中海油石化工程有限公司 CNOOC Petrochemical Engineering Co.,Ltd.	**SPECIFICATION FOR PROCESS PIPING MATERIALS**	Owner Doc.No.	CMIT-240048-728-PIP-15.03-3001	
		Job's Doc. No.	253001D0728MP00S01	
		Phase	Detailed Design	
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Company:	CMIT CNOOC IRAQ LIMITED
Project:	FQN NEW DEGASSING STATION UPGRADING PROJECT
Unit:	FQN DEGASSING STATION
Contract No.: `	CMIT-PRT-10.53-240048

Discipline: PIP

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Rev.	Description	PRED.	CHKD.	APPR.		Date
A	ISSUED FOR REVIEW	LIUXINYU	MAXIANGRONG	CUIQI		20250617

DOCUMENT REVISION HISTORY SHEET

REV	DATE	REVISION DETAILS
A	17/06/2025	First issue

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1. GENERAL

MISSAN Oil Field is located in the SE of Iraq, close to Iran's border, about 175 km N-NW of BASRA City, and 350 km SE of Baghdad – the capital of Iraq.

MISSAN Oil Field includes three producing fields namely Abu GHIRAB, BUZURGAN and FAUQI. Abu GHIRAB and FAUQI fields extend beyond the Iranian border.

Since MISSAN Oil Field was built in 1976, it has suffered from the Iran-Iraq War and the Iraq War, so a lot of facilities needs to be upgraded and revamped.

The intended project is mainly concerned for New Degassing Station Upgrade in FQN.

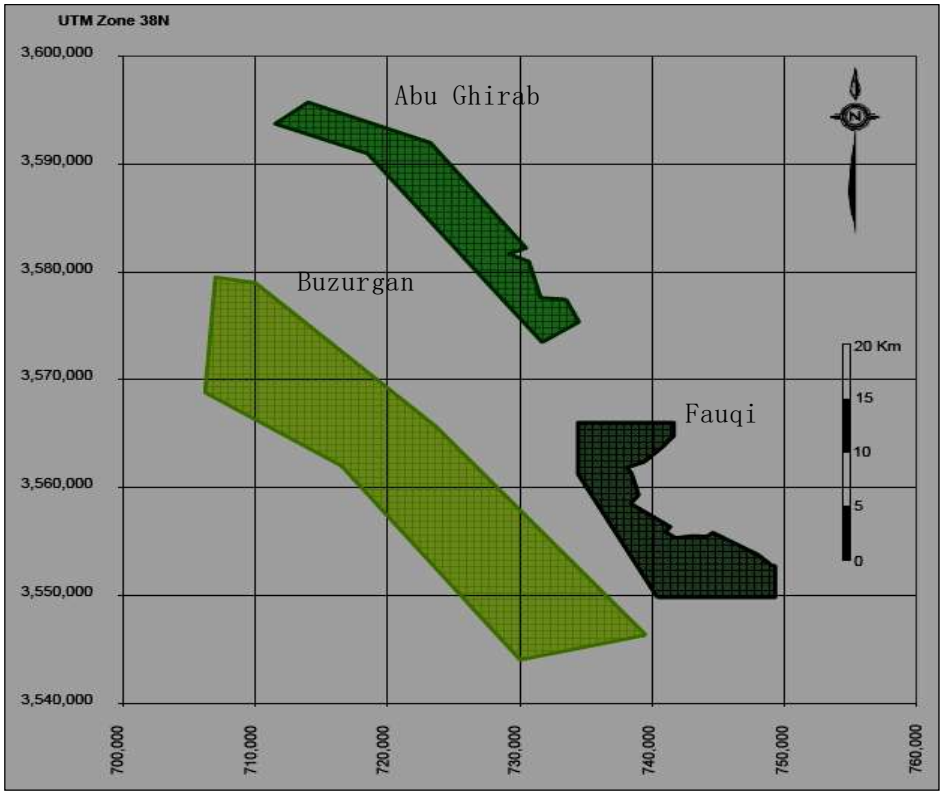

Figure 1.1-1 The overall MISSAN Oil Field

General Field Layout is shown in below figure:

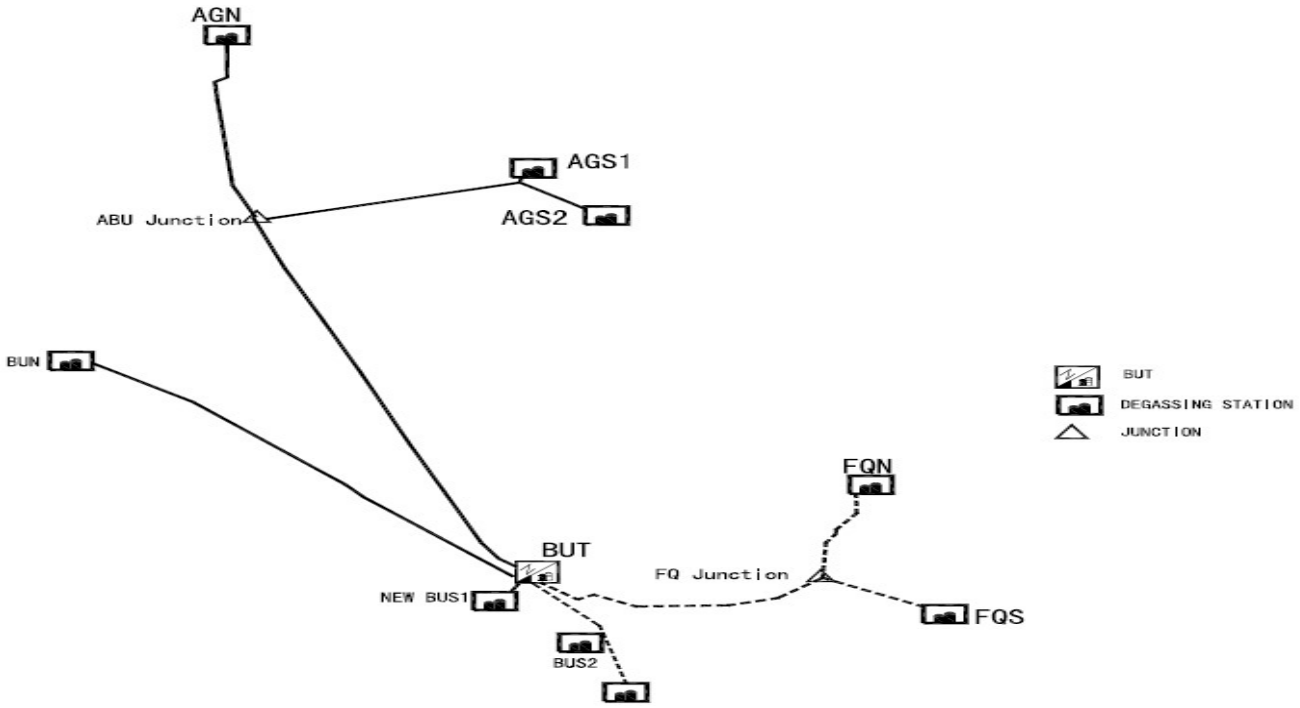

Figure 1.1-2 General Field Layout

1.1. Degassing Station (DS):

The FQN degassing station was built in 1976,the crude oil with gas and water was sent to the DS, the main target for DS is to separate the gas and water from crude oil, and to entirely test/meter each individual well from well pad. Separated Liquid and Gas are exported via individual Trunkline(s) to the BUT CPF located in Buzurgan Area for further processing and treatment.

Due to the increase of liquid form the well, the existing facilities of FQN can not meet the requirement, so two Crude Processing Trains (50 Kbbl/d plus 20% (each)) will be added in FQN degassing station,and other Utilities and Auxiliary Supporting Systems will be added too.

