Basic Engineering Study for
Aung Sinkha Development Project Phase 1A

PIPING MATERIAL CLASS SPECIFICATION

PTTEP	PTT Exploration and Production Public Company Limited Aung Sinkha Development Project Phase 1A Basic Engineering
☑	1. APPROVED
☐	2. APPROVED with comments (Proceed to IFB)
☐	3. Review with comments
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REV	DATE	BY	DESCRIPTION	CHECK	APPR.	CHECK	APPR.
				ENGINEERING APPROVAL		COMPANY APPROVAL	
C2	21-Jul-22	PP	Issued for Bid	KR	CJ	NM	SA
C1	27-Apr-22	PP	Issued for Bid	KR	CJ	NM	SA
B1	14-Jan-22	PP	Issued for Approval	KR	CJ	NM	SA
A1	18-Nov-21	PP	Issued for Review	KR	CJ	NM	SA

REVISION CODE: A = Issued for Review – B = Issued for Approval – C = Issued for Bid

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DOCUMENT TITLE	PIPING MATERIAL CLASS SPECIFICATION□ Rev.C1	PTTEPI DOC. NO.	MM-ASK-1A-APF-PIP-SPE-0001 Rev.C1

Aung Sinkha Development Project PROJECT: Review Commen

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Date issued:	27-Jun-2022	**Date Received:**	27-Jun-2022
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PTTEPI RETURN STATUS

Approved

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1. INTRODUCTION

1.1 Project Overview

PTTEP International Limited (PTTEPI) intends to develop and produce hydrocarbon from the offshore Block M3 named Aung Sinkha (ASK) field. The project is under Production Sharing Contract (PSC) with Myanmar Oil & Gas Enterprise (MOGE) signed on 7th August 2004 while the PSC effective date was on 1st November 2004.

PTTEPI as an Operator had performed 2,842 line-km of 2D seismic, 619 km2 of 3D seismic, and drilled 11 Exploration and Appraisal wells. After successful exploration and appraisal drilling campaigns in 2015, PTTEPI completed the ASK Field Development Plan and submitted to MOGE for approval. MOGE approved ASK Field Development Plan in April 2021.

The ASK field is located at offshore in the Gulf of Moattama, Myanmar, as illustrated in Figure 1.0. The field is located approximately 70 km from Land Fall Point (LFP) at Daw Nyein village and 200 km south-west of Yangon with water depth range of 15-25 meters.

The feed gas will be transported from two (2) offshore wellhead platforms through an offshore export pipeline to ASK Onshore Processing Facilities (APF) located in Daw Nyein village for processing. The sales gas after processing will be exported to tie-in point at Gas Receiving Station no. 2 (GRS#2), of Domestic Gas to Power Pipeline Development Project, nearby the APF. The condensate will be kept in onshore storage tanks before loading, transporting/ offloading to customers. The design of the surface facilities will be based on a Contractual Daily Capacity (CDC) of 60 MMscfd with provision for future expansion to 100 MMscfd. The gas production is planned to start up by Q4 of 2025.

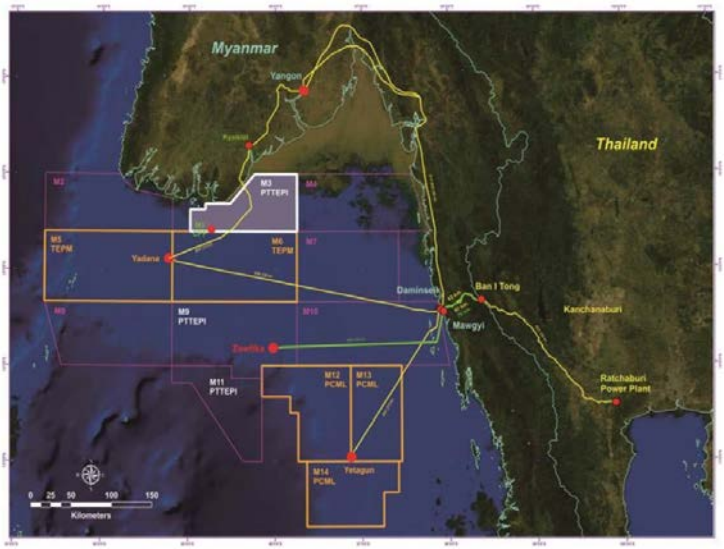


Figure 1.0 Block M3 – Aung Sinkha Field, Offshore Myanmar

The development of Phase 1A consists of the following facilities, as illustrated in Figure 2.0.

- 2 Wellhead Platforms (WPA-1 and WPA-2)
- 1 Intra-field pipeline which links between WPA-1 and WPA-2
- 1 Multiphase export pipeline to transport combined fluid of WPA-1 and WPA-2 to ASK Onshore Processing Facilities (APF)
- ASK Onshore Processing Facilities (APF)
- Onshore pipelines from APF to Gas Receiving Station#2 (GRS#2)
- Onshore infrastructure i.e. condensate offtake facilities, accommodation, Personal Material Transfer Facilities, telecommunication system, roads, etc.

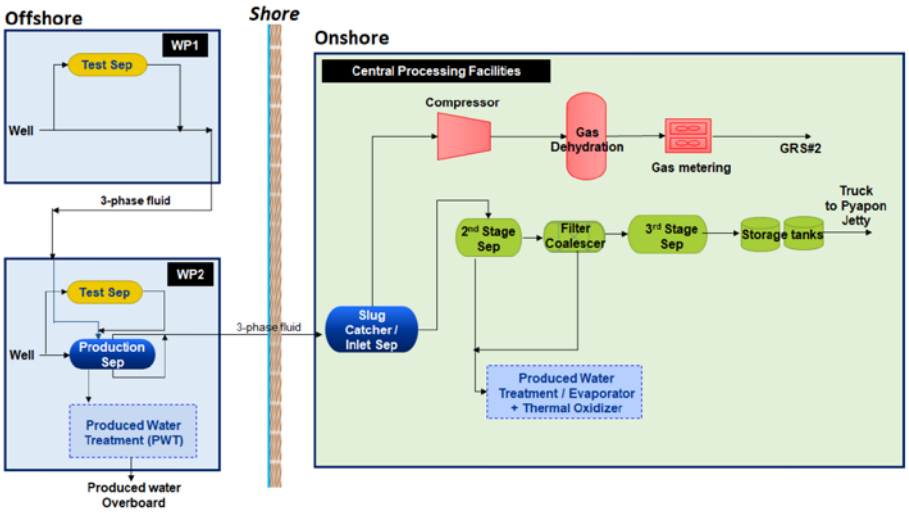


Figure 2.0 Field Block Flow Diagram

1.2 Abbreviation

ABV	ASK Black Valve Station
ACO	ASK Condensate Offloading Station
Al-Br	Aluminum - Bronze
APM	ASK Personnel and Material Transfer Facilities
API	American Petroleum Institute
APF	ASK Onshore Processing Facilities
ASK	Aung Sinkha Development Project
ASTM	American Society for Testing and Materials
BB	Bolted Bonnet
BC	Bolted Cover
BE	Beveled End
Br	Bronze
BW	Butt Weld
CA	Corrosion Allowance
CAF	Compressed Asbestos Fibre
CAS	Cast Alloy Steel
CCS	Cast Carbon Steel
Cr	Chromium
CS	Carbon Steel
ED	Explosive Decompression
EFW	Electric Fusion Welded
ENP	Electroless Nickel Plated
ERW	Electric Resistance Welded
ES	Extended Spindle
F6	Stainless steel, 13% Chromium
FAS	Forged Alloy Steel

FCS	Forged Carbon Steel
FF	Flat Face
GBV	Gas Block Valve Station
GRS	Gas Receiving Station
Gr	Grade
GRE	Glass Reinforced Epoxy
GRP	Glass Reinforced Plastic
HAZ	Heat-Affected Zone
HCP	Hard Chrome Plated
Hh	Heavy Hexagonal
HVOF	High Velocity Oxy Fuel
ISO	International Organization for Standardization
ISRS	Inside Screw Riser Spindle
LJ	Lap Joint
LTCS	Low Temperature Carbon Steel
MDMT	Minimum Design Metal Temperature
MI	Malleable Cast Iron
Mo	Molybdenum
MSS	Manufacturer Standardization Society of the Valve and Fittings Industry
Ni	Nickel
NPS	Nominal Pipe Size
NPT	National Pipe Thread
OS&Y	Outside Screw spindle and Yoke
PE	Plain End
P&ID	Piping and Instrument Diagram
PEGS	PTTEP Engineering General Specification

PMI	Positive Material Identification
PMS	Piping Material Specification
PTFE	Polytetrafluoroethylene (Teflon =Teflon®)
RF	Raised Face
RJ	Machined face for ring Joint
SAW	Submerged Arc Welded
SB	Screwed Bonnet
SF	Small Female face
SM	Small Male face
SMLS	Seamless
SO	Slip-on
SP	Specialty Piping
SPB	Split Body
SS	Stainless Steel
STD	Standard
SW	Socket Welding
TE	Threaded End
TL	Temperature Limit
TM	Trunnion Mounted
TPE	Top Entry
WB	Welded Bonnet
WC	Welded Cover
WN	Weld Neck
WPA	ASK Wellhead Platform
ZOC	Zawtika Operating Center

1.3 The Parties Involved

COMPANY	PTTEP International Limited
CONTRACTOR	For the purposes of this document, CONTRACTOR shall mean any person who has entered into a formal written contract with the COMPANY for the performance of work and or services for and or in connection with the COMPANY for and or in connection with ASK Development Project, or any part thereof.
SUBCONTRACTOR	For the purposes of this document, SUBCONTRACTOR shall mean any person to whom the performance of any part of the WORK is subcontracted including sub-contractors of any tier.
SUPPLIER or VENDOR	For the purposes of this document, SUPPLIER or VENDOR shall mean a supplier of any of; skid mounted assembly, packaged equipment and associated items, itemized (tagged) materials and equipment, linepipe and associated materials, non-itemized (bulk) materials and all other materials and things, for use in the ASK Development Project or for handover to the COMPANY. The term VENDOR shall include vendors of any tier.
SUB SUPPLIER or SUB VENDOR	The organization selected be the supplier to supply part of equipment, service or material scoped by this specification.

2. GENERAL INFORMATION

2.1 Purpose Of Document

This specification is to identify the minimum material requirements for the selection of piping components to be used in the construction of all process, utility and firewater piping systems including slug catcher as shown in P&ID's for Onshore facilities of Aung Sinkha Development Project Phase 1A.

This document does not apply to:

- Fabricated ducts

- Heating, plumbing, ventilation and similar piping inside buildings
- Instrumentation tubing
- Pipeline covered by Pipeline specifications.

This document shall be read in conjunction with Company general specification 10008-STD-6-PIP-009 “Piping Material Classes”.

2.2 Language

The English Language shall be used in all project communications, reports, correspondences, drawings, specifications, calculations, and invoices etc., submitted to COMPANY. All drawings and documents shall be annotated in S.I. units with other units in parenthesis, where applicable.

In this document, the words should and shall have the following meanings:

Shall	Used to indicate that a provision is mandatory.
Should	Used to indicate that a provision is not mandatory but is recommended as good practice.

2.3 Unit of Measurement

The Aung Sinkha Development Project Phase 1A will use metric or S.I. system of units for all calculations, drawings and in all project document.

The units of measure

PARAMETERS	UNITS
DIMENSIONS	
Equipment Dimension	mm, m
Pipe length	M
Pipe size	Inch/ mm
Area	m^2
Volume	m^3
Time	d, hr, s
Distance	m, km
PRESSURE	
Pressure (absolute)	bara (psia)
Pressure (gauge)	barg (psig)
Liquid Head	mbar, bar, mmH_2O
Stress	MPa (MN/m^2 or N/mm^2), kPa (kN/m^2)

PARAMETERS	UNITS
Static Pressure	Bar
Pressure drop	Bar
TEMPERATURE	
Temperature	°C (ºF)
FLOWRATE	
Mass Flowrate	kg/hr
Gas Volume Flowrate (Standard Conditions)	MMSCFD
Actual Liquid Volume Flowrate	BPD, m^3/hr, L/hr, L/day
Liquid Volume Flowrate (stock tank conditions)	BPD
Actual gas volumetric flowrate	m^3/hr (ft^3/d)
PROPERTIES	
Amount of Substance	Kmol
Density	kg/m^3
Dynamic Viscosity	cP
Kinematic Viscosity	cSt
Weight/Mass	kg, tonne (1000 kg)
Thermal Conductivity	kW-m-ºC
Fouling Factor	m^2.hr.°C/kJ
Velocity	m/s
Interfacial Surface tension	dyne/cm
Mass velocity	kg/s
Particle Size	micron
Head	M
Contaminant Concentration (mass)	ppm
Contaminant Concentration (volume)	ppmv
Concentration	mol %
HEAT, ENERGY, WORK AND POWER	
Heat	kJ
Heat Flow/Duty	kJ/hr
Heat Flux	kJ/m^2.hr
Latent Heat	kJ/kg
Specific Heat	kJ/kg.°C
Heat Transfer Coefficient	kJ/hr.m^2.°C
Heating Value (Liquid)	kJ/kg
Heating Value (Gas)	Btu/scf
Specific Enthalpy	kJ/kg
Volumetric Heat Release	kJ/hr.m^3

PARAMETERS	UNITS
Power	W
RADIATION, CONDUCTIVITY AND NOISE	
Radiation	kW/m^2
Noise	dB(A)

Notes:

a. Imperial Units may be given between brackets following the SI Units.

b. Standard Condition are: 1.01325 bara and 15.55 °C (SI).

c. Standard Conditions are: 14.7 psia and 60 °F (Imperial).

