | 1/2 | 20 | - | 150# | Stud bolt, Unified threaded | ASTM A 193-B7M | ASME B18.2.1 | Zinc Plated Chromate Treated |
| 1/2 | 20 | - | 150# | Nut, two heavy nuts for each bolt | ASTM A 194 -2HM | ASME B18.2.2 |
| 1/2 | 20 | - | 300# | Stud bolt, Unified threaded | ASTM A 193-B7M | ASME B18.2.1 |
|  | 1/2 | 20 | - | 300# | Nut, two heavy nuts for each bolt | ASTM A 194 -2HM | ASME B18.2.2 |
| Gate Valve | 1/2 | 1 1/2 | SW/THRD | 800# | Solid wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A105 ,Trim No.12 | API 602 |  |
|  | 2 | 10 | FLGD | 150# | Flexible wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A216 GR. WCB, Trim No.12 | API 600 |  |
| Globe Valve | 1/2 | 1 1/2 | SW/THRD | 800# | OS&Y,BB, Renewable Seat Ring, HO | Body: A 105 Trim No.12 | ISO 15761 |  |
| 2 | 6 | FLGD | 150# | OS&Y,BB, Renewable Seat Ring, HO | Body: A216 GR. WCB., Trim No.12 | BS 1873 |  |
| 8 | 10 | FLGD | 150# | OS&Y,BB, Renewable Seat Ring, GO | BS 1873 |  |
| Check Valve | 1/2 | 1 1/2 | SW | 800# | Lift Type, Piston Type, Renewable Seat Ring | Body: A 105 .Trim No.12 | ISO 15761 |  |
| 2 | 10 | FLGD | 150# | Swing Type | Body: A216 GR. WCB., Trim No.12 | BS 1868 |  |
| Ball Valve | 1/2 | 1 1/2 | SW | 800# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A105, Ball: 316 Stem: 316 Trim:316+PTFE | ISO 17292 | Note 2 |
| 2 | 3 | FLGD | 150# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A216 Gr. WCB, Ball: 316 Stem: 316 Trim:316+PTFE | API 6D | Note 2 |
| 4 | 6 | FLGD | 150# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Lever Operated | API 6D | Note 2 |
| 8 | 10 | FLGD | 150# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, GO | API 6D | Note 2 |
| STRAINER | 1/2 | 1 1/2 | SW | 800# | Y-TYPE | Body: A105 , Screen :A 182 GR. F316L |  |  |
| 2 | 3 | FLGD | 150# | Y-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| 4 | 10 | FLGD | 150# | T-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| Note 1: Thread end will be used just for Orifice flange connections |
| Note 2: Fire Safe per API 6FA. Anti Static, and Blow-Out Proof Stem shall be considered for these valves. |

**PIPE CLASS : AN07**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **10****BRANCH** | T |  |  |  |  |  |  |  |  |  |
| **8** | E | T |  |  |  |  |  |  |  |  |
| **6** | E | E | T |  |  |  |  |  |  |  |
| **4** | E | E | E | T |  |  |  |  |  |  |
| **3** | W | W | E | E | T |  |  |  |  |  |
| **2** | W | W | W | E | E | T |  |  |  |  |
| **11/2** | S | S | S | S | S | S | T |  |  |  |
| **1** | S | S | S | S | S | S | E | T |  |  |
| **3/4** | S | S | S | S | S | S | E | E | T |  |
| **1/2** | S | S | S | S | S | S | E | E | E | T |
| **ND** | **10** | **8** | **6** | **4** | **3** | **2** | **11/2** | **1** | **¾** | **1/2** |

|  |
| --- |
| **LEGEND** |
| S | Sockolet |
| W | Weldolet |
| E | Reducing Tee |
| T | Equal Tee |