1.2. Abbreviation and Acronyms

The following definitions shall apply to this document:

COMPANY: CNOOC IRAQ LIMITED

PMC:Project Management Consultant

CONTRACTOR :CNOOC Petrochemical Engineering Co.,Ltd (COPCL or CNOOCPEC).

DGS or **DS**: Degassing Station

1.3. Scope

This specification governs the selection and limitations of piping and piping system components in the FQN degassing station which belongs to the scope of ASME B31.3.This section should be read in conjunction with associated specifications of this project and most stringent shall be followed when conflicts. The design of wellheads and flowlines is not included in the scope of work.

2. CODES, REGULATIONS, STANDARDS

2.1. Codes and Standards

Vendor shall meet or exceed the requirements of the latest edition or the equivalent ones of the following codes, regulations and standards, except as superseded herein. In cases where more than one code, regulation or standard apply to the same condition, the most stringent shall be followed. In the event of a conflict between this specification and other specifications or correspondence, the COMPANY shall be consulted and a ruling, in writing, shall be obtained before any work is started.

ASME Standards

ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.5	Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	Factory-Made Wrought Buttwelding Fittings
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.11	Forged Fittings, Socket-Welding and Threaded
ASME B16.20	Metallic Gaskets for Pipe Flanges
ASME B16.21	Non-metallic Flat Gaskets for Pipe Flanges
ASME B16.34	Valves - Flanged, Threaded, and Welding End

ASME B16.47	Large Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard
ASME B16.48	Line Blanks
ASME B18.2.2	Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.31.2	Continuous Thread Stud, Double-End Stud, and Flange Bolting Stud (Stud Bolt) (Inch Series)
ASME B31.3	Process Piping
ASME B31.4	Pipeline Transportation Systems for Liquids and Slurries
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe

ASTM Standards

ASTM A105/ A105M	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A106/ A106M	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A182/ A182M	Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A193/ A193M	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A194/ A194M	Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A234/ A234M	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A312/	Standard Specification for Seamless, Welded, and Heavily Cold

A312M	Worked Austenitic Stainless Steel Pipes
ASTM A403/ A403M	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM A790/ A790M	Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe
ASTM A815/ A815M	Standard Specification for Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM A928/ A928M	Standard Specification for Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal
ASTM D3350	Standard Specification For Polyethylene Plastics Pipe And Fittings Materials

API Standards

API STD 600	Steel Gate Valves - Flanged and Butt-welding Ends, Bolted Bonnets
API STD 602	Gate, Globe, and Check Valves for Sizes DN 100 (NPS 4) and Smaller for the Petroleum and Natural Gas Industries
API STD 607	Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
API STD 608	Metal Ball Valves - Flanged, Threaded, and Welding Ends
API STD 609	Butterfly Valves: Double-Flanged, Lug-and Wafer-type
API STD 623	Steel Globe Valves-Flanged and Buttwelding Ends, Bolted Bonnets
API STD 594	Check Valves: Flanged, Lug, Wafer, Butt-welding
API STD 598	Valve Inspection and Testing
API SPEC 6FA	Specification for Fire Test for Valves
API SPEC 6D	Specification for Valves
API SPEC 15LR	Specification for Low Pressure Fiberglass Line Pipe and Fittings

AWWA Standards

AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19 mm) Through 3 In. (76 mm), for Water Service
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks

MSS-SP Standards

MSS SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-43	Wrought and Fabricated Butt-Welding Fittings for Low Pressure, Corrosion Resistant Applications
MSS SP-75	High-Strength, Wrought, Butt-Welding Fittings
MSS SP-83	Class 3000 and 6000 Pipe Unions, Socket Welding and Threaded
MSS SP-95	Swage(d) Nipples and Bull Plugs
MSS SP-97	Integrally Reinforced Forged Branch Outlet Fittings-Socket Welding, Threaded, and Buttwelding Ends

NACE Standards

NACE MR0175 / ISO 15156	Petroleum and Natural Gas Industries - Materials for Use in H_2S-containing Environments in Oil and Gas Production
NACE MR0103 / ISO 17945	Petroleum, Petrochemical and Natural Gas Industries - Metallic Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
NACE TM0177	Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H_2S Environments
NACE TM0284	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking

ISO Standards

ISO 10497	Testing of Valves - Fire Type-Testing Requirements

ISO 15761	Steel Gate, Globe and Check Valves for Sizes DN 100 and Smaller, for the Petroleum and Natural Gas Industries
ISO 17292	Metal Ball Valves for Petroleum, Petrochemical and Allied Industries
ISO 5208	Industrial Valves - Pressure Testing of Metallic Valves

BS Standards

BS EN 10204	Metallic Products - Types of Inspection Documents
BS EN 12266	Industrial Valves - Testing of Metallic Valves

Note: This list covers the majority of references, but it is not exhaustive.

2.2. Reference Documents

The following General Specifications shall be used in conjunction with this specification where applicable:

CMIT-240048-728-PCS-15.69-0001	DESIGN BASIS
CMIT-240048-728-PIP-15.06-3001	PIPE WALL THICKNESS CALCULATION REPORT
CMIT-240048-728-PIP-15.70-3001	MATERIAL SELECTION REPORT
CMIT-240048-728-PIP-15.03-3002	SPECIFICATION FOR MANUAL VALVES
CMIT-240048-728-PIP-15.03-3004	SPECIFICATION FOR A106 GR.B SEAMLESS PIPING MATERIAL IN SOUR SERVICE
CMIT-240048-728-PIP-15.03-3005	SPECIFICATION FOR A105N FORGINGS MATERIAL IN SOUR SERVICE
CMIT-240048-728-PIP-15.03-3006	SPECIFICATION FOR A234 GR.WPB FITTING MATERIAL IN SOUR SERVICE
CMIT-240048-728-PIP-15.03-3007	SPECIFICATION FOR GRE PIPING MATERIAL

Some requirements in this specification may be modified by specific requirements in the Purchase Specification. In case of conflict, the specific requirements supersede this specification.

Any deviation from this specification must be approved, in writing, by COMPANY. Such written approval must be obtained prior to the commencement of any work which would constitute such a deviation.

2.3. Order of Precedence

All conflicts between the requirements of this specification, related contract documents national/ international documents, codes, engineering practices and the requisition shall be referred to COMPANY/CONTRACTOR for clarification. Should any conflict occur in the application of these specifications, the order of precedence shall be as follows:

1) Iraqi Laws and Regulations;

2) PURCHASE Order (including attachments) and variations thereon;

3) Data sheets and drawings;

4) This Technical Specification;

5) Project Specification in conjunction with native standard;

6) International codes and standards.

3. GENERAL

3.1 All pressures given in this Specification are gauge pressure unless specially noted.

3.2 Except under special conditions of severity, hazard, etc., the materials used shall be in accordance with the Piping Materials Specification which is based on the design pressure and temperature and on the type of service. The materials used under special conditions of severity and hazard must be suitable for the particular service conditions involved.

3.3 The corrosion allowance specified for the classes shall be considered in the calculation of the wall thickness.

3.4 In no case it shall be reduced to obtain a thinner commercially available pipe thickness.

3.5 The abbreviated material description in the classes gives brief information to the piping designer. For the supply of the material, detailed technical requirements shall be included in the purchasing requisitions.

3.6 All material used shall be selected in accordance with code requirements and industry standards for good workmanship.

3.7 Pipe materials shall be selected as follows, whenever temperature is the governing factor.

Material	Temperature Range
Carbon Steel	-29°C to 425°C
Low alloys (carbon-moly and chrome alloys)	-40°C to 450°C
Austenite Stainless Steel	-98°C to 450°C

Other types of materials or alloys shall be used where corrosive conditions are the governing factor. NACE MR 0175/ISO 15156 shall be used for selecting and treating of materials for piping in sour services.