2.4 Regulation, Standards and Code of Practice

The Aung Sinkha Development Project Phase 1A shall be designed primarily in accordance with PTTEP's general specifications (PEGSs) and corporate specifications, as appropriate, and the applicable Myanmar legislative requirements. Where such standards are not applicable, accepted international codes / industry good engineering practice will be adopted. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published on the effective date of a contract.

Any deviation from the standard, shall be documented for derogation and proper permission from PTTEP in writing.

The order of precedence of the applicable documents shall be:

1) Government Laws, Rules and Regulations

2) Purchase Order/ Service Order/ Contract Documents

3) Data Sheet, Drawings and Project Particular Specification (PPS)

4) PTTEP Engineering General Specification (PEGS)

5) Other COMPANY specifications, standards, and documents

6) International Codes and Standards

In case of conflicts / contradictions between the various codes, standards, regulations and specification, unless otherwise agreed or decided by COMPANY, it is understood that the more stringent requirement shall apply.

References to PTTEP specifications, Myanmar legislation and the latest editions of the International codes and standards include but not limit to:

2.4.1 Project Particular Documents and Drawings

Reference	Title
MM-ASK-1A-APF-PRO-BOD-0001	Process Basis of Design
MM-ASK-1A-APF-PIP-BOD-0001	Piping Basis of Design
MM-ASK-1A-APF-INS-DWG-0002	Instrument Hook-up Drawings
MM-ASK-1A-APF-PIP-DTS-0001	Datasheet for Manual Valves
MM-ASK-1A-APF-PIP-CAL-0101	Piping Wall Thickness Calculation
MM-ASK-1A-APF-COR-RPT-0001	Corrosion Assessment and Material Selection Report

2.4.2 COMPANY General Specification Standard, Procedure and Guideline

Reference	Title
10008-STD-6-PIP-009	Piping Material Classes
10008-STD-6-PIP-012	Valves
PEGS-12059-PIP-005	Pipes, Flanges, Fittings and Bolting for Piping
PEGS-12059-PIP-008	Piping Glass-Reinforced Plastic (GRP), Design and Installation, Tubes & Accessories
PEGS-12059-PIP-029	Gaskets for Piping and Vessels
PEGS-12060-MMA-002	Valves Materials Requirements for Use in Sour Service
PEGS-0710-PIP-019	Piping and Equipment Subject to Server Sour Service Metallurgical and Welding Requirements
PEGS-12139-PIP-022	Domestic Onshore Construction Specification (Mechanical and Piping – E205)
10008-STD-6-COR-011	Painting of Onshore Structure and Facilities
10008-STD-6-COR-032	Materials for Sour Service
10008-STD-6-PLR-006	Longitudinally Submerged Arc Welded (SAWL) Pipes for Carbon Steel Pipelines (Mild, Intermediate and Severe Sour Service)

2.4.3 International Codes and Standards

Reference	Title
ASME V	Boiler and Pressure Vessel Code - Section V - Non Destructive Examination
ASME IX	Boiler and Pressure Vessel Code - Section IX - Welding Qualifications
ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.2	Gauges and Gauging for Unified Screw Threads
ASME B1.20.1	Pipe Threads, general purpose, inch
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory-Made Wrought Steel Butt Welding Fittings
ASME B 16.11	Forged Fittings, Socket –Welding and Threaded

Reference	Title
ASME B16.20	Metallic Gaskets for Pipe Flanges – Ring-Joint, Spiral – Wound, and Jacketed
ASME B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.25	Butt Welding Ends
ASME B16.34	Valves-Flanged, Threaded and Welding End
ASME B16.36	Orifice Flanges
ASME B16.47	Large Diameter Steel Flanges NPS 26″ through NPS 60″
ASME B16.48	Line Blanks
ASME B31.3	Process Piping
ASME B31.8	Gas Transmission and Distribution Piping Systems
ASME B36.10M	Welded and Seamless Wrought Steel Pipe
ASME B36.19M	Stainless Steel Pipe
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A105	Carbon Steel Forgings for Piping Applications
ASTM A106	Seamless Carbon Steel Pipe for High Temperature Service
ASTM A153	Standard Specification for Zinc Coating (Hotdip) on Iron and Steel Hardware
ASTM A671	Electric-fusion Welded Steel Pipe
ASTM A182	Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings and Valves and Parts for High Temperature Service
ASTM A193	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A216	Steel Castings, Carbon, Suitable for Fusion Welding, for High- Temperature Service
ASTM A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature service
ASTM A312	Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A320	Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service
ASTM A333	Seamless and Welded Steel Pipe for Low Temperature Service
ASTM A350	Carbon and Low Alloy Steel Forgings Requiring Notch Toughness Testing for Piping Components
ASTM A358	Electric Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General application
ASTM A370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A403	Wrought Austenitic Stainless Steel Piping Fittings

Reference	Title
ASTM A420	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Low Temperature Service
ASTM A453	High-Temperature Bolting Materials, with Expansion Coefficients Comparable to Austenitic Stainless Steel
ASTM A516	Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A694	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service
ASTM A700	Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment
ASTM A790	Seamless and Welded Ferritic / Austenitic Stainless Steel Pipe
ASTM A815	Wrought Ferritic, Ferritic /Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM A860	Wrought High-Strength Low Alloy Steel Butt Welding Fittings
ASTM B466	Seamless Copper-Nickel Pipe and Tube
ASTM D1784	Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2467	Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic
API SPEC 5L	Line Pipe
API SPEC 6A	Well Head and Christmas Tree Equipment
API SPEC 6D	Pipeline and Piping Valves
API SPEC 6FA	Fire Test for Valves (Trunnion Ball Valves)
API STD 594	Check Valves: Flanged, Lug, Wafer and Butt-welding
API STD 598	Valve Inspection and Testing
API STD 600	Steel Gate Valves - Flanged and Butt-welding Ends, Bolted Bonnets
API STD 602	Steel Gate, Globe, and Check Valves for Sizes NPS 4 (DN 100) and Smaller for the Petroleum and Natural Gas
API STD 607	Fire Test for Quarter-Turn Valves and Valve Equipped with Non-Metallic Seats
API STD 608	Metal Ball Valves—Flanged, Threaded and Welding Ends
API STD 609	Butterfly Valves: Double-flanged, Lug- and Wafer-type
MSS SP 25	Line Pipe Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP 75	Specification for High-Test, Wrought, Butt-Welding Fittings
MSS SP 97	Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded and Butt Welding End

Reference	Title
EEMUA 144	90/10 Copper Nickel Alloy Piping for Offshore Applications. Tubes - Seamless and Welded
EEMUA 145	90/10 Copper Nickel Alloy Piping for Offshore Applications. Flanges - Composite and Solid
EEMUA 146	90/10 Copper Nickel Alloy Piping for Offshore Applications. Fittings
NACE MR 0175 / ISO 15156	National Association of Corrosion Engineers MR-01-75 "Material Requirements- Sulphide Stress Cracking Resistant Metallic Materials for Oilfield Equipment"
BS EN 10204	Metallic products: Types of inspection documents

3. DESIGN LIFE

The design life of the piping system under the scope of this project is twenty (20) years.

4. REQUIREMENTS FOR PIPING MATERIAL CLASSES

4.1 Unit

All units a expressed in the international SI system, except for nominal bore sizes of pipes, which are in inches. Pressures are gauge pressures (in barg), unless otherwise stated. Temperatures are in degrees Celsius.

- Pipe Size - NPS
- Pipe Thickness - Millimeter (mm) / Schedule
- Pressure - Barg
- Temperature - °C
- Length - Meter (m) or Millimeter (mm)

4.2 Piping Material Class Code

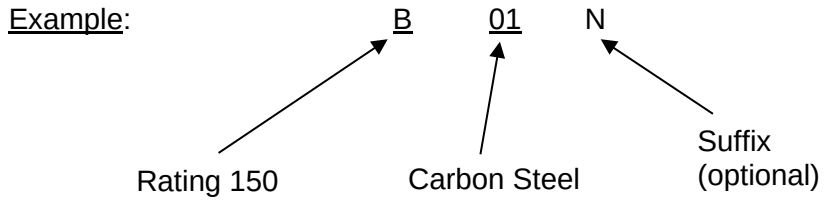
4.2.1 Piping Material Class Code

The piping material class code shall consist of:

1. Capital letter representing the ASME or API flange rating

2. Two-digit number representing the main material used for the pipes, fittings, flanges, valves, etc., of the piping material class with the corrosion allowance.

3. Suffix (optional)



The letters, figures and numbers to be used for piping class coding are indicated hereafter.

4.2.2 Flange Rating Class

Flange rating class as per ASME standards

Flange Rating Code	Flange Rating Class
B	150
D	300
F	600
G	900
H	1500
J	2500

Pressure/Temperature ratings of flanges are based on the latest version of the ASME B16.5 and ASME B16.47.

4.2.3 Material Code

Material Code	Piping Main Material
01 to 30 (1)	Carbon steels
31 to 44	Alloy steels
45 to 70	Stainless steels
71 to 85	Special Alloys such as the various types of Hastelloy®, Monel®, etc
86 to 99	Cast irons and non-ferrous materials (GRP, Copper alloys, etc)

Notes;

(1) Capital The first figure of the material code design the specificity of the material, the second figure, the corrosion allowance with the exception of figure 2:

Example 1: code 03 means normal CS with 3 mm CA.

Example 2: code 13 means galvanized carbon steel with 3 mm CA.

4.2.4 Suffix

The table here below indicate the optional suffixes usually used for piping class coding with the corresponding meaning.

Suffix	Specific Service Condition
D	Jacketed piping
N	Intermediate Sour Service (region 2 as per Specification 10008-STD-6-COR-032)
B31.8 or B31.4	Piping classes not complying with ASME B31.3 but governed by pipeline code ASME B31.4 or ASME B31.8
S	Severe Sour Service (region 3 as per Specification 10008-STD-6-COR-032)
T	High temperature service (over 300°C) except for Steam Classes

Note: For the exceptional case of the slug catcher, which is designed and constructed to ASME B31.8, the piping material class code is designated as “B31.8”.

4.3 Piping Material Class Basis

4.3.1 General

4.3.1.1 Piping Material Classes

Piping material class shall be established in accordance with ASME B31.3, or ASME B31.8 for applicable parts.

4.3.1.2 Diameter Selection

No pipe diameter smaller than ½" shall be used, except for instruments.

Pipe diameters of 1-1/4", 2-1/2", 3-1/2", 5", 7", 9" and 22" shall not be used.

For diameters above 24", sizes 30", 36", 42", 48", 56" and 60" should be preferred.

4.3.1.3 Components

All components selected to establish the piping classes shall comply with applicable Company general specifications in particular:

- PEGS-12059-PIP-005 for Pipes, Flanges and Fittings and Bolting
- 10008-STD-6-PIP-012 for Valves
- PEGS-12059-PIP-029 for Gaskets

Piping components not specified on the individual Piping Material Class, shall be treated as specialty piping (SP) items and shall have a specific data sheet for each of the design type, rating and size/ dimensions.

4.3.2 Thickness Calculation

1. Pipe wall thickness values that are specified in the Piping Material Specifications are adequate for the full range of pressure/temperature combinations tabulated.
2. Pipe wall thickness calculation principle
    - The calculation of pipe wall thickness values shall be in accordance with the ASME B31.3 design code, and shall include a corrosion allowance as well as mill tolerances, threading allowance (in accordance with ASME B1.20.1) as applicable.
    - All steel pipes and piping components of welded construction and 100% radio-graphically examined as specified in the present document are considered with joint factor of 1.0. In other cases, joint factor shall comply with the code.
    - Unless otherwise noted, minimum pipe wall thickness does not address any verification to external loadings or vacuum conditions. Such verification shall be submitted to the Company for approval.
    - If the wall thickness required to contain the pressure is less than the “Minimum Corroded Thickness”, the “Minimum Corroded Thickness” shall be used for pipe wall thickness selection purpose.
3. Pipe wall thickness calculation for pipe class B31.8 (Slug Catcher) is calculated with maximum pressure/temperature design conditions in accordance with the ASME B31.8 design code.

4.3.2.1 Corrosion Allowance

All carbon steel and low alloy steel materials shall incorporate a minimum corrosion allowance of 1.27 mm.

Stainless steels, copper nickels, galvanised carbon steels, glass reinforced materials, and other corrosion resistant materials shall be used without extra-thickness for corrosion allowance, unless otherwise required by relevant material selection study.

The corrosion allowance is specified by the corrosion specialist taking into account the carried fluid, the environmental and operating condition.

4.3.2.2 Mill Tolerance

Mill tolerances to take into account for thickness calculation are those mentioned in Company general specification PEGS-12059-PIP-005.

For Slug catcher, piping class B31.8, mill tolerance shall be in accordance with Company General Specification 10008-STD-6-PLR-006-R00.

4.3.2.3 Minimum Corroded Thickness/Retirement Thickness

It is the minimum wall thickness after reduction by:

- Corrosion Allowance
- Erosion Allowance (if applicable)
- Mill Tolerance
- Threading Allowance (in accordance with ASME B1.20.1) as applicable.

It shall not be less than the following:

Nominal Pipe Size (NPS)	Minimum Corroded Thickness (Retirement Thickness)
½" to ¾"	1.0 mm
1" to 8"	1.5 mm
10”	2.3 mm
12” to 14”	2.8 mm
16” to 24”	3.1 mm
26” to 36”	3.8 mm
38” to 46”	4.6 mm
48”	5.3 mm
Above 48”	6.4 mm

Additionally, schedules "5S" shall not be used for stainless steels, and schedule 80 shall be selected as a minimum for pipes 1.½” in diameter and below.

If the wall thickness required to contain the pressure is less than the "Minimum Corroded Thickness", the "Minimum Corroded Thickness" shall be used for pipe wall thickness selection purpose.

4.4 Jointing Methods

4.4.1 Small Bore Jointing

Small bore (size 1½" and lesser) jointing shall be made in conformance with Company specification PEGS-12059-PIP-005.