 HEADER

| **SERVICES:** Gas CondensateD02D01 | **CLASS: CN05** | **C.A.:3 mm** |
| --- | --- | --- |
| **DES. (TEMP.)** | **°C** | **85** | **Basic Material** | **Carbon Steel** | **NACE 175 Requirements : Yes** | **Rating: 300#** |
| **DES. (PRES.)** | **BARG** | **47.7** | **Design Code: ASME B31.3**  |
| **ITEM** | **SIZES (In)** | **END** | **SCH./RATING** | **DESCRIPTION** | **MATERIAL** | **STANDARD** | **NOTE** |
| **FROM** | **TO** |
| PIPES | 1/2 | 1 1/2 | PBE/TOE/TBE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M | NOTE 1 |
| 2 | 2 | BE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 3 | 6 | BE | SCH.40 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| Nipples | 1/2 | 1 1/2 | PBE/PSE/BLE | Same as Pipe | Nipples | ASTM A106 Gr.B | MSS SP-95 |  |
| FITTINGS | 1/2 | 1 1/2 | SW | 3000# | Cap | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Reducer Conc.&Ecc. | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Union | ASTM A105 | MSS SP-83 |  |
| 1/2 | 1 1/2 | SW | 3000# | Coupling | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Elbow 45° & 90° | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 3000# | Sockolet | ASTM A105 | MSS SP-97 |  |
| 1/2 | 1 1/2 | THD | 3000# | Hex. Head Plug | ASTM A105 | ASME B16.11 |  |
| 2 | 6 | BW | Same as Pipe | Cap | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 6 | BW | Same as Pipe | Tee Eq. & Red | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 6 | BW | Same as Pipe | Reducer Conc.&Ecc. | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 6 | BW | Same as Pipe | Elbow 45° & 90°, LR, SMLSD02 | ASTM 234 WPB | ASME B16.9 |  |
| 2 | 6 | BW | Same as Pipe | Weldolet | ASTM A105 | MSS SP-97 |  |
| FLANGES | 1/2 | 1 1/2 | SW | 300# | Socket welded, RF,SW,SF | ASTM A105 | ASME B16.5 |  |
| 2 | 6 | BW | Same as Pipe 300# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 6 | - | 300# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| CLOUSERS | 1/2 | 6 | - | 300# | Spectacle Blind, RF | ASTM A516-Gr.70 | ASME B16.48 |  |
| GASKETS | 1/2 | 6 | - | 300# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| Nut & Bolt | 1/2 | 6 | - | 300# | Stud bolt, Unified threaded | ASTM A 193-B7M | ASME B18.2.1 |  |
| 1/2 | 6 | - | 300# | Nut, two heavy nuts for each bolt | ASTM A 194 -2HM | ASME B18.2.2 |
| Gate Valve | 1/2 | 1 1/2 | SW/THRD | 800# | Solid wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A105 ,Trim No.12 | API 602 |  |
|  | 2 | 6 | FLGD | 300# | Flexible wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A216 GR. WCB, Trim No.12 | API 600 |  |
| Globe Valve | 1/2 | 1 1/2 | SW | 800# | OS&Y,BB,Renewable Seat Ring, HO | Body: A 105 Trim No.12 | ISO 15761 |  |
|  | 2 | 6 | FLGD | 300# | OS&Y,BB,Renewable Seat Ring, HO | Body: A216 GR. WCB., Trim No.12 | BS 1873 |  |
| Check Valve | 1/2 | 1 1/2 | SW | 800# | Lift Type, Piston Type, Renewable Seat Ring | Body: A 105 .Trim No.12 | ISO 15761 |  |
| 2 | 6 | FLGD | 300# | Swing Type | Body: A216 GR. WCB., Trim No.12 | BS 1868 |  |
| Ball Valve | 1/2 | 1 1/2 | SW | 800# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A105, Ball: 316 Stem: 316 Trim:316+RPTFE | ISO 17292 | Note 2 |
| 2 | 3 | FLGD | 300# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A216 Gr. WCB, Ball: 316 Stem: 316 Trim:316+RPTFE | API 6D | Note 2 |
| 4 | 4 | FLGD | 300# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Lever Operated | API 6D | Note 2 |
| 6 | 6 | FLGD | 300# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Gear Operated | API 6D | Note 2 |
| STRAINER | 1/2 | 1 1/2 | SW | 800# | Y-TYPE | Body: A105 , Screen :A 182 GR. F316L |  |  |
| 2 | 3 | FLGD | 300# | Y-TYPE | Body: A216 GR. WCB , Screen :A 182 GR. F316L |  |  |
| 4 | 6 | FLGD | 300# | T-TYPE | Body: A216 GR. WCB , Screen :A 182 GR. F316L |  |  |
| Note 1: Thread end will be used just for Orifice flange connections |
| Note 2: Fire Safe per API 6FA. Anti Static, and Blow-Out Proof Stem shall be considered for these valves. |