3.8 The use of any materials containing asbestos is prohibited.

3.9 All piping materials shall meet the impact requirements of ASME B31.3. When Charpy V-notch testing is a requirement, it shall be conducted in accordance with ASTM Standard A370 below the minimum design temperature.

3.10 Marking for pipe and fittings shall be done as per relevant piping standard, and shall include the following,

The size

Pipe schedule/wall thickness

The specification and grade of material

The heat number

The batch number

On ferrous material with a thickness under 5mm (austenitic steels under 10mm), marking shall be applied by engraving or by stenciling. For stencil marking, a water insoluble ink shall be used, that does not contain substances which could harmfully affect the material.

On ferrous material with a thickness 5mm & over (austenitic steels 10mm & over), marking shall be applied by low stress hard die stamping. Low stress stamps shall have a round nose with a radius of minimum 0.25mm.

4. PIPE

4.1 Pipe shall normally be as specified in the Specification for Piping Materials for the applicable Piping Class Rating and Service.

4.2 Piping for service below -29°C and above 454°C shall be approved in writing by COMPANY.

4.3 Material ASTM A106 Gr. B (SSC&HIC) is for sour service. For chemical injection service, ASTM A 312-TP316L shall be used. For liquid sulphur, steam jacked carbon steel is used. For the other service material selection, please refers to Appendix B.

4.4 Marking and Finish

Pipe shall be legibly marked in accordance with the applicable ASTM or ISO specification.

4.5 Pipe sizes 1¼", 3½", 5", 7", 9", 22", 26", 34", 38", 44" & 46" shall not be used. Line connections to equipment with such connections sizes should be made with suitable reducing fittings.

4.6 Galvanized piping (1G0, 1G3)

These piping from air header to different field instruments shall be installed with the following considerations.

4.6.1 Threaded connections shall be done by the use of thread compound or P.T.F.E. (Teflon) tape. P.T.F.E. tape shall not be used where temperatures exceed 230°C (450°F).

Wherever thread compound is used on screwed fittings it should be applied to the male thread only.

4.6.2 All pipe ends shall be cut square, reamed of all burrs and cleared of all foreign material.

4.6.3 Cutting oil shall be used in cutting all threads on galvanized pipe.

4.7 Hardness of Pipe Material

The maximum hardness of pipe with welded seams anywhere in the weld, heat-affected zone, or parent metal shall follow the requirements specified in latest edition of NACE MR 0175/ISO15156 or other applicable codes & standards and Section 11.0 hereinafter.

4.8 Schedules 5S shall not be used for stainless steels and schedule 80 shall be selected for carbon steel as a minimum for pipes 1½" diameter and below.

5. VALVES

5.1. GENERAL

Valves shall be provided in accordance with this specification and CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

No valves of brass, cast iron, ductile iron, nodular iron, or semi-steel; nor valves containing rubber, bronze or plastics shall be used unless specifically noted in the CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

Flanged valves shall be used in place of socket weld and screwed valves in 3/4" and 1 1/2" sizes when mounted directly to flanged connection, vent, drain and level control connection. Rating of valves must match nozzle connection.

Care shall be taken to maintain differential hardness between seats and ball/wedge/plug/disc in nickel based alloys to prevent galling.

All valves shall be of fire-safe design. Ball valves shall be fire-safe tested in accordance with API 607/API 6FA.

Gear operators shall be provided on valves as required in the CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

Welded-end (butt welded) valves of any type (e.g., ball, gate, check, etc.) shall not be allowed without prior, specific written approval of COMPANY on a case by case basis. In this project, the heating medium system piping valve shall be welded-end. Detailed information refers to CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

All valves, excluding check valves unless specified otherwise, shall be provided with hand wheels, levers, wrenches or gear operators as required for the intended services, and shall be capable of sealing with design pressure applied from either end of the valve. All ball, check, gate and globe valves shall be field repairable. Balls, discs, flappers, seals and seats shall be replaceable without requiring welding or cutting.

In the absence of a specified test procedure, API 598, ISO5208, BS 6755 or API 6D shall be the basis for testing.

5.2. VALVE IDENTIFICATION

Each valve in a facility shall be designated by a descriptive valve identification number consisting of the following identifiers:

Nominal Valve Size (inches NPS)

Valve Type

Piping Class Code

Valve Style

S (NACE TAGGED)

E.G. 10"-BA-1A1-1S, specifies:

10" -----Nominal valve size.

BA -----Valve Type (Ball Valve).

1A1 -----Piping Class Code (See APPENDIX A)

1 -----Valve Sequence Number (See CMIT-240048-728-PIP-15.03-3002_ SPECIFICATION FOR MANUAL VALVES)

S -----NACE Tagged.

Valve Type:

BA - Ball BT - Butterfly CK – Check GA - Gate GL - Globe PL-Plug

6. FLANGES

6.1 Flanges shall be provided in accordance with this specification for the applicable Piping Class Rating and Service.

6.2 Flanges and flanged connections up to and including NPS 24" shall be in accordance with ASME B 16.5 and flanges 26" & above shall be in accordance with ASME B16.47 series "A" (formerly MSS SP 44) unless otherwise stated.

6.3 RF(less than 600#) and RJ (600# and above) are recommended for ease of fit up and installation and removal of valves and equipment with COMPANY approval. For Piping Class 1G0, 1G3 (Galvanized), in place of socket welded & weld neck flanges, screwed (NPT) raised face flanges shall be used.

6.4 Spectacle blind shall be in accordance with ASME B16.48 & shall be suitable for installation between ASME B16.5 RF and RJ flanges.

6.5 Orifice flanges shall be supplied in pairs, complete with jackscrews for ease of removal. Quantities on bills-of-material, material requisitions, etc., shall indicate sets, not individual flanges.

6.6 All spec breaks (e.g. two different materials or different thicknesses) must be indicated at flanges.

6.7 Slip-on flanges (flat face) are permitted only for where connection is necessary between fiberglass flanges and steel flanges.

7. FITTINGS

7.1 Fittings shall be provided in accordance with this specification for the applicable Piping Class Rating and Service.

7.2 Fittings shall conform to ASTM A234, ASTM A105, ASTM A182, ASTM A403 and as applicable.

7.3 For sour service, ASTM A105N and ASME A234 Gr.WPB(SSC&HIC) are chosen as material of fittings.

7.4 Branch Connections using welding tees or commercial integrally reinforced fittings such as Weldolets, or Threadolets are equally acceptable, with the choice of the type of connection based on the criteria provided by the Branch Connection Tables contained in Appendix C.

7.5 Butt weld elbows shall be long radius type (radius = 1½ nominal pipe size).

7.6 Fittings shall be prepared for shipment in a manner that damage or atmospheric corrosion of internal or external surfaces is avoided during storage and transport.

7.7 Fittings shall be marked in according with MSS SP-25.

8. BOLTING

8.1 Flange bolting shall be provided suitable for connecting ASME B16.5/ASME B16.47 Series. All flanges shall be in accordance with this specification for the applicable Piping Class Rating and Service.

8.2 Materials for use below -29°C and above 425°C shall be approved in writing by COMPANY unless otherwise specified in supplementary specifications.

8.3 Studs shall be threaded full length.

8.4 Threads on stud bolts and nuts under 1" diameter shall be coarse thread series. Larger diameter studs shall have Unified 8 Class 2A threads. Nuts shall have Class 2B threads.

8.5 The stud length shall be selected so when nuts are fully engaged the stud projects beyond the nuts but not more than two full threads.

8.6 Bolt tensioning shall be considered for all bolts 1½" (38 mm) diameter and larger. In addition, for elevated temperatures, cyclic service and other critical joints, controlled tensioning shall be considered.

9. GASKETS

9.1 Gaskets shall be provided in accordance with this specification for the applicable Piping Class Rating and Service.

9.2 Spiral-Wound Gaskets shall be according to ASME B16.20 used for ASME B16.5/ B16.47 flanges connection, and Nonmetallic Flat Gaskets shall be according to ASME B16.21. The end types of flanges are FF, RF and RJ.