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

Threaded joints shall not be used on process service, with the exception of instrument connections which are located downstream a block valve; in such a case, the upstream side of this block valve shall be flanged or may be socket welded on a nipple with a flanged joint immediately upstream to ensure further possible maintenance.

All threaded connections shall have taper threads in accordance with ASME B 1.20.1 (NPT).

The use of threaded joint shall be forbidden in the following cases:

a) Hazardous service, e.g.:

- Liquids above their Auto-Ignition Temperature (AIT), or at temperatures greater than 210°C, (if the AIT is not known).
- Flammable liquids flashing on leakage to form a substantial vapour cloud (this includes LNG condensate)
- Fluids liable to cause a hazard by blockage due to hydrate formation or solids deposits
- Lethal or toxic substances, including H2S gas
- High pressure air injection (ratings ≥ 900)

b) General chemical service

c) Highly corrosive fluids (e.g., acids such as hydrochloric or hydrofluoric acids).

4.4.2 Welding

For each project, welding specifications have to be developed by the EPCI Contractor for all types of material selected (in the possible absence of corresponding Company General Specification).

Jointing weld shall be carried out in accordance with the relevant qualified welding procedures and qualified welders as per ASME Section IX and inspected as per ASME Section V.

4.4.3 Branch Reinforcement

The principle is as follows:

a) Connections of equal sizes always require an equal Tee.

b) Connections where both header and branch are of a diameter less than 2 inches are made using Tees (equal or reduced).

c) Reducing or equal Tees to be used if the branch diameter is equal to half the header diameter or larger.

d) All other connections shall be made using branch outlet fittings such as weldolets, sockolets, sweepolets etc., for branch diameters less than half the header diameter only. The use of weldolets shall be limited to 8" branch diameter maximum to avoid the risk of welding thermal distortion. Sweepolet or reducing tee plus reducer are to be used instead.

e) Special cases may require different rules or means for reinforcing branch connections (including the use of extruded headers, etc.). These must be submitted to the Company for approval.

f) For piping classes 10 000 API ratings, sockolet, threadolet and weldolet branch connection types are not allowed. Only sweepolet for branch diameter less than 2" is acceptable and reduced tees, equal tees or equal tees plus reducer for larger diameter are acceptable.

g) Except for branch connections made of equal or reduced tees, the use of integral reinforced connections in one single piece (comprising the required reinforcement, a nipple; “nippolet”, and eventually an end flange; “weldoflange” is permitted.

4.4.4 Unions

Unions may only be used where threaded connections are authorized by this specification; in general, their use shall be avoided wherever possible. They shall not be used in the following circumstances:

a) Systems ratings 600 and above
b) Where design temperature is above 250°C
c) Cryogenic Temperature Service (Design temperatures < minus 46°C)
d) Corrosive and Toxic Service (including H2S gas)
e) Fuel Gas Service.

4.4.5 Bolt Tensioners

Hydraulic bolt tensioners shall be used on flange stud bolt diameter greater than 1.1/2”. Bolting for use with bolt tensioners shall have the normal length increased by one bolt diameter. Bolt extensions beyond the nut shall be protected from corrosion by caps.

4.5 Piping Components

4.5.1 Pipes, Fittings and Flanges

All pipes, fittings and flanges selected for the various piping material classes shall comply with the requirements of Company general specification PEGS-12059-PIP-005.

Pipe nipples with thread caps of 3/4" NB shall be used for hydrostatic vents and drains for all metallic piping material classes. The thread caps shall be sealing welded after testing.

All 90º butt weld elbows shall be long radius (1.5D) unless space limitations dictate otherwise and Company approval is given.

Flanges for diameters up to 24 inches shall be in accordance with ASME B16.5 and for flanges 26 inches or more in diameter shall be in accordance with ASME B16.47 Series A.

API 5000 and API 10000 psi flanges shall be in accordance with API 6A/ISO10423.

4.5.2 Bolting

All bolting for piping shall comply with the requirements of Company general specification PEGS-12059-PIP-005.

Coating requirements for bolting shall comply with Company General Specification 10008-STD-6-COR-011-R00.

4.5.3 Gaskets

All gaskets for piping shall comply with the requirements of ASME B16.20, ASME B16.21 and Company general specification PEGS-12059-PIP-029.

4.5.4 Glass Reinforced Epoxy (GRE) Materials

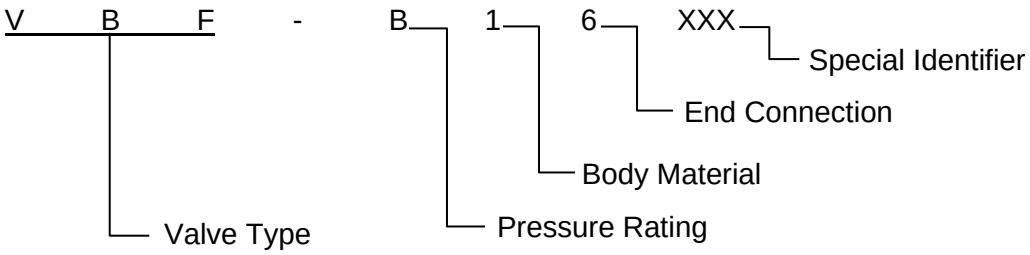
GRE material shall comply with the requirements of Company general specification PEGS-12059-PIP-008.

4.5.5 Valves

All valves shall comply with the requirements of Company general specification 10008-STD-6-PIP-012 and Datasheet for Manual Valves, MM-ASK-1A-APF-PIP-DTS-0001.

4.5.5.1 Manual Valves Identification System

Example VBF-B16S



- Valve Type :

VB	Ball Valve (VB-Reducer Bore, VBF-Full Bore)
VC	Check Valve (VCP – Piston/Ball Check, VCW - Wafer, VCS - Swing, VCN - Non-Slam, VCC - Compact)
VGL	Globe Valve
VG	Gate Valve
VN	Needle Valve
VW	Butterfly Valve
VS	Single Block and Bleed Valve
VI	Integral Double Block and Bleed Valve

- Pressure Rating :

B	Class 150
D	Class 300
F	Class 600
M	Class 800
G	Class 900
H	Class 1500
J	Class 2500

- Body Material :

1	CS
2	CS + GALV.
3	LTCS

4 SS
5 DSS
6 NAB (Nickel-Aluminum Bronze)
7 PVC

- End Connection :

1 Screwed
2 Socket End
3 Plain End
4 Buttweld
5 FF Flange
6 RF Flange
7 RTJ Flange
8 Flanged x Screwed
9 Plain end x Screwed

- Special Identifier :

A Service Class “A” Valves
B Buried Valve
C Chain Operated
E Service Class “E” Valves
H High Temperature Seal in Standard Valve
K One side flange weld overlay
L Low Temperature Seal, in Standard Valve
M Metal Seated
S Sour service & NACE MR 0175/ISO 15156
X Extended Spindle

4.5.5.2 Ball Valves

All Ball Valves shall be reduced bore, except otherwise indicated on the PID for each individual Ball Valve. Valves of diameter ≤ 1.½”” shall have a port size at least equal to the internal bore of the matching pipe.

If valves are required to be insulated, they shall be provided with extended spindle assembly suitable for making an insulation seal. Extended spindles shall be:

- For Valves diameter 2 inches and smaller: 100 mm, plus or minus 10 mm
- For Valves diameter 3 inches and larger: 150 mm, plus or minus 10 mm.

- For flanged valves, the extended spindle length is measured from the top of an end flange; for screwed or socket weld valves, it is measured from the top of the valve body.

4.5.5.3 Gate, Globe, Butterfly and Check Valves

Gate and globe valves located below ground level shall be installed in valve pits, unless otherwise specified. Butterfly valves may be buried, but they shall be provided with an extended spindle with oil-filled outer casing and an aboveground weatherproof gearbox.

Dual plate check valves are acceptable in lieu of swing check valves.

Swing check valve is not allowed to be installed in the system possibly contacted with gas e.g. liquid return line to main gas production system.

Flangeless valves, which have no connections as part of the valve body and are simply bolted or clamped between the adjoining line flanges, shall not be used for “Process Control” and “Isolation” purpose on piping in flammable or toxic services.

Flangeless lugged through drilled wafer check valve in piping for flammable or toxic service with size DN 50 – DN 200 (NPS 2 – NPS 8) shall also be avoided when possible. If it is unavoidable, due to process concern as agreed with Company, possible joint leakage and bolts shall be shielded and properly protected against fire at all scenario.

Dual plate check valves in piping for flammable or toxic service with size larger than DN 200 (NPS 8) shall be double flanged type.

4.5.5.4 Block and Bleed Valves

Use of integral block and bleed valves shall be limited to instrument connections.

Instrument connections on either piping or pressure vessels requiring either single or double block and bleed facilities shall be made of an integrated manifold.

Manifold shall be ball type two or three pieces bolted.

For integral manifold, less than 2”, the internal diameter of the main body shall be 10 mm minimum.

The bleed valve shall be needle type with a bolted bonnet.

The side of this integrated manifold, which connects to the piping or the pressure vessel, must be flanged, whilst the instrument connection side may be flanged or ½” NPT female depending on instrument connection:

The bleed connection shall be ½” NPTF protected by a metallic plug screwed.

All integrated (or Monoblock) manifolds shall be in line type. Valve type selection shall be carefully made to suit with the application and process isolation requirement.

Monoflange type is prohibited.

4.5.6 Special Fittings

4.5.6.1 Slip-on flanges

The use of slip-on flanges is not generally permitted. They may be used, however, where necessary, for tie-ins, subject to the following restrictions:

- Maximum pressure/temperature rating: class 300
- Maximum design temperature: 260°C
- Carbon steel materials only
- Their use is not permitted in sour, corrosive or severe cyclic services.

4.5.6.2 Line blanks

Line blanks shall conform to ASME B16.48.

5. PIPING CLASS INDEX

The list hereafter incorporates all piping classes currently applicable for Onshore facilities of Aung Sinkha Development Project Phase 1A.

Class	Flanges rating	Material (Corrosion in mm)	Symbol	Fluid	Temp. Range (°C)	Limit Design Press. (Bar g)
B01	150 RF	C.S. (1.27)	DF, NG	Diesel fuel, Nitrogen	-29 / 38 100 150 200	19.6 17.7 15.8 13.8
B03	150 RF	C.S. (3)	DP, OW, FG, PL, PG, DG, RV, VG	Process gas/liquid, Fuel gas, Vent gas, Drain pressurized, Drain gravity, Produced water, Oily water, Relief	-29 / 38 100 150 200	19.6 17.7 15.8 13.8
B10	150 RF	C.S. Galvanized (1.27)	IA	Instrument air	-29 / 38 100 150 200	19.6 17.7 15.8 13.8
B23	150 RF	L.T.C.S. (3)	RV, VG, BD, FG, HF, DP, LF	Vent gas, Blowdown, Relief, Fuel gas, High pressure flare, Low pressure flare, Drain pressurized	-46 / 38 100 150 200	19.6 17.7 15.8 13.8
B49	150 RF	S.S. TP 316/316L (0)	BI, CI, FG, FW, UW	Chemical, Biocide, Corrosion Inhibitor, Fuel Gas, A/G Firewater and Deluge Firewater, A/G Foam Solution and Deluge foam solution	-46 / 38 100 150 200	19 16.2 14.8 13.7
B70	150 RF	Duplex UNS S31803 (0)	OW	Oily water, Produced water	-46 / 38 100 150 200	20 17.7 15.8 13.8
B90	150 FF	GRE (0)	FW, UW	U/G Firewater, Utility water	-29 / 90	18
B91	150 FF	GRE (0)	OW, DG	Oily water, Drain gravity	-29 / 90	12
D03	300 RF	C.S. (3)	FG, PG, PL, DP	Process gas/liquid, Drain pressurized, Fuel gas	-29 / 38 100 150 200	51.1 46.6 45.1 43.8
D06	300 RF	C.S. (6)	PL, PG	Process gas/liquid	-29 / 38 100 150 200	51.1 46.6 45.1 43.8

Class	Flanges rating	Material (Corrosion in mm)	Symbol	Fluid	Temp. Range (°C)	Limit Design Press. (Bar g)
D23	300 RF	L.T.C.S. (3)	PG	Process gas	-46 / 38 100 150 200	51.1 46.6 45.1 43.8
D49	300 RF	S.S. TP 316/316L (0)	FG	Fuel gas	-46 / 38 100 150 200	49.6 42.2 38.5 35.7
F03	600 RF	C.S. (3)	PG, PL, DP, GR, GL, VG	Process gas/liquid, Vent gas, Drain pressurized, Glycol rich, Glycol lean	-29 / 38 100 150 200	102.1 93.2 90.2 87.6
F03N	600 RF	C.S. (3)	GR	Glycol rich (Intermediate Sour Service)	-29 / 38 100 150 200	102.1 93.2 90.2 87.6
F06	600 RF	C.S. (6)	GC, PG, DP	Gas & Condensate, Process gas, Drain pressurized	-29 / 38 100 150 200	102.1 93.2 90.2 87.6
F06S	600 RF	C.S. (6)	GC	Gas & Condensate (Severe sour service)	-29 / 38 100 150 200	102.1 93.2 90.2 87.6
F23	600 RF	L.T.C.S. (3)	PG, VG, BD	Process gas, Vent gas, Blowdown	-46 / 38 100 150 200	102.1 93.2 90.2 87.6
F26	600 RF	L.T.C.S. (6)	PG	Process gas	-46 / 38 100 150 200	102.1 93.2 90.2 87.6
F26S	600 RF	L.T.C.S. (6)	PG, GC	Process gas (Severe sour service), Gas & Condensate	-46 / 38 100 150 200	102.1 93.2 90.2 87.6
F49	600 RF	S.S. TP 316/316L (0)	PG, FG	Process gas, Fuel gas	-46 / 38 100 150 200	99.3 84.4 77 71.3
G01	900 RJ	C.S. (1.27)	PG	Process gas	-29 / 38 100 150 200	153.2 139.8 135.2 131.4