**PIPE CLASS : CN05**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10**BRANCH** | T |  |  |  |  |  |  |  |  |  |
| 8 | E | T |  |  |  |  |  |  |  |  |
| 6 | E | E | T |  |  |  |  |  |  |  |
| 4 | E | E | E | T |  |  |  |  |  |  |
| 3 | W | W | E | E | T |  |  |  |  |  |
| 2 | W | W | W | E | E | T |  |  |  |  |
| 11/2 | S | S | S | S | S | S | T |  |  |  |
| 1 | S | S | S | S | S | S | E | T |  |  |
| 3/4 | S | S | S | S | S | S | E | E | T |  |
| 1/2 | S | S | S | S | S | S | E | E | E | T |
| **ND** | **10** | **8** | **6** | **4** | **3** | **2** | **11/2** | **1** | **¾** | **1/2** |

|  |
| --- |
| **LEGEND** |
| S | Sockolet |
| W | Weldolet |
| E | Reducing Tee |
| T | Equal Tee |

 HEADER

| **SERVICES:** GasD02 | **CLASS: FN05** | **C.A.: 3 mm** |
| --- | --- | --- |
| **DES. (TEMP.)** | **°C** | **85** | **Basic Material** | **Carbon Steel** | **NACE MR 0175 / ISO 15156 Requirements : Yes** | **Rating: 600#** |
| **DES. (PRES.)** | **BARG** | **60** | **Design Code: ASME B31.3** |
| **ITEM** | **SIZES (In)** | **END** | **SCH./RATING** | **DESCRIPTION** | **MATERIAL** | **STANDARD** | **NOTE** |
| **FROM** | **TO** |
| PIPES | 1/2 | 1 1/2 | PBE/TOE/TBE | SCH.160 | Seamless | ASTM A106 Gr.B | ASME B36.10M | NOTE 1 |
| 2 | 2 | BE | SCH.160 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 3 | 3 | BE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 4 | 6 | BE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 8 | 8 | BE | SCH.80 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| Nipples | 1/2 | 1 1/2 | PBE/PSE/BLE | Same as Pipe | Nipples | ASTM A106 Gr.B | MSS SP-95 |  |
| FITTINGS | 1/2 | 1 1/2 | SW | 6000# | Cap | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 6000# | Reducer Conc.&Ecc. | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 6000# | Union | ASTM A105 | MSS SP-83 |  |
| 1/2 | 1 1/2 | SW | 6000# | Coupling | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 6000# | Elbow 45° & 90° | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 6000# | Sockolet | ASTM A105 | MSS SP-97 |  |
| 1/2 | 1 1/2 | THD |  | Hex. Head Plug | ASTM A105 | ASME B16.11 |  |
| 2 | 8 | BW | Same as Pipe | Cap,SMLS | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Tee Eq. & Red, SMLS  | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Reducer Conc.&Ecc, SMLS | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Elbow 45° & 90°, SMLS,LR | ASTM A234 WPB | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Weldolet | ASTM A105 | MSS SP-97 |  |
| FLANGES | 1/2 | 1 1/2 | SW | 600# | Socket welded, RF,SW,SF | ASTM A105 | ASME B16.5 |  |
| 2 | 8 | BW | Same as Pipe 600# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 8 | - | 600# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| CLOUSERS | 1/2 | 8 | - | 600# | Spectacle Blind, RF | ASTM A516-Gr.70 | ASME B16.48 |  |
| GASKETS | 1/2 | 8 | - | 600# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| Nut & Bolt | 1/2 | 8 | - | 600# | Stud bolt, Unified threaded | ASTM A 193-B7M | ASME B18.2.1 |  |
| 1/2 | 8 | - | 600# | Nut, two Heavy Hex nuts for each bolt | ASTM A 194 -2HM | ASME B18.2.2 |
| Gate Valve | 1/2 | 1 1/2 | SW/THRD | 800# | Solid wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A105 ,Trim No.12 | API 602 |  |
| 2 | 8 | FLGD-RF | 600# | Flexible wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A216 GR. WCB, Trim No.12 | API 600 |  |
| Globe Valve | 1/2 | 1 1/2 | SW | 800# | OS&Y,BB,Renewable Seat Ring, HO | Body: A 105 . Trim No.12 | ISO 15761 |  |
| 2 | 4 | FLGD-RF | 600# | OS&Y,BB,Renewable Seat Ring, HO | Body: A216 GR. WCB., Trim No.12 | BS 1873 |  |
| 6 | 8 | FLGD-RF | 600# | OS&Y,BB,Renewable Seat Ring, GO | BS 1873 |  |
| Check Valve | 1/2 | 1 1/2 | SW | 800# | Piston Lift Type,BC, Renewable Seat Ring,Horizontal Install Type | Body: A 105 .Trim No.12 | ISO 15761 |  |
| 2 | 6 | FLGD-RF | 600# | Swing Type,BC | Body: A216 GR. WCB., Trim No.12 | BS 1868 |  |
| Ball Valve | 1/2 | 1 1/2 | SW | 800# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A105, Ball: A182 Ball: 316 Stem: 316 Trim:316+RPTFE | ISO 17292 | Note 2 |
| 2 | 34 | FLGD-RF | 600# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Lever Operated | Body: A216 Gr. WCB, Ball: SS316 Trim:316+RPTFE | API 6D | Note 2 |
| 4 | 8 | FLGD-RF | 600# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Gear Operated | Body: A216 Gr. WCB, Ball: SS316 Trim:316+RPTFE | API 6D | Note 2 |
| STRAINER | 1/2 | 1 1/2 | SW | 800# | Y-TYPE | Body: A105 , Screen :A 182 GR. F316L |  |  |
| 2 | 2 | FLGD-RF | 600# | Y-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| 3 | 8 | FLGD-RF | 600# | T-TYPE | Body: A234WPB, Screen :A 182 GR. F316L |  |  |
| Note 1: Thread end will be used just for Orifice flange connections |
| Note 2: Fire Safe per API 6FA. Anti Static, and Blow-Out Proof Stem shall be considered for these valves. |