10. NON METALLIC MATERIAL

For non-metallic material used in this project, related standards shall be followed.

11. SOUR SERVICE PIPING

11.1. General Requirement

All components shall comply with the requirements of NACE MR0175.

Where a difference in Codes, Standards exists, the more stringent requirement shall govern.

If no special definition, the maximum carbon equivalent (CE) of all components shall be less than 0.43%.

If no special definition, the maximum hardness of all components at any position shall be not higher than 220HV(10).

Stainless steels components shall be delivered in the solution heat treated and pickled-inactivation condition.

HIC and SSC test must be done for all sour service valves and piping materials.

11.2. Piping

Threaded and socket welded piping shall not be used in sour service; such piping shall be butt-welded and flanged.

11.3. Fitting & Flanges

The steel fittings and flanges used in sour service shall comply with the requirements of Specification for A234 WPB Fitting Material in Sour Service and Specification for A105N Flange Material in Sour Service.

11.4. Bolting

ASTM A193 Grade B7M bolting materials and ASTM A194 Grade 2HM nuts material shall be mating with carbon steel components.

Proper bolt tightening procedures shall be used to avoid cold working, or yielding of bolt materials. Impact tightening is not permitted.

12. PIPING CLASSIFICATIONS AND MATERIAL SPECIFICATIONS

12.1. PIPING CLASS

1	2	3
1	A	1

1—— Piping Pressure Rating

1	150 pounds rating (ASME codes)
3	300 pounds rating (ASME codes)
6	600 pounds rating (ASME codes)
9	900 pounds rating (ASME codes)

15	1500 pounds rating (ASME codes)
25	2500 pounds rating (ASME codes)
50	5000 pounds rating (API codes)
100	10000 pounds rating (API codes)

2—— Piping Material Classification

A	Carbon Steel
B	Alloy Steel
C	Stainless Steel
D	Carbon Steel Sour Service
E	Low Temperature Carbon Steel Sour Service
F	Stainless Steel Sour Service
G	Carbon Steel Galvanized Pipe
H	Cunifer
J	PVDF
K	Carbon Steel with inner coating
L	Super Duplex Stainless Steel (25% Cr)
M	6% Molybdenum
N	Duplex Stainless Steel (22% Cr)
P	Glass Fibre Reinforced Plastic
R	Duplex Stainless Steel (22% Cr) Sour Service
S	PVCU
T	High Temperature Carbon Steel(Heating medium service)
U	Steam Jacked Carbon Steel(Liquid Sulfur service)
V	PE
W	Solid-Solution Nickel-Based Alloys

X	PPR

3——Piping Material Corrosion Grade

0	Corrosion allowance is 0 mm
1	Corrosion allowance is 1mm
2	Corrosion allowance is 2 mm
3	Corrosion allowance is 3 mm
4	Corrosion allowance is 4 mm
6	Corrosion allowance is 6 mm

12.2. Abbreviations Used (in alphabetical order)

ABBREVIATION	NAME	NOTE
AL	Aluminum	
ANSI	American National Standard Institute	
API	American Petroleum Institute	
ASME	American Society of Mechanical Engineers	
ASTM	American Society of Testing and Materials	
ATM	Atmosphere	
BB	Bolted Bonnet	
BBE	Beveled both Ends	
BC	Bolted Cover	
BE	Beveled End	
BLE	Beveled Large End	
BOE	Beveled One End	
Br	Bronze	
BRZG	Capillary Brazing End	
BSE	Beveled Small End	
BW	Butt Welding	

ABBREVIATION	NAME	NOTE
CA	Corrosion Allowance	
CAS	Cast Alloy Steel	
CCS	Cast Carbon Steel	
CI	Cast Iron	
CONC	Concentric	
Cr	Chromium	
CS	Carbon Steel	
CSA	Canadian Standards Association	
CuNi	Copper-Nickel	
CWP	Cold Working Pressure	
D	Diameter	
ECC	Eccentric	
EFW	Electric Fusion Welded	
EQ	Equal	
ERW	Electric Resistance Welded	
F6	Stainless Steel, 13% Cr	
FAS	Forged Alloy Steel	
FCS	Forged Carbon Steel	
FF	Flat Face	
FM	Female Face	
GALV	Galvanize	
Gr	Grade	
HEX	Hexagonal	
HT	Heat Tracing	
IH	Hot Insulation	
LJ	Lap Joint	

ABBREVIATION	NAME	NOTE
LR	Long Radius	
M	Male Face	
Manuf	Manufacturer	
Max	Maximum	
MI	Malleable Cast iron	
MNPT	Male Threading as per ASME B1.20.1	
Mo	Molybdenum	
MPCS	Micro-porous Calcium Silicate	
MSS	Manufacturer Standardization Society	
NCS	Normalized Carbon Steel	
Ni	Nickel	
NPT	Threading as per ASME B1.20.1	
OD	Outside Diameter	
PBE	Plain both Ends	
PE	Plain End	
PLE	Plain Large End	
PO	Polyurethane	
POE	Plain One End	
PP	Personnel Protection Insulation	
PSE	Plain Small End	
PT	Polyethylene Type	
PVC	Polyvinyl Chloride	
R	Radius	
RED	Reducing	
RF	Raised Face	
RJ	Ring Joint Face	

ABBREVIATION	NAME	NOTE
SAW	Submerged Arc Welding	
SB	Screwed Bonnet	
Sch	Schedule	
SMLS	Seamless	
SS	Stainless Steel	
STD	Standard	
SW	Socket Welding	
TBE	Threaded both Ends	
TE	Threaded End	
THK	Thickness	
TLE	Threaded Large End	
TLPR	Two layer Polyolefin Resin	
TOE	Threaded one End	
TSE	Threaded Small End	
WB	Welded Bonnet	
WN	Welded Neck	

Appendix A and B provide details for the selection and limitations of piping materials for each piping class rating and service. For branching table refer to Appendix C.

APPENDIX A

PIPING CLASSES SPECIFICATIONS

APPENDIX A PIPING CLASSES SPECIFICATIONS						
Class	Service	Rating	Material	C.A. (mm)	Design Pressure	Design Temperature Limits
1A1	Utility Air Fuel Gas Nitrogen Gas Natural Gas Diesel	150#	ASTM A106 Gr.B	1	1.2MPa	-20 ~ 85°C
1A4	Waste Water	150#	ASTM A106 Gr.B	4	1.0MPa	-20 ~ 99°C
1C0	Chemical	150#	ASTM A312 TP316L	0	0.6MPa	-20 ~ 100°C
1D3	Closed Drain Sour Gas/Sour Water Atmospheric Vent High Pressure Flare Low Pressure Flare Hydrocarbon Liquid (Sour) Fuel Gas Off-spec Oil	150#	ASTM A106 Gr.B (SSC&HIC)	3	0.6MPa	-20 ~ 100°C
1D6	Crude Oil (Sour) Sour Gas	150#	ASTM A106 Gr.B (SSC&HIC)	6	1.6MPa	-20 ~ 100°C
1G0	Instrument Air	150#	ASTM A106 Gr.B +GALV	0	1.0MPa	-20 ~ 80°C
1G3	Fire Water	150#	ASTM A106 Gr.B +GALV	3	1.1MPa	-20 ~ 40℃
1L0	Oily Water	150#	ASTM A790 S32760/ A928 S32760	0	1.2MPa	-20 ~ 125°C