Class	Flanges rating	Material (Corrosion in mm)	Symbol	Fluid	Temp. Range (°C)	Limit Design Press. (Bar g)
G03	900 RJ	C.S. (3)	DP, PG	Process gas, Drain pressurized	-29 / 38 100 150 200	153.2 139.8 135.2 131.4
G06	900 RJ	C.S. (6)	PG	Process gas	-29 / 38 100 150 200	153.2 139.8 135.2 131.4
G23	900 RJ	L.T.C.S. (3)	PG	Process gas	-46 / 38 100 150 200	153.2 139.8 135.2 131.4
G26	900 RJ	L.T.C.S. (6)	PG	Process gas	-46 / 38 100 150 200	153.2 139.8 135.2 131.4
G49	900 RJ	S.S. TP 316/316L (0)	PG	Process gas	-46 / 38 100 150 200	148.9 126.6 115.5 107
B31.8	300 RF	High Strength C.S. (6)	-	Slug Catcher	-29 / 70	40
PVC	150 FF	PVC (0)	HP	Chlorine	0 / 60	13

6. REFERENCE ATTACHEMENTS

Attachment 1 – Piping Material Class

Attachment 2 – Branch Reinforcement Table

Attachment 3 – Bolting Table

Attachment 4 – Notes for Modification of Pipe Classes from PEGS

ATTACHMENT 1 – PIPE MATERIAL CLASS

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 150 Lbs RF	**CLASS** **B 01**
Service: Diesel fuel, Vent, Drain gravity and Relief, Nitrogen	**Corrosion allowance:** 1.27 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	19.6	19.6	17.7	13.12
Temperature (°C)	-29	+37	+100	+220

Pipes (12)	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	
	Schedule (16)	80					40			20			
	Ends	PE				BE							
	Mat.Spec. (17)	API 5L Gr B seamless											

Fittings (18)	3000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)
Flanges (3) (11)	150 Lbs RF, SW, A105	WN, 150 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges
		WN, 300 Lbs RF, orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 6" and Trunnion mounted for diameters 8" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves	800 Lbs SW, A105, Stellite coated, OS&Y, BB (5) (9)	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB (5) (9)
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above); Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen
Gaskets (13)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 12", spacers and spades for 14" and above, carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B 16.5 for diameters up to 24" and as per ASME B 16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) Schedules up to 24" are acceptable for full vacuum
(13) as per PEGS-12059-PIP-029
(14) Valves shall be clearly identified and equipped with elastomeric seals suitable to methanol service
(15) Deleted
(16) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 fpr SAW pipe.
(17) Product Specification Level PSL-2 is required for pipe API 5L Gr. B.
(18) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design
(19) Deleted
(20) Deleted

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 150 Lbs RF	**CLASS** **B 03**
Service: Process gas/liquid, Exhaust, Fuel gas, Vent gas, Drain pressurized, Drain Gravity, Produced water, Oily water, Nitrogen and Relief	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	19.6	19.6	17.7	13.8
Temperature (°C)	-29	+37	+100	+200

Pipes (12)	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	28	
	Schedule (14)	160				80	40			20		30	20					STD	
	Ends	PE				BE													
	Mat.Spec. (15)	API 5L Gr B seamless																API 5L Gr B – SAW – 100% Radiographed	

Fittings (16)	6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB or A234 WPBW – 100% Radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)
Flanges (3) (11)	150 Lbs RF, SW, A105	WN, 150 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges
		WN, 300 Lbs RF, orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 6" and Trunnion mounted for diameters 8" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves	800 Lbs SW, A105, Stellite coated, OS&Y, BB (5) (9)	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB (5) (9)
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above); Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen
Gaskets (13)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 12", spacers and spades for 14" and above, carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B 16.5 for diameters up to 24" and as per ASME B 16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) Schedules up to 24" are acceptable for full vacuum
(13) as per PEGS-12059-PIP-029
(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe.
(15) Product Specification Level PSL-2 is required for pipe API 5L Gr. B.
(16) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design
(17) For underground installation, Coating and Wrapping shall be provided as per PEGS-12139-PIP-022 Section 13 and 14.

PIPING MATERIALS		
Material: Carbon steel Galvanised	**Rating:** 150 Lbs RF	**CLASS** **B 10**
Service: Instrument air	**Corrosion allowance:** 1.27 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	19.6	19.6	17.7	13.8
Temperature (°C)	-29	+37	+100	+200

Pipes (12)	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	
	Schedule (8)	160				80		40		20	
	Ends	TE						BE (10)			
	Mat.Spec. (9)	API 5L Gr B seamless Galvanized to A153 class B						API 5L Gr B seamless (10)			
Fittings		3000 Lbs threaded, A105, 45° or 90° elbows (1), couplings, tees, threadolets, Galvanized to A153 class B						A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets (10)			
Flanges (2)		150 Lbs threaded RF, A105, Galvanized to A153 class B						WN, 150 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges (10)			
Gate valves		800 Lbs threaded, A105, Stellite coated, OS&Y, BB (3)						A216 WCB Body, Trim stellite coated for diameters 4" and F6 for diameter 6", OS&Y, BB, Handwheel, Flanged (2)			
Ball valves											
Globe valves (4) (6)		800 Lbs threaded, A105, Stellite coated, OS&Y, BB									
Plug valves											
Butterfly valves											
Check valves		800 Lbs threaded, A105, BC, Stellite coated (4) (5), Horizontal piston lift						A216 WCB Body, Trim stellite coated for diameter 4” and F6 for diameter 6”, Dual-Plate (Lug-type)			
Strainers		600 Class, threaded, A105, Y type, SS316L screen									
Gaskets (7)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B16.20									
Bolting		Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011									
Miscellaneous		Spectacle blind, carbon steel A516 Gr.70N									

NOTES

(1) Bending not permitted

(2) Flanges as per ASME B16.5 "Smooth finish" facing for use of Spiral wound gasket

(3) Single-piece wedge

(4) Removable seat

(5) Horizontal installation

(6) Swivel plug disc

(7) as per PEGS-12059-PIP-029

(8) Thickness based on mill tolerance as per PEGS-12059-PIP-005

(9) Product Specification Level PSL-2 is required for pipe API 5L Gr.B

(10) All butt welding pipes, fittings and flanges for size 4” and above shall be Hot-dip galvanized after piping spool fabrication.

PTTEP

PIPING MATERIALS

Material: Low Temperature Carbon Steel (LTCS)	**Rating:** 150 Lbs RF	**CLASS** **B 23**
Service: Vent gas, Blowdown, Relief, Fuel gas, High pressure flare, Low pressure flare, Drain pressurized	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	19.6	19.6	17.7	13.8
Temperature (°C)	-46	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26	28	30
	Schedule (14)	160				80	40			20		30	20					STD		
	Ends	PE				BE														
	Mat.Spec. (13)	ASTM A 333 Gr.6 seamless											A671 CC65 Cl22 W/S2 at -46°C (100% radiographed)							

Fittings (15)	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, sockolets, A350 LF2 CL.1	A420 WPL6 or A420 WPL6W – 100% radiographed from diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	150 Lbs RF, SW, A350 LF2 CL.1	WN, 150 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A105 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 6" and Trunnion mounted for diameters 8" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A 352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5) (7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above); Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL6 carbon steel, SS316L screen
Gaskets (12)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 12", spacers and spades for 14" and above, Low temperature carbon steel	

NOTES

(1) Connections to be calculated by Engineering Company

(2) Bending not permitted

(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above

(4) Deleted

(5) Removable seat

(6) Deleted

(7) Horizontal installation

(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics

(9) Swivel plug disc

(10) Firesafe and Anti-static device

(11) "Smooth finish" facing for use of Spiral wound gasket

(12) as per PEGS-12059-PIP-029

(13) For sizes 18" and above, thickness calculations are performed With Allowable Stress values of A333 Gr 6

(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe.

26	28	30	32	34	36	38	40	42	44	46
STD				20		XS				

(15) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design.

PIPING MATERIALS		
Material: Stainless steel TP 316/316L	**Rating:** 150 Lbs RF	**CLASS** **B 49**
Service: Chemical, Biocide, Corrosion Inhibitor, Fuel Gas, A/G Firewater and Deluge Firewater, A/G Foam Solution and Deluge foam solution	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 2.2)				
Pressure (barg)	19	19	16.2	13.7
Temperature °C)	-46 (see note 14)	+37	+100	+200

Pipes (15)	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (18)	80 S				40 S	10 S											
	Ends	PE				BE												
	Mat.Spec.	A312 TP 316/316L (Dual stamped) Seamless or welded (EFW) per ASTM A358 Gr 316/316L class 1 (100% radiographed)																
Fittings (21)		3000 Lbs A182 F316/316L, SW, 45° or 90° elbows, couplings, tees, sockolets (2)				A403 WP 316/316L (19), thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A182 F316/316L weldolets, sweepolets (1)												
Flanges (3) (11)		150 Lbs RF, SW, A182 F316/316L				WN, 150 Lbs RF, A182 F316/316L, hub thickness as per pipe schedule, blind flanges (12)												
						WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection												
Gate valves																		
Ball valves (10)		800 Lbs, A182 F316/316L, 316 Trim, Seals (8), Floating ball, SW				A182 F316/F316L or A351 CF8M Body, Type 316 Trim material, Seals (8), SPB or TPE, Floating ball for diameters up to 6" and Trunnion mounted for diameters 8" and above, Gearbox for diameters 8" and above, Flanged (3)												
Globe valves (5) (9)		800 Lbs SW, A182 F316/F316L, 316 Trim, BB, OS&Y				A351 CF8M Body, 316 Trim, OS&Y, BB, Flanged (13)												
Plug valves																		
Butterfly valves																		
Check valves		800 Lbs SW, BC, A182 F316/316L, Horizontal piston lift (5) (7)				A351 CF8M Body, Type 316 Trim material, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3) (13)												
Strainers		600 Class, SW, A182 F316/316L, Y type, SS316L screen				Tee type Strainers, A403 WP 316/316L body, SS316L screen												
Gaskets (17)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20																
Bolting (20)		Studs A193 B8M class 2, Hh nuts A194 Gr 8MA, coating as per 10008-STD-6-COR-011																
Miscellaneous		Spectacle blind up to 12", spacer and spades for 14" and above, A240 TP 316/316L																

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B 16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per PEGS-12059-PIP-006 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) Blind flange may be in A182 F 316
(13) Forged steel to ASTMA182 F316/316L is an acceptable alternate for body materials
(14) Acceptable between -46°C and -140°C for blow down situation only (no valve manually operated below -46°C)
(15) Schedules up to 24" are acceptable for full vacuum
(16) Deleted
(17) As per PEGS-12059-PIP-029
(18) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for EFW pipe
(19) A403 WP 316L class S or class WX full dye penetrant on the weld surface and radiographic examination after forming and heat treatment
(20) Stainless steel bolting to ASTM A193 Gr.B8M may conform to class 1 instead of class 2 for bolt diameter larger than 1.5"
(21) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Duplex UNS S31803 (17)	**Rating:** 150 Lbs RF	**CLASS** **B 70**
Service: Oily water, Produced water	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 2.8)				
Pressure (barg)	20	20	17.7	13.8
Temperature °C)	-46	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12
	Schedule (14) (16)	80 S				10 S						
	Ends	PE				BE						
	Mat.Spec.	ASTM A 790 UNS S31803 seamless or ASTM A928 Class 1 welded - (100% radiographed)										
Fittings (18)		3000 Lbs SW, A182 F51, couplings, tees, sockolets, 45° or 90° elbows (2)				ASTM A 815 - S31803, class WP - S or WX material, Thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees (11), A182 F51 weldolets, sweepolets (1)						
Flanges (3) (13)		150 Lbs RF, SW, A182 F51				ASTM A182 F51 material, 190 HB minimum hardness, WN, 150 Lbs RF, Hub thickness as per pipe schedule, blind flanges						
						WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection						
Gate valves												
Ball valves (10)		800 Lbs SW, A182 F51, Seals (8), Floating ball				A182 F51 or A890 Gr.4A body, A182 F51 trim, SPB or TPE, Seal (8), Floating ball for diameters up to 6" and Trunnion mounted for diameter 8" and above, Gearbox for diameters 8" and above, Flanged (3)						
Globe valves (5) (9)		800 Lbs, A182 F51, SW, Stellite coated, OS&Y, BB				A890 Gr.4A body A182 F51 Trim, OS&Y, BB, Flanged (3)						
Plug valves												
Butterfly valves												
Check valves		800 Lbs SW, BC, Stellite coated, A182 F51 (5) (7) (12)				A890 Gr.4A Body, A182 F51 trim, Trim stellite coated for diameter 2" to 4" Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above) (3)						
Strainers		150 Lbs, SW, A182 F51 body & screen, Y type				Tee type Strainer, UNS S31803						
Gaskets (15)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20										
Bolting		A453 Gr. 660 Class A or B, coating as per 10008-STD-6-COR-011										
Miscellaneous		Spectacle blind, UNS S31803										

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B 16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per PEGS-12059-PIP-006 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Welded wrought fittings must be 100% radiographed after forming
(12) Horizontal piston lift
(13) "Smooth finish" facing for use of Spiral wound gasket
(14) Deleted
(15) As per PEGS-12059-PIP-029
(16) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe
(17) Material shall be supplied as per PEGS-12059-PIP-020
(18) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: GRE (**Note 4**)	**Rating:** 150 Lbs FF	**CLASS** **B 90**
Service: U/G Firewater, Utility water	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits		
Pressure (barg)	18	18
Temperature (°C)	-29	+90

Pipes	**Diameter**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**
	Thickness (mm)	Per specification PEGS-12059-PIP-008 and Manufacturer's standards (8)											
	Ends	"Bell and Spigot" type											
	Mat.Spec.	GRE material conforming to specification PEGS-12059-PIP-008											
Fittings		GRE material identical to pipe material, conforming to specification PEGS-12059-PIP-008, "Bell" ends											
Flanges (1) (2)		Fixed GRE flanges, material identical to pipe material, designed to be bonded to the adjacent piece of pipe or fitting ("bell and spigot" joints), conforming to specification PEGS-12059-PIP-008											
Gate valves (1) (3) (4)		A182 F316/F316L or A351 CF8M Body, Type 316 Trim material, OS&Y, BB Gearbox for diameters 14" and above, FF Flanged as per ASME B16.5											
Ball valves													
Globe valves													
Plug valves													
Butterfly valves													
Check valves													
Strainers													
Gaskets		Neoprene flat gaskets, 3 mm thick for diameters up to 6 inches, and 5 mm thick for diameters above 6 inches, SHORE A hardness 60 to 70 maximum.											
Bolting		Studs A193 B7, with two washers and Hh nuts A194 2H, coating as per 10008-STD-6-COR-011											
Miscellaneous													

NOTES

(1) All valve and flanges up to 40” must be flat facing if they are designed to connect to a GRE system

(2) Blind flanges FF shall be made of C.S. material with an overlay of Cu-Ni on the contact face

(3) Bores of all valves to suit pipe bores

(4) Single-piece wedge for diameters up to 24” and Flexible wedge for diameters 26” and above.