**PIPE CLASS FN07:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10**BRANCH** | T |  |  |  |  |  |  |  |  |  |
| 8 | E | T |  |  |  |  |  |  |  |  |
| 6 | E | E | T |  |  |  |  |  |  |  |
| 4 | E | E | E | T |  |  |  |  |  |  |
| 3 | W | W | E | E | T |  |  |  |  |  |
| 2 | W | W | W | E | E | T |  |  |  |  |
| 11/2 | S | S | S | S | S | S | T |  |  |  |
| 1 | S | S | S | S | S | S | E | T |  |  |
| 3/4 | S | S | S | S | S | S | E | E | T |  |
| 1/2 | S | S | S | S | S | S | E | E | E | T |
| **ND** | **10** | **8** | **6** | **4** | **3** | **2** | **11/2** | **1** | **¾** | **1/2** |

|  |
| --- |
| **LEGEND** |
| S | Sockolet |
| W | Weldolet |
| E | Reducing Tee |
| T | Equal Tee |

 HEADER

| **SERVICES:** GasD02 | **CLASS: FN07** | **C.A.: 6 mm** |
| --- | --- | --- |
| **DES. (TEMP.)** | **°C** | **85** | **Basic Material** | **Carbon Steel** | **NACE MR 0175 / ISO 15156 Requirements : Yes** | **Rating: 600#** |
| **DES. (PRES.)** | **BARG** | **60** | **Design Code: ASME B31.3** |
| **ITEM** | **SIZES (In)** | **END** | **SCH./RATING** | **DESCRIPTION** | **MATERIAL** | **STANDARD** | **NOTE** |
| **FROM** | **TO** |
| PIPES | 1/2 | 1 1/2 | PBE/TOE/TBE | SCH.XXS | Seamless | ASTM A106 Gr.B | ASME B36.10M | NOTE 1 |
| 2 | 2 | BE | SCH.XXS | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 3 | 3 | BE | SCH.160 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 4 | 6 | BE | SCH.120 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| 8 | 8 | BE | SCH.100 | Seamless | ASTM A106 Gr.B | ASME B36.10M |  |
| Nipples | 1/2 | 1 1/2 | PBE/PSE/BLE | Same as Pipe | Nipples | ASTM A106 Gr.B | MSS SP-95 |  |
| FITTINGS | 1/2 | 1 1/2 | SW | 9000# | Cap | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Reducer Conc.&Ecc. | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Union | ASTM A105 | MSS SP-83 |  |
| 1/2 | 1 1/2 | SW | 9000# | Coupling | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Elbow 45° & 90° | ASTM A105 | ASME B16.11 |  |
| 1/2 | 1 1/2 | SW | 9000# | Sockolet | ASTM A105 | MSS SP-97 |  |
| 1/2 | 1 1/2 | THD |  | Hex. Head Plug | ASTM A105 | ASME B16.11 |  |
| 2 | 8 | BW | Same as Pipe | Cap,SMLS | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Tee Eq. & Red, SMLS  | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Reducer Conc.&Ecc, SMLS | ASTM A234 WPB  | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Elbow 45° & 90°, SMLS,LR | ASTM A234 WPB | ASME B16.9 |  |
| 2 | 8 | BW | Same as Pipe | Weldolet | ASTM A105 | MSS SP-97 |  |
| FLANGES | 1/2 | 1 1/2 | SW | 600# | Socket welded, RF,SW,SF | ASTM A105 | ASME B16.5 |  |
| 2 | 8 | BW | Same as Pipe 600# | Weld Neck, RF, SF | ASTM A105 | ASME B16.5 |  |
| 1/2 | 8 | - | 600# | Blind, RF, SF | ASTM A105 | ASME B16.5 |  |
| CLOUSERS | 1/2 | 8 | - | 600# | Spectacle Blind, RF | ASTM A516-Gr.70 | ASME B16.48 |  |