APPENDIX A PIPING CLASSES SPECIFICATIONS

Class	Service	Rating	Material	C.A. (mm)	Design Pressure	Design Temperature Limits
1N0	Oily Water	150#	ASTM A790 S31803/ A928 S31803	0	1.8MPa	-20 ~ 65°C
1P0	Water Injection Oily Water	150#	GRE Epoxy Resins API SPEC 15LR	0	1.8MPa	-20 ~ 65°C
1V0	RO Water Other Chemical injection	150#	PE 4710, ASTM D3350 SDR7.3	0	1.2MPa	-20 ~ 65°C
3C0	Chemical	300#	ASTM A312 TP316L	0	2.2MPa	-20 ~ 100°C
3D3	Sour Gas Hydrocarbon Liquid	300#	ASTM A106 Gr.B (SSC&HIC)	3	2.2MPa	-20 ~ 100°C
3D6	Crude Oil(Sour) Sour Gas	300#	ASTM A106 Gr.B (SSC&HIC)	6	4MPa	-20 ~ 125°C
3L0	Oily Water	300#	ASTM A790 S32760/ A928 S32760	0	2.2MPa	-20 ~ 100°C
3N0	Oily Water	300#	ASTM A790 S31803/ A928 S31803	0	4MPa	-20 ~ 65°C
3P0	Water Injection Oily Water	300#	GRE Epoxy Resins API SPEC 15LR	0	4MPa	-20 ~ 65°C

Notes:

1. Piping Classes listed in Appendix A is for related system based on the design conditions supplied by process.

2. The Service & Design Pressure & Design Temperature will be updated according to Line List.

APPENDIX B

PIPING MATERIAL SPECIFICATION

1A1	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	1 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 85°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	800#	SW	BA-1A11 (Floating Ball, Full Bore)	(Note 1)
			150#	Flanged, RF	BA-1A12 (Floating Ball, Full Bore)	
	2"	4"	150#	Flanged, RF	BA-1A13 (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, RF	BA-1A14 (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1A15 (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, RF	BA-1A16 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	800#	SW	GA-1A11 (Wedge Gate)	(Note 1)
			150#	Flanged, RF	GA-1A12 (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1A13 (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1A14 (Flat Gate)	
	10"	18"	150#	Flanged, RF	GA-1A15 (Wedge Gate & /W Gear Operator)	
	10"	18"	150#	Flanged, RF	GA-1A16 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1A11 (Swivel Type Plug)	(Note 1)

1A1	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	1 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 85°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	2"	6"	150#	Flanged, RF	GL-1A12 (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1A13 (Swivel Type Plug & Renewable Seat With Gear Operator)	
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1A11 (Lift)	(Note 1)
	2"	18"	150#	Flanged, RF	CK-1A12 (Wafer)	
Butterfly Valve	6"	6"	150#	Flanged, RF	BT-1A11 (Three-Eccentricity)	(Note 1)
	8"	18"	150#	Flanged, RF	BT-1A12 (Three-Eccentricity With Gear Operator)	
Pipe	1/2"	1 1/2"	SCH80	PE	Seamless, Steel Pipe	ASTM A106 Gr.B To ASME B36.10 (Note 2)
	2"	6"	SCH40	BE	Seamless, Steel Pipe	
	8"	18"	SCH30	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	SCH160	PE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B To ASME B36.10
	1/2"	1 1/2"	SCH160	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	3000#	SW	Elbow, Tee, Cap, Swage Nipple	ASTM A234 Gr.WPB To ASME B16.11 & MSS SP-95 (Note 3)
	1/2"	1 1/2"	3000#	NPT	Cap	ASTM A234 Gr.WPB To ASME B16.11 (Note 4)
	1/2"	1 1/2"	3000#	SW	Sockolets	ASTM A105 To MSS SP-97 (Note 3)
	2"	6"	SCH40	BW	Elbow (LR), Tee,	ASTM A234 Gr.WPB To

1A1	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	1 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 85°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	8"	18"	SCH30	BW	Reducing Tee, Reducer, Cap	ASME B16.9 (Note 5)
	2"	6"	SCH40	BW	Weldolets	ASTM A105 To MSS SP-97 (Note 5)
	8"	8"	SCH30	BW		
Flanges	1/2"	1 1/2"	150#	SW/RF	Socket Welding (Note 5)	ASTM A105 To ASME B16.5
	2"	18"	150#	Flanged, RF	Welding Neck (Note 5)	ASTM A105 To ASME B16.5
	1/2"	18"	150#	Flanged, RF	Blind	ASTM A105 To ASME B16.5
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A105 To ASME B16.48
	14"	18"	150#	RF	Blinds and Spacer	
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7/194-2H Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	150#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Socket weld shall be as per ASME B16.11.
4. Threaded end as per ASME B1.20.1.
5. Thickness to suit pipe.

1A4	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	4 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Design Parameter	1.0Mpa @ 99°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1A41 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1A42 (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, RF	BA-1A43 (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1A44 (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, RF	BA-1A45 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1A41 (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1A42 (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1A43 (Flat Gate)	
	10"	18"	150#	Flanged, RF	GA-1A44 (Wedge Gate & /W Gear Operator)	
	10"	18"	150#	Flanged, RF	GA-1A45 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1A41 (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1A42 (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1A43 (Swivel Type Plug & Renewable Seat With Gear Operator)	
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1A41 (Lift)	(Note 1)

1A4	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	4 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Design Parameter	1.0Mpa @ 99°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	2"	18"	150#	Flanged, RF	CK-1A42 (Wafer)	
Pipe	1/2"	3/4"	XXS	BE	Seamless, Steel Pipe	ASTM A106 Gr.B To ASME B36.10 (Note 2)
	1"	1 1/2"	SCH160	BE	Seamless, Steel Pipe	
	2"	2"	SCH160	BE	Seamless, Steel Pipe	
	3"	4"	SCH80	BE	Seamless, Steel Pipe	
	6"	8"	SCH40	BE	Seamless, Steel Pipe	
	10"	18"	SCH30	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	XXS	BE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B To ASME B36.10
	1/2"	1 1/2"	XXS	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	3/4"	XXS	BW	Elbow (LR), Tee, Reducing Tee, Reducer, Cap	ASTM A234 Gr.WPB To ASME B16.9 (Note 3)
	1"	1 1/2"	SCH160	BW		
	2"	2"	SCH160	BW		
	3"	4"	SCH80	BW		
	6"	8"	SCH40	BW		
	10"	18"	SCH30	BW		
	1/2"	3/4"	XXS	BW	Weldolets	ASTM A105 To MSS SP-97 (Note 3)
	1"	1 1/2"	SCH160	BW		
	2"	2"	SCH160	BW		
	3"	4"	SCH80	BW		
	6"	8"	SCH40	BW		
	10"	18"	SCH30	BW		
Flanges	1/2"	18"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A105 To ASME B16.5
	1/2"	18"	150#	Flanged, RF	Blind	ASTM A105 To ASME B16.5
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A105 To ASME B16.48
	14"	18"	150#	RF	Blinds and Spacer	

1A4	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	4 mm
Rating	150 #				Piping Material	C.S.
PWHT	NONE					
Design Parameter	1.0Mpa @ 99°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7/194-2H Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	150#	RF	Spirally Wound /W Inner & Outer Rings	S31803/FG 4.5mm Thk OR/IR:S31803 To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.