(5) Refer to PEGS-12059-PIP-008

- AMERON products: S2400-B91 up to 40"
- Future Pipe industries: Wavistrong EST32 up to 3", EST25 from 4" to 6", EST20 from 8" to 32"

PIPING MATERIALS		
Material: GRE (**Note 7**)	**Rating:** 150 Lbs FF	**CLASS** **B 91**
Service: Oily Water, Gravity Drain	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits		
Pressure (barg)	12	12
Temperature (°C)	-29	+90

Pipes	**Diameter**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**28**	**30**
	Thickness (mm)	Per specification PEGS-12059-PIP-008 and Manufacturer's standards (8)													
	Ends	"Bell and Spigot" type													
	Mat.Spec.	GRE material conforming to specification PEGS-12059-PIP-008													
Fittings		GRE material identical to pipe material, conforming to specification PEGS-12059-PIP-008, "Bell" ends													
Flanges (1) (2)		Fixed GRE flanges, material identical to pipe material, designed to be bonded to the adjacent piece of pipe or fitting ("bell and spigot" joints), conforming to specification PEGS-12059-PIP-008													
Gate valves (1) (3) (4) (5)		A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameter 6" and above, OS&Y, BB, Gearbox for diameter 14" and above, FF Flanged as per ASME B16.5													
Ball valves															
Globe valves															
Plug valves															
Butterfly valves															
Check valves															
Strainers															
Gaskets		Neoprene flat gaskets, 3 mm thick for diameters up to 6 inches, and 5 mm thick for diameters above 6 inches, SHORE A hardness 60 to 70 maximum.													
Bolting		Studs A193 B7, with two washers and Hh nuts A194 2H, coating as per 10008-STD-6-COR-011													
Miscellaneous		Spectacle blind up to 12", spacer and spades for 14" and above, Cu-Ni to B171 C70600													

NOTES

(1) All valve and flanges up to 40” must be flat facing if they are designed to connect to a GRE system

(2) Blind flanges FF shall be made of C.S. material with an overlay of Cu-Ni on the contact face

(3) Valves packing to be CRANE C1065 type, or approved equal

(4) Bores of all valves to suit pipe bores

(5) Single-piece wedge for diameters up to 24” and Flexible wedge for diameters 26” and above.

(6) Deleted

(7) GRE shall be fire resistant tested as per PEGS-12059-PIP-008

(8) Refer to PEGS-12059-PIP-008

- AMERON products: S2400-B91 up to 40"
- Future Pipe industries: Wavistrong EST32 up to 3", EST25 from 4" to 6", EST20 from 8" to 32"

(9) Deleted

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 300 Lbs RF	**CLASS** **D 03**
Service: Process gas/liquid, Drain pressurized, Fuel gas	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	51.1	51.1	46.6	43.8
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	**½**	**¾**	**1**	**1 ½**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**
	Schedule (13)	160				80	40						
	Ends	PE				BE							
	Mat.Spec. (14)	API 5 L Gr B seamless											

Fittings (15)	6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB or A234 WPBW -100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)
Flanges (3) (11)	300 Lbs RF, SW, A105	WN, 300 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges (3)
		WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 4" and Trunnion mounted for diameters 6" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A105, Stellite coated, OS&Y, BB	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type 10" and above), Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen
Gaskets (12)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 8" , spacers and spades for 10" and above, carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Service pressure according to temperature and supplier's recommendations. Use as per P&ID indications. Maximum temperature = 180°C
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) as per PEGS-12059-PIP-029
(13) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(14) Product Specification Level PSL-2 is required for pipe API 5L Gr.B
(15) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 300 Lbs RF	**CLASS** **D 06**
Service: Process gas/liquid	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	51.1	51.1	46.6	43.8
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	28	
	Schedule (14)	XXS					160	120	80		60							22.23 mm	
	Ends	PE				BE													
	Mat.Spec. (15)	API 5 L Gr B seamless										ASTM A333 Gr 6 seamless		A671 CC65 Cl22 W/S2 – EFW 100% radiographed					

Fittings (16)	6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)	A420 WPL6 or A420 WPL6W – 100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	300 Lbs RF, SW, A105	WN, 300 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges	WN, 300 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection	
Gate valves			
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 4" and Trunnion mounted for diameters 6" and above, Gearbox for diameters 8" and above, Flanged (3)	
Globe valves (5) (9)	800 Lbs SW, A105, Stellite coated, OS&Y, BB	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB	
Plug valves			
Butterfly valves			
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type 10" and above), Swing type (flanged, BC) is acceptable if density is above 0.7 (3)	
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen	
Gaskets (13)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20		
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011		
Miscellaneous	Spectacle blind up to 8" , spacers and spades for 10" and above, carbon steel A516 Gr.70N		

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Service pressure according to temperature and supplier's recommendations. Use as per P&ID indications. Maximum temperature = 180°C
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes Below 1 inch, and to 3.1 mm only for fittings below 2 inches
(13) as per PEGS-12059-PIP-029
(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(15) Product Specification Level PSL-2 is required for pipe API 5L Gr.B
(16) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PTTEP

PIPING MATERIALS

Material: Low Temperature Carbon Steel (LTCS)	**Rating:** 300 Lbs RF	**CLASS** **D 23**
Service: Process gas	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	51.1	51.1	46.6	43.8
Temperature (°C)	-46	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (14)	160				80	40								XS	40		
	Ends	PE				BE												
	Mat.Spec. (13)	ASTM A 333 Gr.6 seamless													A671 CC65 Cl22 W/S2 at -46°C (100% radiographed)			

Fittings	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, sockolets, A350 LF2 CL.1	A420 WPL6 or A420 WPL6W – 100% radiographed from diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	300 Lbs RF, SW, A350 LF2 CL.1	WN, 300 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Floating ball for diameters up to 4" and Trunnion mounted for diameters 6" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A 352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5) (7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above); Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL6 carbon steel, SS316L screen
Gaskets (12)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 8", spacers and spades for 10" and above, LTCS A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Service pressure according to temperature and supplier's recommendations. Use as per P&ID indications. Maximum temperature = 180°C
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing for use of Spiral wound gasket
(12) as per PEGS-12059-PIP-029
(13) For sizes 18" and above, thickness calculations are performed With Allowable Stress values of A333 Gr 6
(14) Thickness based on mill tolerance as per PEGS-12059-PIP-008 and weld coefficient = 1 for welded pipe.

26	28	30	32	34	36	38	40	42	44	46
17.48 mm	17.48 mm	19.05 mm	20.62 mm	20.62 mm	22.23 mm	23.83 mm	23.83 mm	25.4 mm	26.97 mm	26.97 mm

(15) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design.

PIPING MATERIALS		
Material: Stainless steel TP 316/316L	**Rating:** 300 Lbs RF	**CLASS** **D 49**
Service: Fuel gas	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 2.2)				
Pressure (barg)	49.6	49.6	42.2	35.7
Temperature °C)	-46 (see note 14)	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16
	Schedule (17)(18)	80 S				40 S	10 S		40 S					
	Ends	PE				BE								
	Mat.Spec.	A312 TP 316/316L (Dual stamped) Seamless or welded (EFW) per ASTM A358 Gr 316/316L class 1 (100% radiographed)												

Fittings (21)	3000 Lbs A182 F316/316L, SW, 45° or 90° elbows, couplings, tees, sockolets (2)	A403 WP 316/316L (19), thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A182 F316/316L weldolets, sweepolets (1)
Flanges (3) (11)	300 Lbs RF, SW, A182 F316/316L	WN, 300 Lbs RF, A182 F316/316L, hub thickness as per pipe schedule, blind flanges (12)
		WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs, A182 F316/316L, 316 Trim, Seals (8), Floating ball, SW	A182 F316/F316L or A351 CF8M Body, Type 316 Trim material, Seals (8), SPB or TPE, Floating ball for diameters up to 4" and Trunnion mounted for diameters 6" and above, Gearbox for diameters 8" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A182 F316/F316L, 316 Trim, BB, OS&Y	A351 CF8M Body, 316 Trim, OS&Y, BB, Flanged (13)
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, BC, A182 F316/316L, Horizontal piston lift (5) (7)	A351 CF8M Body, Type 316 Trim material, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3) (13)
Strainers	600 Class, SW, A182 F316/316L, Y type, SS316L screen	Tee type Strainers, A403 WP 316/316L body, SS316L screen
Gaskets (16)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20	
Bolting (20)	Studs A193 B8M class 2, Hh nuts A194 Gr 8MA, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 8", spacer and spades for 10" and above, A240 TP 316/316L	

NOTES

(1) Connections to be calculated by Engineering Company

(2) Bending not permitted

(3) Flanges as per ASME B 16.5 for diameters up to 24" and as per ASME B 16.47 Series 'A' for diameters 26" and above

(4) Deleted

(5) Removable seat

(6) Deleted

(7) Horizontal installation

(8) Seal materials as per PEGS-12059-PIP-006 depending on operating conditions and fluid characteristics

(9) Swivel plug disc

(10) Firesafe and Anti-static device

(11) "Smooth finish" facing for use of Spiral wound gasket

(12) Blind flange may be in A182 F 316

(13) Forged steel to ASTMA182 F316/316L is an acceptable alternate for body materials

(14) Acceptable between -46°C and -140°C for blow down situation only (no valve manually operated below -46°C)

(15) Deleted

(16) As per PEGS-12059-PIP-029

(17) Minimum calculated thickness for pipe diameter 26" and above; wherever possible the minimum acceptable thickness is selected according to ASME B36.10M and shall be at least equal to this value.

(18) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for EFW pipe

26	28	30	32	34	36	38	40	42	44	46
12.8 mm	13.7 mm	14.7 mm	15.7 mm	16.7 mm	17.6 mm	18.6 mm	19.6 mm	20.6 mm	21.5 mm	22.5 mm

(19) A403 WP 316L class S or class WX full dye penetrant on the weld surface and radiographic examination after forming and heat treatment

(20) Stainless steel bolting to ASTM A193 Gr.B8M may conform to class 1 instead of class 2 for bolt diameter larger than 1.5"

(21) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 03**
Service: Process gas, Vent gas, Drain pressurized, Corrosive hydrocarbons	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (15) (16)	160					80											
	Ends	PE					BE											
	Mat.Spec. (16)	API 5 L Gr B seamless									ASTM A333 Gr 6 seamless				A671 CC65 Cl22 W/S2 – EFW 100% radiographed			
Fittings (17)		6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets				A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)					A420 WPL6 or A420 WPL6W – 100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)							
Flanges (3) (11)		600 Lbs RF, SW, A105				WN, 600 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges (13)					WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges (3)							
						WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection												
Gate valves																		
Ball valves (10)		800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball				A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)												
Globe valves (5) (9)		800 Lbs SW, A105, Stellite coated, OS&Y, BB				A216 WCB Body, F6 Trim, Flanged, OS&Y, BB												
Plug valves																		
Butterfly valves																		
Check valves		800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift				A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)												
Strainers		600 Class, SW, A105, Y type, SS316L screen					Tee type Strainers, A234 WPB body, SS316L screen											
Gaskets (14)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and external rings per ASME B16.20																
Bolting		Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011																
Miscellaneous		Spectacle blind up to 6", spade and spacer for 8" and above, carbon steel A516 Gr.70N																

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) For diameters 26 inches and above, fittings according to A860 WPHY60, wall thickness to suit matching pipe
(13) For diameters 26 inches and above, flanges per ASTM A694 grade F60, to match pipe wail thickness
(14) as per PEGS-12059-PIP-029
(15) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(16) Minimum calculated thickness for pipe diameter 26" and above

26	28	30	32	34	36	38	40	42	44	46
24.1 mm	25.6 mm	27.2 mm	28.8 mm	30.4 mm	32.0 mm	33.6 mm	36.2 mm	36.8 mm	38.4 mm	40.0 mm