| GASKETS | 1/2 | 8 | - | 600# | Spiral Wound, 4.45 mm Thick., RF, SF | S.S 316 Winding /Graphite Filler, C.S. Outer& S.S 316L Inner Ring  | ASME B16.20 |  |
| Nut & Bolt | 1/2 | 8 | - | 600# | Stud bolt, Unified threaded | ASTM A 193-B7M | ASME B18.2.1 |  |
| 1/2 | 8 | - | 600# | Nut, two Heavy Hex nuts for each bolt | ASTM A 194 -2HM | ASME B18.2.2 |
| Gate Valve | 1/2 | 1 1/2 | SW/THRD | 800# | Solid wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A105 ,Trim No.12 | API 602 |  |
| 2 | 8 | FLGD-RF | 600# | Flexible wedge, BB, OS.&Y, Renewable Seat Ring, HO | Body: A216 GR. WCB, Trim No.12 | API 600 |  |
| Globe Valve | 1/2 | 1 1/2 | SW | 800# | OS&Y,BB,Renewable Seat Ring, HO | Body: A 105 . Trim No.12 | ISO 15761 |  |
| 2 | 4 | FLGD-RF | 600# | OS&Y,BB,Renewable Seat Ring, HO | Body: A216 GR. WCB., Trim No.12 | BS 1873 |  |
| 6 | 8 | FLGD-RF | 600# | OS&Y,BB,Renewable Seat Ring, GO | BS 1873 |  |
| Check Valve | 1/2 | 1 1/2 | SW | 800# | Piston Lift Type,BC, Renewable Seat Ring,Horizontal Install Type | Body: A 105 .Trim No.12 | ISO 15761 |  |
| 2 | 6 | FLGD-RF | 600# | Swing Type,BC | Body: A216 GR. WCB., Trim No.12 | BS 1868 |  |
| Ball Valve | 1/2 | 1 1/2 | SW | 800# | RB, Soft Seat, Floating Ball, Renewable Seat Ring, Lever Operated | Body: A105, Ball: A182 Ball: 316 Stem: 316 Trim:316+RPTFE | ISO 17292 | Note 2 |
| 2 | 34 | FLGD-RF | 600# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Lever Operated | Body: A216 Gr. WCB, Ball: SS316 Trim:316+RPTFE | API 6D | Note 2 |
| 4 | 8 | FLGD-RF | 600# | RB, Soft Seat, Trunnion mounted, Renewable Seat Ring, Gear Operated | Body: A216 Gr. WCB, Ball: SS316 Trim:316+RPTFE | API 6D | Note 2 |
| STRAINER | 1/2 | 1 1/2 | SW | 800# | Y-TYPE | Body: A105 , Screen :A 182 GR. F316L |  |  |
| 2 | 2 | FLGD-RF | 600# | Y-TYPE | Body: A216 , Screen :A 182 GR. F316L |  |  |
| 3 | 8 | FLGD-RF | 600# | T-TYPE | Body: A234WPB, Screen :A 182 GR. F316L |  |  |
| Note 1: Thread end will be used just for Orifice flange connections |
| Note 2: Fire Safe per API 6FA. Anti Static, and Blow-Out Proof Stem shall be considered for these valves. |

**PIPE CLASS FN07:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10**BRANCH** | T |  |  |  |  |  |  |  |  |  |
| 8 | E | T |  |  |  |  |  |  |  |  |
| 6 | E | E | T |  |  |  |  |  |  |  |
| 4 | E | E | E | T |  |  |  |  |  |  |
| 3 | W | W | E | E | T |  |  |  |  |  |
| 2 | W | W | W | E | E | T |  |  |  |  |
| 11/2 | S | S | S | S | S | S | T |  |  |  |
| 1 | S | S | S | S | S | S | E | T |  |  |
| 3/4 | S | S | S | S | S | S | E | E | T |  |
| 1/2 | S | S | S | S | S | S | E | E | E | T |
| **ND** | **10** | **8** | **6** | **4** | **3** | **2** | **11/2** | **1** | **¾** | **1/2** |

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