1C0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A312-TP316L
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	0.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1C01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1C02 (Floating Ball, Full Bore)	
	6"	6"	150#	Flanged, RF	BA-1C03 (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1C04 (Floating Ball, Reduced Bore)	
	6"	6"	150#	Flanged, RF	BA-1C05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1C01 (Wedge Gate)	(Note 1)
	2"	6"	150#	Flanged, RF	GA-1C02 (Wedge Gate)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1C01 (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1C02 (Swivel Type Plug & Renewable Seat)	
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1C01 (Lift)	(Note 1)
	2"	6"	150#	Flanged, RF	CK-1C02 (Wafer)	
Pipe	1/2"	1 1/2"	SCH80S	PE	Seamless, Steel Pipe	ASTM A312-TP316L To ASME B36.19 (Note 2)
	2"	6"	SCH40S	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	SCH160	PE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A312-TP316L To ASME B36.10
	1/2"	1 1/2"	SCH160	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	

1C0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A312-TP316L
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	0.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Fittings	1/2"	1 1/2"	3000#	SW	Elbow, Tee, Cap, Swage Nipple	ASTM A403 WP316L-S To ASME B16.11 & MSS SP-95 (Note 3)
	1/2"	1 1/2"	3000#	NPT	Cap	ASTM A403 WP316L-S To ASME B16.11 (Note 4)
	1/2"	1 1/2"	3000#	SW	Sockolets	ASTM A182-F316L To MSS SP-97 (Note 3)
	2"	6"	SCH40S	BW	Elbow (LR), Tee, Reducing Tee, Reducer, Cap	ASTM A403 WP316L-S To ASME B16.9 (Note 5)
	2"	6"	SCH40S	BW	Weldolets	ASTM A182-F316L To MSS SP-97 (Note 5)
Flanges	1/2"	1 1/2"	150#	SW/RF	Socket Welding (Note 5)	ASTM A182-F316L To ASME B16.5
	2"	6"	150#	Flanged, RF	Welding Neck (Note 5)	ASTM A182-F316L To ASME B16.5
	1/2"	6"	150#	Flanged, RF	Blind	ASTM A182-F316L To ASME B16.5
	1/2"	6"	150#	RF	Spectacle Blank	ASTM A182-F316L To ASME B16.48
Studs/ Nuts	1/2"	6"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M /A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	6"	150#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/RPTFE 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

2. Bevelled end as per ASME B16.25.

3. Socket weld shall be as per ASME B16.11.

4. Threaded end as per ASME B1.20.1.

5. Thickness to suit pipe.

1D3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	0.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1D31S (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1D32S (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, RF	BA-1D33S (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1D34S (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, RF	BA-1D35S (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1D31S (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1D32S (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1D33S (Flat Gate)	
	10"	18"	150#	Flanged, RF	GA-1D34S (Wedge Gate & /W Gear Operator)	
	10"	18"	150#	Flanged, RF	GA-1D35S (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1D31S (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1D32S (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1D33S (Swivel Type Plug & Renewable Seat With Gear Operator)	

1D3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	0.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1D31S (Lift)	(Note 1)
	2"	18"	150#	Flanged, RF	CK-1D32S (Wafer)	
Pipe	1/2"	1 1/2"	SCH160	BE	Seamless, Steel Pipe	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10 (Note 2)
	2"	2"	SCH80	BE	Seamless, Steel Pipe	
	3"	6"	SCH40	BE	Seamless, Steel Pipe	
	8"	18"	SCH30	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	XXS	BE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10
	1/2"	1 1/2"	XXS	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	SCH160	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3)
	2"	2"	SCH80	BW		
	3"	6"	SCH40	BW		
	8"	18"	SCH30	BW		
	6"	6"	SCH40	BW	Elbow (5D)	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3&4)
	8"	18"	SCH30	BW		
	1/2"	1 1/2"	SCH160	BW	Weldolets	ASTM A105N (SSC&HIC) To MSS SP-97 (Note 3)
	2"	2"	SCH80	BW		
	3"	6"	SCH40	BW		
	8"	8"	SCH30	BW		
Flanges	1/2"	18"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	18"	150#	Flanged, RF	Blind	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A105N

1D3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	0.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	14"	18"	150#	RF	Blinds and Spacer	(SSC&HIC) To ASME B16.48
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ 194-2HM Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	150#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. Each end with 1D straight pipe (Not less than 250mm).

1D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1D61S (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1D62S (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, RF	BA-1D63S (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1D64S (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, RF	BA-1D65S (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1D61S (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1D62S (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1D63S (Flat Gate)	
	10"	18"	150#	Flanged, RF	GA-1D64S (Wedge Gate & /W Gear Operator)	
	10"	18"	150#	Flanged, RF	GA-1D65S (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1D61S (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1D62S (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1D63S (Swivel Type Plug & Renewable Seat With Gear Operator)	

1D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1D61S (Lift)	(Note 1)
	2"	18"	150#	Flanged, RF	CK-1D62S (Wafer)	
Pipe	1/2"	1 1/2"	XXS	BE	Seamless, Steel Pipe	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10 (Note 2)
	2"	4"	SCH160	BE	Seamless, Steel Pipe	
	6"	8"	SCH80	BE	Seamless, Steel Pipe	
	10"	12"	SCH60	BE	Seamless, Steel Pipe	
	14"	18"	SCH40	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	XXS	BE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10
	1/2"	1 1/2"	XXS	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	XXS	BW	Elbow (LR), Tee, Reducing Tee, Reducer, Cap	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3)
	2"	4"	SCH160	BW		
	6"	8"	SCH80	BW		
	10"	12"	SCH60	BW		
	14"	18"	SCH40	BW		
	6"	8"	SCH80	BW	Elbow (5D)	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3&4)
	10"	12"	SCH60	BW		
	14"	18"	SCH40	BW		
	1/2"	1 1/2"	XXS	BW	Weldolets	ASTM A105N (SSC&HIC) To MSS SP-97 (Note 3)
	2"	4"	SCH160	BW		
	6"	8"	SCH80	BW		
Flanges	1/2"	18"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	18"	150#	Flanged, RF	Blind	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A105N

1D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	150 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.6Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	14"	18"	150#	RF	Blinds and Spacer	(SSC&HIC) To ASME B16.48
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ 194-2HM Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	150#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. Each end with 1D straight pipe (Not less than 250mm).

1G0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	C.S.(Galv)
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.0 Mpa @ 80°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1G01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1G02(Floating Ball, Full Bore)	
	2"	4"	150#	Flanged, RF	BA-1G03(Floating Ball, Reduced Bore)	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1G01 (Wedge Gate)	(Note 1)
	2"	4"	150#	Flanged, RF	GA-1G02 (Wedge Gate)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1G01 (Swivel Type Plug)	(Note 1)
	2"	4"	150#	Flanged, RF	GL-1G02 (Swivel Type Plug & Renewable Seat)	
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1G01 (Lift)	(Note 1)
	2"	4"	150#	Flanged, RF	CK-1G02 (Wafer)	
Pipe	1/2"	2"	SCH80	NPTM	Seamless, Hot Dip Galvanized	ASTM A106 GR.B Galvanized To ASME B36.10 (Note 2, 3, 4&5)
	3"	4"	SCH40	NPTM	Seamless, Hot Dip Galvanized	
Fittings	1/2"	2"	CL3000	NPTF	Cap, Coupling Elbow (LR) ,Tee, Union	ASTM A105+ Galvanized To ASME B16.11 & MSS SP-83 (Note 2&5)
	1/2"	2"	CL3000	NPTM	Swage Nipple	ASTM A105+ Galvanized To MSS SP-95 (Note 2, 4&5)

1G0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	C.S.(Galv)
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.0 Mpa @ 80°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	3"	4"	CL3000	NPTF	Cap, Coupling Elbow (LR) ,Tee, Reducing Tee	ASTM A105 + Galvanized To ASME B16.11 (Note 2&5)
Flanges	1/2"	4"	150#	NPTF/ RF	Thread (Note 6)	ASTM A105+ Galvanized To ASME B16.5
	1/2"	4"	150#	RF	Blind	ASTM A105+ Galvanized To ASME B16.5
	1/2"	4"	150#	RF	Spectacle Blank	ASTM A105+ Galvanized To ASME B16.48
Studs/ Nuts	1/2"	4"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7/194-2H Hot Dip Galvanized To ASTM A153
Gasket	1/2"	4"	150#	RF	Non-Metal Gasket, Asbestos Free	RPTFE 3.2mm Thk To ASME B16.21

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Threaded end as per ASME B1.20.1.
3. What is above-mentioned to be hot dip Galvanized shall be in accordance to ASTM A153-B.
4. The threaded end (NPTM) shall be by ASME B1.20.1.
5. Pipe to pipe joining for all sizes shall be by means of screwed full coupling.
6. Thickness to suit pipe.