(17) Product Specification Level PSL-2 is required for pipe API 5L Gr.B and API 5L X60
(18) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel **(12)**	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 03 N**
Service: Glycol rich (Intermediate Sour Service)	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	
	Schedule (17)	160					80								
	Ends	PE				BE									
	Mat.Spec. (18)	API 5 L Gr B or Equivalent seamless									ASTM A333 Gr 6 seamless				
Fittings (19)		6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets				A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)					A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)				
Flanges (3) (11)		600 Lbs RF, SW, A105				WN, 600 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges					WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges				
						WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection									
Gate valves															
Ball valves (10)		800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball				A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)									
Globe valves (5) (9)		800 Lbs SW, A105, Stellite coated, OS&Y, BB				A216 WCB Body, F6 Trim, Flanged, OS&Y, BB									
Plug valves															
Butterfly valves															
Check valves		800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift				A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)									
Strainers		600 Class, SW, A105, Y type, SS316L screen					Tee type Strainers, A234 WPB body, SS316L screen								
Gaskets (13)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and external rings per ASME B16.20													
Bolting (16)		Studs A193 B7, Hh nuts A194 2H, Zn plating with PTFE Fluoropolymer coating as per 10008-STD-6-COR-010-R00													
Miscellaneous		Spectacle blind up to 6", spade and spacer for 8" and above, carbon steel A516 Gr.70N													

NOTES

(1) Connections to be calculated by ENGINEERING COMPANY
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012-R00 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) All materials shall comply with the NACE MR0175/ISO 15156 Standard & with the specification PEGS-0710-PIP-018 and 10008-STD-6-COR-032. Valve materials shall also conform to the specification PEGS-12060-MMA-002.
(13) as per PEGS-12059-PIP-029 Rev.0-0.
(14) Deleted
(15) Deleted
(16) Material bolting in A193 B7M and A194 2HM shall mandatorily use for piping confined under insulation.
(17) Thickness based on mill tolerance as per PEGS-12059-PIP-005 Rev.0-0
(18) Product Specification Level PSL-2 is required for pipe API 5L Gr. B
(19) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Carbon steel	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 06**
Service: Gas & Condensate, Process gas, Drain pressurized	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (16)	XXS					160		120		100						80	
	Ends	PE				BE												
	Mat.Spec. (17)	API 5 L Gr B seamless						ASTM A333 Gr 6 seamless									A671 CC65 CI22 W/S2 – EFW 100% radiographed	

Fittings (18)	6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)	A420 WPL6 or A420 WPL6W – 100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	600 Lbs RF, SW, A105	WN, 600 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges	WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection	
Gate valves			
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)	
Globe valves (5) (9)	800 Lbs SW, A105, Stellite coated, OS&Y, BB	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB	
Plug valves			
Butterfly valves			
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)	
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen	
Gaskets (13)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and external rings per ASME B16.20		
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011		
Miscellaneous	Spectacle blind up to 6", spade and spacer for 8" and above, carbon steel A516 Gr.70N		

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3.1 mm only for fittings below 2 inches
(13) as per PEGS-12059-PIP-029
(14) For diameters 26 inches and above, fittings according to A860 WPHY60, wall thickness to suit matching pipe
(15) For diameters 26 inches and above, flanges per ASTM A694 grade F60, to match pipe wail thickness
(16) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(17) Product Specification Level PSL-2 is required for pipe API 5L Gr.B and API 5L X60
(18) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel (13)	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 06 S**
Service: Gas & Condensate (Severe sour service)	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (18)	XXS					160		120		100						80	
	Ends	PE					BE											
	Mat.Spec. (19)	API 5 L Gr B seamless						ASTM A333 Gr 6 seamless									A671 CC65 CI22 W/S2 – EFW 100% radiographed	

Fittings (15)(20)	6000 Lbs SW, A105, 45° or 90° elbows (2), couplings, tees, sockolets	A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)	A420 WPL6 or A420 WPL6W – 100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	600 Lbs RF, SW, A105	WN, 600 Lbs RF, A105, hub thickness as per pipe schedule, blind flanges	WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection	
Gate valves			
Ball valves (10)	800 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)	
Globe valves (5) (9)	800 Lbs SW, A105, Stellite coated, OS&Y, BB	A216 WCB Body, F316 Trim, Flanged, OS&Y, BB	
Plug valves			
Butterfly valves			
Check valves	800 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)	
Strainers	600 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen	
Gaskets (14)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and external rings per ASME B16.20		
Bolting (17)	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011		
Miscellaneous	Spectacle blind up to 6", spade and spacer for 8" and above, carbon steel A516 Gr.70N		

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3.1 mm only for fittings below 2 inches
(13) All materials shall comply with the NACE MR0175/ISO 15156 Standard & with the specification PEGS-0710-PIP-019 and 10008-STD-6-COR-032. Valve materials shall also conform to the specification PEGS-12060-MMA-002
(14) as per PEGS-12059-PIP-029
(15) For diameters 26 inches and above, fittings according to A860 WPHY60, wall thickness to suit matching pipe
(16) For diameters 26 inches and above, flanges per ASTM A694 grade F60, to match pipe wail thickness
(17) Material bolting in A193 B7M and A194 2HM shall mandatorily used for piping confined under insulation
(18) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(19) Product Specification Level PSL-2 is required for pipe API 5L Gr.B and API 5L X60
(20) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Low temperature Carbon Steel (LTCS)	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 23**
Service: Process gas, Vent gas, Blowdown	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-46	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	
	Schedule (14)	160					80											
	Ends	PE					BE											
	Mat.Spec. (13)	ASTM A 333 Gr 6 seamless													A671 CC65 CI22 W/S2 at -46°C (100% radiographed)			

Fittings (15)	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, Sockolets, A350 LF2 CL.1	A420 WPL6 or A420 WPL6W-100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	600 Lbs RF, SW, A350 LF2 CL.1	WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5) (7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL-6 carbon steel, SS316L screen
Gaskets (12)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B16.20	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 6", spade and spacer for 8" and above, Low temperature carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company

(2) Bending not permitted

(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above

(4) Deleted

(5) Removable seat

(6) Deleted

(7) Horizontal installation

(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics

(9) Swivel plug disc

(10) Firesafe and Anti-static device

(11) "Smooth finish" facing

(12) as per PEGS-12059-PIP-029

(13) For sizes 18" and above, thickness calculations are performed with Allowable Stress values of A333 Gr 6

(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe. Minimum calculated thickness for pipe diameter 26" and above

26	28	30	32	34	36	38	40	42	44	46
29.1 mm	31.1 mm	33.1 mm	35 mm	37 mm	39 mm	41 mm	43 mm	45 mm	46.9 mm	48.9 mm

(15) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Low temperature Carbon Steel (LTCS)	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 26**
Service: Process gas	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-46	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12
	Schedule (15)	XXS					160		120		100	
	Ends	PE				BE						
	Mat.Spec. (14)	ASTM A 333 Gr 6 seamless										

Fittings (16)	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, Sockolets, A350 LF2 CL.1	A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	600 Lbs RF, SW, A350 LF2 CL.1	WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5)(7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL-6 carbon steel, SS316L screen
Gaskets (13)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B16.20	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 6", spade and spacer for 8" and above, Low temperature carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3.1 mm only for fittings below 2 inches
(13) as per PEGS-12059-PIP-029
(14) For sizes 18" and above, thickness calculations are performed with Allowable Stress values of A333 Gr 6
(15) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe.
(16) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Low temperature Carbon Steel (LTCS) (13)	**Rating:** 600 Lbs RF (Smooth finish)	**CLASS** **F 26 S**
Service: Process gas (Severe sour service), Gas & Condensate	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	102.1	102.1	93.2	87.6
Temperature (°C)	-46	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12
	Schedule (16)	XXS					160		120		100	
	Ends	PE				BE						
	Mat.Spec. (15)	ASTM A 333 Gr 6 seamless										

Fittings (17)	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, Sockolets, A350 LF2 CL.1	A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	600 Lbs RF, SW, A350 LF2 CL.1	WN, 600 Lbs RF, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 600 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	800 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)
Globe valves (5) (9)	800 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	800 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5)(7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3)
Strainers	600 Class, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL-6 carbon steel, SS316L screen
Gaskets (14)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B16.20	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 6", spade and spacer for 8" and above, Low temperature carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) "Smooth finish" facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3.1 mm only for fittings below 2 inches
(13) All materials shall comply with the NACE MR0175/ISO 15156 Standard & with the specification PEGS-0710-PIP-019 and 10008-STD-6-COR-032. Valve materials shall also conform to the specification PEGS-12060-MMA-002
(14) as per PEGS-12059-PIP-029
(15) For sizes 18" and above, thickness calculations are performed with Allowable Stress values of A333 Gr 6
(16) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe.
(17) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Stainless steel TP 316/316L	**Rating:** 600 Lbs RF	**CLASS** **F 49**
Service: Process gas, Fuel gas	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 2.2)				
Pressure (barg)	99.3	99.3	84.4	71.3
Temperature °C)	-46 (see note 14)	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	
	Schedule (17)	80 S					40 S			80 S		60	
	Ends	PE				BE							
	Mat.Spec.	A312 TP 316/316L (Dual stamped) Seamless or welded (EFW) per ASTM A358 Gr 316/316L class 1 (100% radiographed)											
Fittings (20)		3000 Lbs A182 F316/316L, SW, 45° or 90° elbows, couplings, tees, sockolets (2)				A403 WP 316/316L (19), thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A182 F316/316L weldolets, sweepolets (1)							
Flanges (3) (11)		150 Lbs RF, SW, A182 F316/316L				WN, 150 Lbs RF, A182 F316/316L, hub thickness as per pipe schedule, blind flanges (12)							
						WN, 300 Lbs RF, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection							
Gate valves													
Ball valves (10)		800 Lbs, A182 F316/316L, 316 Trim, Seals (8), Floating ball, SW				A182 F316/F316L or A351 CF8M Body, Type 316 Trim material, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)							
Globe valves (5) (9)		800 Lbs SW, A182 F316/F316L, 316 Trim, BB, OS&Y				A351 CF8M Body, 316 Trim, OS&Y, BB, Flanged (13)							
Plug valves													
Butterfly valves													
Check valves		800 Lbs SW, BC, A182 F316/316L, Horizontal piston lift (5) (7)				A351 CF8M Body, Type 316 Trim material, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3) (13)							
Strainers		600 Class, SW, A182 F316/316L, Y type, SS316L screen					Tee type Strainers, A403 WP 316/316L body, SS316L screen						
Gaskets (16)		Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and centering rings per ASME B 16.20											
Bolting		Studs A193 B8M class 2, Hh nuts A194 Gr 8MA, coating as per 10008-STD-6-COR-011											
Miscellaneous		Spectacle blind up to 6", spacer and spades for 8" and above, A240 TP 316/316L											

NOTES

(1) Connections to be calculated by Engineering Company

(2) Bending not permitted

(3) Flanges as per ASME B 16.5 for diameters up to 24" and as per ASME B 16.47 Series 'A' for diameters 26" and above

(4) Deleted

(5) Removable seat

(6) Deleted

(7) Horizontal installation

(8) Seal materials as per PEGS-12059-PIP-006 depending on operating conditions and fluid characteristics

(9) Swivel plug disc

(10) Firesafe and Anti-static device

(11) "Smooth finish" facing for use of Spiral wound gasket

(12) Blind flange may be in A182 F 316

(13) Forged steel to ASTMA182 F316/316L is an acceptable alternate for body materials

(14) Acceptable between -46°C and -140°C for blow down situation only (no valve manually operated below -46°C)

(15) Deleted

(16) As per PEGS-12059-PIP-029

(17) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for EFW pipe

(18) A403 WP 316L class S or class WX full dye penetrant on the weld surface and radiographic examination after forming and heat treatment

(19) Stainless steel bolting to ASTM A193 Gr.B8M may conform to class 1 instead of class 2 for bolt diameter larger than 1.5"

(20) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 900 Lbs RJ	**CLASS** **G 01**
Service: Process gas	**Corrosion allowance:** 1.27 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	153.2	153.2	139.8	131.4
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12
	Schedule (15)	80							120	100		
	Ends	PE				BE						
	Mat.Spec. (16)	API 5 L Gr B seamless							ASTM A 333 Gr 6 seamless			
Fittings (17)		3000 Lbs SW, A105, 45° or 90° elbows, couplings, tees, Sockolets (2)				A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)			A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)			
Flanges (3) (11) (14)		1500 Lbs RJ, SW, A105				WN, 900 Lbs RJ, A105, hub thickness as per pipe schedule, blind flanges			WN, 900 Lbs RJ, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges			
						WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection						
Gate valves												
Ball valves (10)		1500 Lbs SW, A105, 316 Trim, Seals (8), Floating ball				A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)						
Globe valves (5) (9)		1500 Lbs SW, A105, Stellite coated, OS&Y, BB				A216 WCB Body, F6 Trim, Flanged, OS&Y, BB						
Plug valves												
Butterfly valves												
Check valves		1500 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift				A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC or pressure seal) is acceptable if density is above 0.7 (3)						
Strainers		1500 Class, SW, A105, Y type, SS316L screen					Tee type Strainers, A234 WPB body, SS316L screen					
Gaskets		Octagonal Ring Joint, Soft Iron (Armco), per ASME B16.20 – 90 HB max, 900 Lbs rating										
Bolting		Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011										
Miscellaneous		Spectacle blind up to 4", spade and spacer for 6" and above, carbon steel A516 Gr.70N										