1G3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S.(Galv)
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.1 Mpa @ 40°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1G31S (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1G32S (Floating Ball, Full Bore)	
	6"	12"	150#	Flanged, RF	BA-1G33S (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1G34S (Floating Ball, Reduced Bore)	
	6"	12"	150#	Flanged, RF	BA-1G35S (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1G31S (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1G32S (Wedge Gate)	
	10"	12"	150#	Flanged, RF	GA-1G33S (Wedge Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1G31S (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1G32S (Swivel Type Plug & Renewable Seat)	
	8"	12"	150#	Flanged, RF	GL-1G33S (Swivel Type Plug & Renewable Seat With Gear Operator)	
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1G31S (Lift)	(Note 1)
	2"	12"	150#	Flanged, RF	CK-1G32S (Wafer)	

1G3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S.(Galv)
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.1 Mpa @ 40°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Pipe	1/2"	1/2"	XXS	NPTM	Seamless, Hot Dip Galvanized	ASTM A106 GR.B Galvanized To ASME B36.10 (Note 2, 3, 4&5)
	3/4"	2"	SCH160	NPTM	Seamless, Hot Dip Galvanized	
	3"	4"	SCH80	NPTM	Seamless, Hot Dip Galvanized	
	6"	6"	SCH40	BE	Seamless, Hot Dip Galvanized	
	8"	12"	SCH30	BE	Seamless, Hot Dip Galvanized	
Fittings	1/2"	1/2"	CL6000	NPTF	Cap, Coupling Elbow (LR) ,Tee, Union	ASTM A105+ Galvanized To ASME B16.11 & MSS SP-83 (Note 2&5)
	3/4"	2"	CL3000	NPTF		
	1/2"	1/2"	CL6000	NPTM	Swage Nipple	ASTM A105+ Galvanized To MSS SP-95 (Note 2, 4&5)
	3/4"	2"	CL3000	NPTM		
	3"	4"	CL3000	NPTF	Cap, Coupling Elbow (LR) ,Tee, Reducing Tee	ASTM A105 + Galvanized To ASME B16.11 (Note 2&5)
	6"	6"	SCH40	BW	Cap, Elbow(LR), Tee, Reducing Tee	ASTM A234 Gr.WPB + Galvanized To ASME B16.9 (Note 6)
	8"	12"	SCH30	BW		
	1/2"	1/2"	XXS	BW	Weldolets	ASTM A105 + Galvanized To To MSS SP-97 (Note 6)
	3/4"	2"	SCH160	BW		
	3"	4"	SCH80	BW		
	6"	6"	SCH40	BW		
	8"	8"	SCH30	BW		
Flanges	1/2"	4"	150#	NPTF/ RF	Thread (Note 6)	ASTM A105+ Galvanized To ASME B16.5

1G3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	150 #				Piping Material	C.S.(Galv)
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.1 Mpa @ 40°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	6"	12"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A105+ Galvanized To ASME B16.5
	1/2"	12"	150#	RF	Blind	ASTM A105+ Galvanized To ASME B16.5
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A105+ Galvanized To ASME B16.48
Studs/ Nuts	1/2"	12"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7/194-2H Hot Dip Galvanized To ASTM A153
Gasket	1/2"	12"	150#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Threaded end as per ASME B1.20.1.
3. What is above-mentioned to be hot dip Galvanized shall be in accordance to ASTM A153-B.
4. The threaded end (NPTM) shall be by ASME B1.20.1.
5. Pipe to pipe joining for all sizes shall be by means of screwed full coupling.
6. Thickness to suit pipe.

1L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1L01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1L02 (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, RF	BA-1L03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1L04 (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, RF	BA-1L05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1L01 (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1L02 (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1L03 (Flat Gate)	
	10"	18"	150#	Flanged, RF	GA-1L04 (Wedge Gate & Gear Operator)	
	10"	18"	150#	Flanged, RF	GA-1L05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1L01 (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1L02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1L03 (Swivel Type Plug & Renewable Seat With Gear Operator)	

1L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1L01 (Lift)	(Note 1)
	2"	18"	150#	Flanged, RF	CK-1L02 (Wafer)	
Pipe	1/2"	1 1/2"	SCH40S	BE	Seamless, Duplex Stainless Pipe	ASTM A790-S32760 To ASME B36.19 (Note 2)
	2"	12"	SCH10S	BE	Seamless, Duplex Stainless Pipe	
	14"	18"	SCH10S	BE	EFW, Duplex Stainless Pipe	ASTM A928-S32760 CLASS 1 Welded To ASME B36.19
Nipple	1/2"	1 1/2"	SCH80S	BE xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	ASTM A790-S32760 To ASME B36.19
	1/2"	1 1/2"	SCH80S	MNPT xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	SCH40S	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A815-S32760 WP-S To ASME B16.9 (Note 3)
	2"	12"	SCH10S	BW		
	14"	18"	SCH10S	BW	Welded, Elbow (LR), Tee, Reducer, Cap	ASTM A815-S32760 WP-WX To ASME B16.9 (Note 3)
	1/2"	1 1/2"	SCH40S	BW	Weldolets	ASTM A182-F55 To MSS SP-97 (Note 3)
	2"	8"	SCH10S	BW		
Flanges	1/2"	18"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A182-F55 To ASME B16.5
	1/2"	18"	150#	Flanged, RF	Blind	
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A182-F55 To ASME B16.48
	14"	18"	150#	RF	Blinds and Spacer	

1L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.2Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	18"	150#	RF	Spirally Wound /W Inner & Outer Rings	S32760/FG 4.5mm Thk OR/IR:S32760 To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.

1N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, RF	BA-1N01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, RF	BA-1N02 (Floating Ball, Full Bore)	
	6"	24"	150#	Flanged, RF	BA-1N03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	150#	Flanged, RF	BA-1N04 (Floating Ball, Reduced Bore)	
	6"	24"	150#	Flanged, RF	BA-1N05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, RF	GA-1N01 (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, RF	GA-1N02 (Wedge Gate)	
	2"	8"	150#	Flanged, RF	GA-1N03 (Flat Gate)	
	10"	24"	150#	Flanged, RF	GA-1N04 (Wedge Gate & Gear Operator)	
	10"	24"	150#	Flanged, RF	GA-1N05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, RF	GL-1N01 (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, RF	GL-1N02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, RF	GL-1N03 (Swivel Type Plug & Renewable Seat With Gear Operator)	

1N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	150#	Flanged, RF	CK-1N01 (Lift)	(Note 1)
	2"	24"	150#	Flanged, RF	CK-1N02 (Wafer)	
Butterfly Valve	6"	6"	150#	Flanged, RF	BT-1N01	(Note 1)
	8"	24"	150#	Flanged, RF	BT-1N02	
Pipe	1/2"	1 1/2"	SCH40S	BE	Seamless, Duplex Stainless Pipe	ASTM A790-S31803 To ASME B36.19 (Note 2)
	2"	12"	SCH10S	BE	Seamless, Duplex Stainless Pipe	
	14"	24"	SCH10S	BE	EFW, Duplex Stainless Pipe	ASTM A928-S31803 CLASS 1 Welded To ASME B36.19
Nipple	1/2"	1 1/2"	SCH80S	BE xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	ASTM A790-S31803 To ASME B36.19
	1/2"	1 1/2"	SCH80S	MNPT xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	SCH40S	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A815-S31803 WP-S To ASME B16.9 (Note 3)
	2"	12"	SCH10S	BW		
	14"	24"	SCH10S	BW	Welded, Elbow (LR), Tee, Reducer, Cap	ASTM A815-S31803 WP-WX To ASME B16.9 (Note 3)
	1/2"	1 1/2"	SCH40S	BW	Weldolets	ASTM A182-F51 To MSS SP-97 (Note 3)
	2"	8"	SCH10S	BW		
Flanges	1/2"	24"	150#	Flanged, RF	Welding Neck (Note 3)	ASTM A182-F51 To ASME B16.5