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above Minimum Brinell hardness 110 HB
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-006 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Ring joint facing
(12) Valves shall be clearly identified and equipped with elastomeric seals suitable to methanol service
(13) For diameters 18 inches and above, fittings according to A860 WPHY60, wall thickness to suit matching pipe.
(14) For diameters 18 inches and above, flanges per ASTM A694 grade F60, to match pipe wail thickness grade F60, to match pipe wall thickness.
(15) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(16) Product Specification Level PSL-2 is required for pipe API 5L Gr. B and API 5L X60
(17) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 900 Lbs RJ	**CLASS** **G 03**
Service: Process gas, Drain pressurized	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	153.2	153.2	139.8	131.4
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16
	Schedule (14)	160						120						
	Ends	PE				BE								
	Mat.Spec. (15)	API 5 L Gr B seamless				A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)			ASTM A 333 Gr 6 seamless						
Fittings (16)		6000 Lbs SW, A105, 45° or 90° elbows, couplings, tees, Sockolets (2)							A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)					
Flanges (11)		1500 Lbs RJ, SW, A105				WN, 900 Lbs RJ, A105, hub thickness as per pipe schedule, blind flanges (3)			WN, 900 Lbs RJ, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges (3)					
						WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection								
Gate valves														
Ball valves (10)		1500 Lbs SW, A105, 316 Trim, Seals (8), Floating ball				A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)								
Globe valves (5) (9)		1500 Lbs SW, A105, Stellite coated, OS&Y, BB				A216 WCB Body, F6 Trim, Flanged, OS&Y, BB								
Plug valves														
Butterfly valves														
Check valves		1500 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift				A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC or pressure seal) is acceptable if density is above 0.7 (3)								
Strainers		1500 Class, SW, A105, Y type, SS316L screen							Tee type Strainers, A234 WPB body, SS316L screen					
Gaskets		Octagonal Ring Joint, Soft Iron (Armco), per ASME B16.20 – 90 HB max, 900 Lbs rating												
Bolting		Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011												
Miscellaneous		Spectacle blind up to 4", spade and spacer for 6" and above, carbon steel A516 Gr.70N												

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above Minimum Brinell hardness 110 HB
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-006 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Ring joint facing
(12) For diameters 18 inches and above, fittings according to A860 WPHY60, wall thickness to suit matching pipe.
(13) For diameters 18 inches and above, flanges per ASTM A694 grade F60, to match pipe wail thickness grade F60, to match pipe wall thickness.
(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(15) Product Specification Level PSL-2 is required for pipe API 5L Gr. B and API 5L X60
(16) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: Carbon steel	**Rating:** 900 Lbs RJ	**CLASS** **G 06**
Service: Process gas	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	153.2	153.2	139.8	131.4
Temperature (°C)	-29	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16
	Schedule (15)	XXS							160	140				
	Ends	PE				BE								
	Mat.Spec. (16)	API 5 L Gr B seamless					ASTM A 333 Gr 6 seamless							

Fittings (17)	6000 Lbs SW, A105, 45° or 90° elbows, couplings, tees, Sockolets (2)	A234 WPB, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A105 weldolets, sweepolets (1)	A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	1500 Lbs RJ, SW, A105	WN, 900 Lbs RJ, A105, hub thickness as per pipe schedule, blind flanges	WN, 900 Lbs RJ, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection	
Gate valves			
Ball valves (10)	1500 Lbs SW, A105, 316 Trim, Seals (8), Floating ball	A105 or A216 WCB Body, A105 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)	
Globe valves (5) (9)	1500 Lbs SW, A105, Stellite coated, OS&Y, BB	A216 WCB Body, F6 Trim, Flanged, OS&Y, BB	
Plug valves			
Butterfly valves			
Check valves	1500 Lbs SW, A105, BC, Stellite coated (5) (7), Horizontal piston lift	A216 WCB Body, Trim stellite coated for diameters 2" to 4" and F6 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC or pressure seal) is acceptable if density is above 0.7 (3)	
Strainers	1500 Class, SW, A105, Y type, SS316L screen	Tee type Strainers, A234 WPB body, SS316L screen	
Gaskets	Octagonal Ring Joint, Soft Iron (Armco), per ASME B16.20 – 90 HB max, 900 Lbs rating		
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011		
Miscellaneous	Spectacle blind up to 4", spade and spacer for 6" and above, carbon steel A516 Gr.70N		

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending R = 5 dia. to be used wherever possible
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above Minimum Brinell hardness 110 HB
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-006 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Ring joint facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3 mm only for fittings below 2 inches.
(13) Deleted.
(14) Deleted.
(15) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for SAW pipe
(16) Product Specification Level PSL-2 is required for pipe API 5L Gr. B and API 5L X60
(17) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Low temperature Carbon Steel (LTCS)	**Rating:** 900 Lbs RJ	**CLASS** **G 23**
Service: Process gas	**Corrosion allowance:** 3 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)				
Pressure (barg)	153.2	153.2	139.8	131.4
Temperature (°C)	-46	+ 37	+ 100	+ 200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16	
	Schedule (13)	160						120							
	Ends	PE				BE									
	Mat.Spec. (12)	ASTM A 333 Gr 6 seamless													
Fittings (14)		6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, Sockolets, A350 LF2 CL.1				A420 WPL6 or A420 WPL6W-100% radiographed for diameter 18" and above, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)									
Flanges (3) (11)		1500 Lbs RJ, SW, A350 LF2 CL.1				WN, 900 Lbs RJ, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges									
						WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection									
Gate valves															
Ball valves (10)		1500 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball				A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)									
Globe valves (5) (9)		1500 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB				A352 LCC Body, F316 Trim, Flanged, OS&Y, BB									
Plug valves															
Butterfly valves															
Check valves		1500 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5) (7), Horizontal piston lift				A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC or pressure seal) is acceptable if density is above 0.7 (3)									
Strainers		1500 Lbs, SW, A350 LF2 CL.1, Y type, SS316L screen				Tee type Strainers, A420 WPL-6 carbon steel, SS316L screen									
Gaskets		Octagonal Ring Joint, Soft Iron (Armco), per ASME B16.20 – 90 HB max, 900 Lbs rating													
Bolting		Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011													
Miscellaneous		Spectacle blind up to 4", spade and spacer for 6" and above, Low temperature carbon steel A516 Gr.70N													

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above . Minimum Brinell hardness 110 HB
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Ring joint facing
(12) For sizes 18" and above, thickness calculations are performed with Allowable Stress values of A333 Gr 6
(13) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe. Minimum calculated thickness for pipe diameter 26" and above

26	28	30	32	34	36	38	40	42	44	46
41.4 mm	44.4 mm	47.3 mm	50.2 mm	53.2 mm	56.1 mm	59.0 mm	62.0 mm	64.9 mm	67.8 mm	70.8 mm

(14) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design

PIPING MATERIALS

Material: Low temperature Carbon Steel (LTCS)	**Rating:** 900 Lbs RJ	**CLASS** **G 26**
Service: Process gas	**Corrosion allowance:** 6 mm (12)	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 1.1)

Pressure (barg)	153.2	153.2	139.8	131.4
Temperature (°C)	-46	+ 37	+ 100	+ 200

Pipes	**Diameter**	**½**	**¾**	**1**	**1 ½**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**
	Schedule (14)	XXS							160	140				
	Ends	PE				BE								
	Mat.Spec.	ASTM A 333 Gr 6 seamless												

Fittings (15)	6000 Lbs SW, 45° or 90° elbows (2), couplings, tees, Sockolets, A350 LF2 CL.1	A420 WPL6, thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A350 LF2 CL.1 weldolets, sweepolets (1)
Flanges (3) (11)	1500 Lbs RJ, SW, A350 LF2 CL.1	WN, 900 Lbs RJ, A350 LF2 CL.1, hub thickness as per pipe schedule, blind flanges
		WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	1500 Lbs SW, A350 LF2 CL.1, 316 Trim, Seals (8), Floating ball	A350 LF2 CL.1 or A352 LCC Body, A350 LF2 CL.1 ENP ball, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)
Globe valves (5) (9)	1500 Lbs SW, A350 LF2 CL.1, Stellite coated, OS&Y, BB	A352 LCC Body, F316 Trim, Flanged, OS&Y, BB
Plug valves		
Butterfly valves		
Check valves	1500 Lbs SW, A350 LF2 CL.1, BC, Stellite coated (5) (7), Horizontal piston lift	A352 LCC Body, Trim stellite coated for diameters 2" to 4" and F316 for diameters 6" and above, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC or pressure seal) is acceptable if density is above 0.7 (3)
Strainers	1500 Lbs, SW, A350 LF2 CL.1, Y type, SS316L screen	Tee type Strainers, A420 WPL-6 carbon steel, SS316L screen
Gaskets	Octagonal Ring Joint, Soft Iron (Armco), per ASME B16.20 – 90 HB max, 900 Lbs rating	
Bolting	Studs A193 B7M, Hh nuts A194 2HM, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 4", spade and spacer for 6" and above, Low temperature carbon steel A516 Gr.70N	

NOTES

(1) Connections to be calculated by Engineering Company
(2) Bending not permitted
(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above . Minimum Brinell hardness 110 HB
(4) Deleted
(5) Removable seat
(6) Deleted
(7) Horizontal installation
(8) Seal materials as per 10008-STD-6-PIP-012 depending on operating conditions and fluid characteristics
(9) Swivel plug disc
(10) Firesafe and Anti-static device
(11) Ring joint facing
(12) Corrosion allowance limited to 5 mm only for nominal pipe sizes below 1 inch and to 3.1 mm only for fittings for below 2 inches
(13) Deleted
(14) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for welded pipe.
(15) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP-97 and Sweepolet as per Manufacturer design.

PIPING MATERIALS		
Material: Stainless steel TP 316/316L	**Rating:** 900 Lbs RJ	**CLASS** **G 49**
Service: Process gas	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits (Group 2.2)				
Pressure (barg)	148.9	148.9	126.6	107.0
Temperature (°C)	-46 (see note 14)	+37	+100	+200

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12	14	16
	Schedule (16)	80 S								14.27 mm	18.26 mm	20.62 mm	22.23 mm	25.4 mm
	Ends	PE				BE								
	Mat.Spec.	A312 TP 316/316L Seamless or welded (EFW) per ASTM A358 Gr 316/316L class 1 (100% radiographed)												

Fittings (19)	3000 Lbs A182 F316/316L, SW, 45° or 90° elbows, couplings, tees, sockolets (2)	A403 WP 316/316L (17), thickness as per pipe schedule, BW, 45° or 90° elbows (r = 1.5 dia.), concentric/eccentric reducers, tees, A182 F316/316L weldolets, sweepolets (1)
Flanges (3) (11)	1500 Lbs RF, SW, A182 F316/316L	WN, 900 Lbs RJ, A182 F316/316L, hub thickness as per pipe schedule, blind flanges (12)
		WN, 900 Lbs RJ, Orifice flange as per ASME B16.36 supplied with bolting for instrument connection
Gate valves		
Ball valves (10)	1500 Lbs, A182 F316/316L, 316 Trim, Seals (8), Floating ball, SW	A182 F316/F316L or A351 CF8M Body, Type 316 Trim material, Seals (8), SPB or TPE, Trunnion mounted, Gearbox for diameters 6" and above, Flanged (3)
Globe valves (5) (9)	1500 Lbs SW, A182 F316/316L, 316 Trim, BB, OS&Y	A351 CF8M Body, 316 Trim, OS&Y, BB, Flanged (13)
Plug valves		
Butterfly valves		
Check valves	1500 Lbs SW, BC, A182 F316/316L (5) (7), Horizontal piston lift	A351 CF8M Body, Type 316 Trim material, Dual-Plate (Lug-type for 8" and below, Flanged-type for 10" and above). Swing type (flanged, BC) is acceptable if density is above 0.7 (3) (13)
Strainers	1500 Class, SW, A182 F316/316L, Y type, SS316L screen	Tee type Strainers, A403 WP 316/316L body, SS316L screen
Gaskets	Octagonal Ring Joint, TP 316 SS, per ASME B16.20 - 135 HB max, 900 Lbs rating	
Bolting (18)	Studs A193 B8M class 2, Hh nuts A194 Gr 8MA, coating as per 10008-STD-6-COR-011	
Miscellaneous	Spectacle blind up to 4", spade and spacer for 6" and above, A240 TP316/316L	

NOTES

(1) Connections to be calculated by Engineering Company

(2) Bending not permitted

(3) Flanges as per ASME B16.5 for diameters up to 24" and as per ASME B16.47 Series 'A' for diameters 26" and above. Minimum Brinell hardness 150 HB

(4) Deleted

(5) Removable seat

(6) Deleted

(7) Horizontal installation

(8) Seal materials as per PEGS-12059-PIP-006 depending on operating conditions and fluid characteristics

(9) Swivel plug disc

(10) Firesafe and Anti-static device

(11) Ring joint facing, minimum hardness 150 HB

(12) Blind flange may be in A182 F316

(13) Forged steel to ASTMA182 F316/316L is an acceptable alternate for body materials

(14) Acceptable between -46°C and -140°C for blow down situation only (no valve manually operated below -46°C)

(15) Deleted

(16) Thickness based on mill tolerance as per PEGS-12059-PIP-005 and weld coefficient = 1 for EFW pipe

(17) A403 WP 316L class S or class WX full dye penetrant on the weld surface and radiographic examination after forming and heat treatment

(18) Stainless steel bolting to ASTM A193 Gr.B8M may conform to class 1 instead of class 2 for bolt diameter larger than 1.5"

(19) Integrally Reinforced Forged Branch Outlet Fittings (weldolet, sockolet) as per MSS SP 97 and Sweepolet as per Manufacturer design

PIPING MATERIALS		
Material: High-Strength Carbon steel	**Rating:** 300 Lbs RF (smooth finish)	**CLASS** **B31.8**
Service: Slug Catcher	**Corrosion allowance:** 6 mm	**Date:** 07/2022 **Rev. C2**

Pressure / Temperature limits	
Pressure (barg)	40.0
Temperature (°C)	(-)29 to 70

Diameter	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**40**	**48**	**52**	**56**
Schedule/ Wall thickness (4)	XXS	160	120	80		40				XS			15.88 mm	17.48 mm	19.05 mm	
Ends	Bevel End (BE)															
Mat.Spec.	API 5L X65, PSL2, SMLS												API 5L X65, PSL2, SAW - 100% Radiographed			
Fittings (5) (6)	ASTM A860 WPHY65 – 45° or 90° Elbow (R = 1.5 dia.), Concentric/Eccentric Reducer, Tee, Cap, BW to ASME B16.9 and MSS SP-75, thickness as per pipe schedule ASTM A694 F65 – Weldolet, Sweepolet to MSS SP-97, BW to ASME B16.25, thickness as per pipe schedule												ASTM A860 WPHY65 – 45° or 90° Elbow (R = 1.5 dia.), Concentric/Eccentric Reducer, Tee, Cap, BW to ASME B16.9 and MSS SP-75, thickness as per pipe schedule			
Flanges (1) (2)	ASTM A694 F65 – WN & Blind Flange, thickness as per pipe schedule CL.300, RF, Smooth finish															
Gaskets (3)	Spiral wound, graphite filler, 4 mm thick 316L SS winding, 3.2 mm thick inner and external rings per ASME B16.20															
Bolting	Studs A193 B7, Hh nuts A194 2H, coating as per 10008-STD-6-COR-011															
Miscellaneous	Spectacle blind, Fig.8 up to 6", Spade and Spacer for 8" and above, Carbon steel A516 Gr.70N, per ASME B16.48 and Manufacturer's Standard															

NOTES

(1) Flanges shall be as per ASME B16.5 for size up to 24" and as per ASME B16.47 Series A for size above 24".

(2) Flange facing shall be "Smooth finish", maximum roughness 125 AARH - 250 AARH (3.2µm - 6.3µm).

(3) As per PEGS-12059-PIP-029.

(4) Pipe wall thickness calculation is based on ASME B31.8 Code.

(5) Integrally Reinforced Forged Branch Outlet Fittings (Weldolet) as per MSS SP-97 and Sweepolet as per Manufacturer design.

(6) All butt welding fittings shall be as per ASME B16.9 and MSS SP-75.

(7) Impact test required as the design temperature is -29°C.

PIPING MATERIALS		
Material: PVC	**Rating:** 150 Lbs FF	**CLASS** **PVC**
Service: Chlorine	**Corrosion allowance:** 0 mm	**Date:** 07/2022 **Rev. C2**
	Pressure / Temperature limits	
	Pressure (barg)	See Note 5, 6
	Temperature (°C)	0 +60

Pipes	**Diameter**	½	¾	1	1 ½	2	3	4	6	8	10	12
	Thickness	SCH 80										
	Ends	PE										
	Mat.Spec.	PVC, ASTM D1785, Type I, Grade 1										
Fittings		PVC, ASTM D2467, Type I, Grade 1 SCH 80 Socket ends										
Flanges (1) (2)		PVC, ASTM D2467, Type I, Grade 1, SCH 80 Socket Type & 150# FF Flange ASME B16.5 PVC, ASTM D2467, Type I, Grade 1 & 150# FF Blind Flange ASME B16.5										
Ball valves (4)		Body & Ball, PVC, SCH 80 Socket ends, True union ball valve, according to Manufacturer's standard										
Check Valve		Body & Ball/Wedge, PVC, SCH80, Socket ends, True union ball check valve, according to Manufacturer's standard										
Gaskets (3)		Neoprene flat gaskets, 3 mm thick, SHORE A hardness 60 to 70 maximum, per ASME B16.21										
Bolting		Studs A193 B7, with two washers and Hh nuts A194 2H, coating as per 10008-STD-6-COR-011										

NOTES

(1) Flange vendor shall provide bolt length, bolt torque table and certified dimensional drawings.

(2) "Stock finish" facing

(3) As per PEGS-12059-PIP-029

(4) Bores of all valves to suit pipe bores

(5) Pressure rating, Temperature de-rating factor and pipe support span shall be confirmed with Vendor during EPC phase.

(6) The pressure ratings as per ASTM D1785 Type I, Grade 1 @73°F (or 22.8°C) with plain end pipe (unthreaded).

NPS	½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"
Max. Working pressure (barg)	58.6	47.6	43.4	32.4	27.6	25.5	22.1	19.3	17.2	15.9	15.9

Recommended Temperature De-rating Factor

Operating Temperature (°F)	Operating Temperature (°C)	De-Rating Factor
73	22.8	1.00
80	26.4	0.88
90	32.2	0.75
100	37.8	0.62
110	43.3	0.51
120	48.9	0.40
130	54.4	0.31
140	60	0.22

ATTACHMENT 2 – BRANCH REINFORCEMENT TABLE

ATTACHMENT 2

BRANCH REINFORCEMENT TABLE - CS, LTCS AND SS

Applicable pipe class: B01, B03, B23, B49, B70, D03, D06, D23, D49, F03, F03N, F06, F06S, F23, F26, F26S, F49, G01, G03, G06, G23, G26, G49, B31.8

Header																							
1/2	T																						
3/4	RT	T																					
1	RT	RT	T																				
1 1/2	RT	RT	RT	T																			
2	W	W	W	W	T																		
3	W	W	W	W	RT	T																	
4	W	W	W	W	RT	RT	T																
6	W	W	W	W	W	RT	RT	T															
8	W	W	W	W	W	W	RT	RT	T														
10	W	W	W	W	W	W	W	RT	RT	T													
12	W	W	W	W	W	W	W	RT	RT	RT	T												
14	W	W	W	W	W	W	W	W	RT	RT	RT	T											
16	W	W	W	W	W	W	W	W	RT	RT	RT	RT	T										
18	W	W	W	W	W	W	W	W	W	RT	RT	RT	RT	T									
20	W	W	W	W	W	W	W	W	W	RT	RT	RT	RT	RT	T								
24	W	W	W	W	W	W	W	W	W	RT+R	RT	RT	RT	RT	RT	T							
26	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT	RT	RT	RT	RT	T						
28	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT	RT	RT	RT	RT	RT	T					
30	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT+R	RT	RT	RT	RT	RT	RT	T				
40	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT+R	RT+R	RT **(4)**	RT	RT	RT	RT	RT	T			
48	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	RT	RT	RT	T		
52	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	RT	RT	RT	T	
56	W	W	W	W	W	W	W	W	W	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT **(4)**	RT+R	RT	RT	RT	RT	RT	T
	1/2	**3/4**	**1**	**1 1/2**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**26**	**28**	**30**	**40**	**48**	**52**	**56**	**Branch**

Notes:

1. W : O' let- Sockolet or Threadolet for branch diameter < 2", Weldolet for large diameter.
   T : Equal Tee / RT : Reduced tee, socket weld end for diameter < 2", but weld for large diameter.
   RT+R : Reduced tee and reducer
2. For branch reinforcement special cases, 10008-STD-6-PIP-009 shall apply
3. For piping class B90, B91 branch reinforcement table shall be confirmed by vendor.
4. Reducing Tee shall be used for Branch size 56" x 24" and 40" x 18" as per MM-ASK-1A-APF-PIP-TQ-0002.

ATTACHMENT 2

BRANCH REINFORCEMENT TABLE - CS (GALV.)

Applicable pipe class: B10

Header										
1/2	T									
3/4	RT	T								
1	RT	RT	T							
1 1/2	RT	RT	RT	T						
2	RT+R	RT+R	RT	RT	T					
3	RT+R	RT+R	RT+R	RT	RT	T				
4	W	W	W	W	RT	RT	T			
6	W	W	W	W	W	RT	RT	T		
8	W	W	W	W	W	W	RT	RT	T	
	1/2	**3/4**	**1**	**1 1/2**	**2**	**3**	**4**	**6**	**8**	**Branch**

Notes:

1. T : Equal Tee; Threaded ends for diameter ≤ 3", Butt welded ends for diameter > 3"
   RT : Reduced Tee; Threaded ends for diameter ≤ 3", Butt welded ends for diameter > 3"
   RT+R : Reduced tee and reducer
   W : O' let- Threadolet for branch diameter ≤ 3", Weldolet for branch diameter > 3".
2. For branch reinforcement special cases, 10008-STD-6-PIP-009 shall apply

ATTACHMENT 2

BRANCH REINFORCEMENT TABLE - NON-METALLIC

Applicable pipe class: PVC

Header												
1/2	T											
3/4	RT	T										
1	RT	RT	T									
1 1/2	RT	RT	RT	T								
2	RT	RT	RT	RT	T							
3	RT+R	RT+R	RT+R	RT	RT	T						
4	RT+R	RT+R	RT+R	RT+R	RT	RT	T					
6	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	T				
8	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	T			
10	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	T		
12	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT+R	RT	RT	RT	T	
	1/2	**3/4**	**1**	**1 1/2**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**Branch**

Notes:

1. T : Equal Tee / RT : Reduced tee
   RT+R : Reduced tee and reducer
2. For piping class B91 branch reinforcement table shall be confirmed by vendor during detailed engineering design.

ATTACHMENT 3 – BOLTING TABLE

ATTACHMENT 3

STUD BOLT TABLE

FLANGE SIZE (INCH)	150# RF			300# RF			600# RF			900# RTJ			
	BOLT SIZE		Q'TY	BOLT SIZE		Q'TY	BOLT SIZE		Q'TY	BOLT SIZE		Q'TY	GASKET NO.
	BOLT DIAMETER	BOLT LENGTH		BOLT DIAMETER	BOLT LENGTH		BOLT DIAMETER	BOLT LENGTH		BOLT DIAMETER	BOLT LENGTH		
1/2"	1/2"	65	4	1/2"	75	4	1/2"	85	4	3/4"	120	4	R12
3/4"	1/2"	75	4	5/8"	85	4	5/8"	100	4	3/4"	125	4	R14
1"	1/2"	75	4	5/8"	85	4	5/8"	100	4	7/8"	135	4	R16
11/2"	1/2"	80	4	3/4"	100	4	3/4"	120	4	1"	150	4	R20
2"	5/8"	95	4	5/8"	100	8	5/8"	120	8	7/8"	155	8	R24
3"	5/8"	100	4	3/4"	120	8	3/4"	135	8	7/8"	155	8	R31
4"	5/8"	100	8	3/4"	125	8	7/8"	155	8	1.1/8"	180	8	R37
6"	3/4"	110	8	3/4"	130	12	1"	180	12	1.1/8"	205	12	R45
8"	3/4"	120	8	7/8"	150	12	1.1/8"	205	12	1.3/8"	230	12	R49
10"	7/8"	125	12	1"	170	16	1.1/4"	225	16	1.3/8"	245	16	R53
12"	7/8"	130	12	1.1/8"	180	16	1.1/4"	230	20	1.3/8"	265	20	R57
14"	1"	145	12	1.1/8"	190	20	1.3/8"	245	20	1.1/2"	290	20	R62
16"	1"	145	16	1.1/4"	200	20	1.1/2"	265	20	1.5/8"	345	20	R66
18"	1.1/8"	155	16	1.1/4"	205	24	1.5/8"	330	20	1.7/8"	395	20	R70
20"	1.1/8"	170	20	1.1/4"	215	24	1.5/8"	350	24	2"	425	20	R74
24"	1.1/4"	180	20	1.1/2"	240	24	1.7/8"	400	24	2.1/2"	530	20	R78
26"	1.1/4"	235	24										
28"	1.1/4"	240	28										
30"	1.1/4"	245	28										

NOTES :

1. BOLT LENGTH ARE IN MILLIMETER.
2. BOLTING FOR USE WITH BOLT TENSIONERS (FOR STUD BOLT DIAMETER GREATER THAN 1.1/2") SHALL HAVE LENGTH INCREASED BY ONE BOLT DIAMETER, AND THE EXPOSED THREADS SHALL BE PROTECTED WITH CORROSION CAP.
3. FOR PIPING CLASS B91, BOLTING TABLE SHALL BE CONFIRMED BY VENDOR DURING DETAILED ENGINEERING DESIGN.

ATTACHMENT 4 – NOTES FOR MODIFICATION OF PIPE CLASSES FROM PEGS

ATTACHMENT 4

NOTES FOR MODIFICATION OF PIPE CLASSES FROM PEGS

ITEM NO.	TOPIC	PIPING CLASS	MODIFICATION DESCRIPTION	Remark
1	Pipe wall thicknesses	G03	Pipe wall thicknesses have been modified as per wall thickness calculation, Doc no. MM-ASK-1A-APF-PIP-CAL-0001	
2	Coating of Bolting	All	Revise reference PEGS for Coating of Bolting to 10008-STD-6-COR-011	
3	Changes material from CS to LTCS	F03, G03	Revise material from CS to LTCS for pipes, flanges, and fittings for wall thickness above 12.7 mm	
4	Impact test requirement	F03, G03	Add requirement "impact test at -29°C is mandatory" for material grade API 5L X60-SAW 100% RT.	
5	Applicable valves for piping classes used for hydrocarbon services	B01, B03, B23, F03, F23, G03, G23	Delete Gate valves, Plug valves and Butterfly valves which are not applicable for piping classes used for hydrocarbon services	
6	Applicable valves for piping classes used for utility services.	B10	Delete Plug valves and Ball valves which are not applicable for piping classes used for utility services.	
7	Flange face "Stock finish"	All	Delete "Stock finish" requirement for pipe classes used RF flange.	
8	Flange face "Smooth finish"	All	Delete "Smooth finish" requirement for pipe classes used FF flange.	
9	Gasket type for RF Flange	All	Identify gasket type for RF flange to be Spiral wound type only.	
10	Gasket type for FF Flange	All	Identify gasket type for FF flange to be Flat gasket type only.	
11	Suffix "R"	-	Delete Suffix "R" - Piping classes govened by Code ASME B31.5 in section 4.2.4	
12	Fluid	All	Update fluid according to applicable services for this Project.	
13	Size range	All	Update pipe size range according to exactly used for this Project.	
14	Pipe Class B31.8	B31.8	Add pipe class B31.8 for Slug Catcher	
15	BW Pipes, Fittings and Flanges for Galvanized pipe class	B10	Add BW Pipes, Fittings and Flanges for Galvanized pipe class	
16	Valve material	B91	Revised gate valve material from Cast Alu-Bronze to CS.	
17	New Pipe Class	B70, B90, G26	Add New Pipe Class	