1N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	1"	24"	150#	Flanged, FF	Flat Face (Note 4)	
	1/2"	24"	150#	Flanged, RF	Blind	
	1/2"	12"	150#	RF	Spectacle Blank	ASTM A182-F51 To ASME B16.48
	14"	24"	150#	RF	Blinds and Spacer	
Studs/ Nuts	1/2"	24"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	24"	150#	RF	Spirally Wound /W Inner & Outer Rings	S31803/FG 4.5mm Thk OR/IR:S31803 To ASME B16.20
Insulation Gasket	1/2"	24"	150#	RF	TYPE F FLANGE INSULATION KITS, MAX WATER ABSORPTION 0.1%, MIN INSULATION PROPERTY 10 MOHM ASME B16.5	NEMA GRADE G-10 GLASS REINFORCED EPOXY ELECTRICALLY INSULATED RETAINER W/VITON SEALING, NEMA GRADE G-10 SLEEVES, DOUBLE NEMA GRADE G-10 WASHERS AND DOUBLE ZP STEEL WASHERS PER SLEEVE, 3.2MM THK

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

2. Bevelled end as per ASME B16.25.

3. Thickness to suit pipe.

4. Used for connection with GRE piping.

1P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, FF	BA-1P01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, FF	BA-1P02 (Floating Ball, Full Bore)	
	6"	18"	150#	Flanged, FF	BA-1P03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	150#	Flanged, FF	BA-1P04 (Floating Ball, Reduced Bore)	
	6"	18"	150#	Flanged, FF	BA-1P05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	150#	Flanged, FF	GA-1P01 (Wedge Gate)	(Note 1)
	2"	8"	150#	Flanged, FF	GA-1P02 (Wedge Gate)	
	2"	8"	150#	Flanged, FF	GA-1P03 (Flat Gate)	
	10"	18"	150#	Flanged, FF	GA-1P04 (Wedge Gate & Gear Operator)	
	10"	18"	150#	Flanged, FF	GA-1P05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, FF	GL-1P01 (Swivel Type Plug)	(Note 1)
	2"	6"	150#	Flanged, FF	GL-1P02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	150#	Flanged, FF	GL-1P03 (Swivel Type Plug & Renewable Seat With Gear Operator)	
Check Valve	1/2"	1 1/2"	150#	Flanged, FF	CK-1P01 (Lift)	(Note 1)
	2"	18"	150#	Flanged, FF	CK-1P02 (Wafer)	

1P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Pipe	1"	18"	1.8Mpa	Taper/ Taper Type, Socket End	Pipe, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 1.8Mpa @ 65°C	GRE, Epoxy Resins API 15LR
Fitting	1"	18"	1.8Mpa	Taper/ Taper Type, Socket End	Elbow, Tee, Reducing Tee, Coupling, Cap, Union, Reducer, Saddle, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 1.8Mpa @ 65°C	GRE, Epoxy Resins API 15LR (Note 2)
Adaptor	2"	18"	1.8Mpa	Taper/ Taper Type, Socket End	Adaptor , Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 1.8Mpa @ 65°C	GRE, Epoxy Resins API 15LR
Flanges	1"	18"	150#	Flanged, FF/ Taper/ Taper Type, Socket End	Flange, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 1.8Mpa @ 65°C (Note 2)	GRE, Epoxy Resins API 15LR To ASME B16.5
	1"	18"	150#	Flanged, FF	Blind, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 1.8Mpa @ 65°C	

1P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	1.8Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts & 2 Washers, To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts, Alloy Steel, ASTM A193-B7M /A194-2HM XYLAN Fluoropolymer Coated
Gasket	1"	18"	150#	FF	Non-Metal Gasket, Asbestos Free	RPTFE 3.2mm Thk To ASME B16.21

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

2. Thickness to suit pipe.

1V0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	PE (Polyethylene)
PWHT	NONE					
Design Parameter	1.2Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	150#	Flanged, FF	BA-1V01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	150#	Flanged, FF	BA-1V02 (Floating Ball, Full Bore)	
	2"	4"	150#	Flanged, FF	BA-1V03 (Floating Ball, Reduced Bore)	
Gate Valve	1/2"	1 1/2"	150#	Flanged, FF	GA-1V01 (Wedge Gate)	(Note 1)
	2"	4"	150#	Flanged, FF	GA-1V02 (Wedge Gate)	
Globe Valve	1/2"	1 1/2"	150#	Flanged, FF	GL-1V01 (Swivel Type Plug)	(Note 1)
	2"	4"	150#	Flanged, FF	GL-1V02 (Swivel Type Plug & Renewable Seat)	
Check Valve	1/2"	1 1/2"	150#	Flanged, FF	CK-1V01 (Lift)	(Note 1)
	2"	4"	150#	Flanged, FF	CK-1V02 (Wafer)	
Pipe	1/2"	3"	335psig	PE	As Per Design Condition 1.2Mpa @ 65°C UV Inhibition	PE 4710 SDR7.0 AWWA C901 ASTM D3350 (Note 4)
	4"	4"	335psig	PE	As Per Design Condition 1.2Mpa @ 65°C UV Inhibition	PE 4710 SDR7.0 AWWA C906 ASTM D3350 (Note 4)
Fittings	1/2"	4"	335psig	PE	Elbow (LR), Tee, Reducer Bushing, Coupling, Cross As Per Design Condition 1.2Mpa @ 65°C UV Inhibition	PE 4710 SDR7.0 AWWA C906 ASTM D3350 (Note 4)

1V0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	150 #				Piping Material	PE (Polyethylene)
PWHT	NONE					
Design Parameter	1.2Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Flanges	1/2"	4"	150#	Flanged, FF	Lapped Flange	ASTM A105 To ASME B16.5
	1/2"	4"	150#	Flanged, FF	Blind	ASTM A105 To ASME B16.5
	1/2"	4"	150#	FF	Spectacle Blank	ASTM A105 To ASME B16.48
Studs/ Nuts	1/2"	18"	150#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7/194-2H Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	150#	FF	Non-Metal Gasket, Asbestos Free	RPTFE 3.2mm Thk To ASME B16.21

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. 335psig under the condition of 27°C.

3C0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A312-TP316L
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, RF	BA-3C01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, RF	BA-3C02 (Floating Ball, Full Bore)	
	6"	6"	300#	Flanged, RF	BA-3C03 (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	300#	Flanged, RF	BA-3C04 (Floating Ball, Reduced Bore)	
	6"	6"	300#	Flanged, RF	BA-3C05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, RF	GA-3C01 (Wedge Gate)	(Note 1)
	2"	6"	300#	Flanged, RF	GA-3C02 (Wedge Gate)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, RF	GL-3C01 (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, RF	GL-3C02 (Swivel Type Plug & Renewable Seat)	
Check Valve	1/2"	1 1/2"	300#	Flanged, RF	CK-3C01 (Lift)	(Note 1)
	2"	6"	300#	Flanged, RF	CK-3C02 (Wafer)	
Pipe	1/2"	1 1/2"	SCH80S	PE	Seamless, Steel Pipe	ASTM A312-TP316L To ASME B36.19 (Note 2)
	2"	6"	SCH40S	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	SCH160	PE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A312-TP316L To ASME B36.10

3C0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A312-TP316L
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	1/2"	1 1/2"	SCH160	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	3000#	SW	Elbow, Tee, Cap, Swage Nipple	ASTM A403 WP316L-S To ASME B16.11 & MSS SP-95 (Note 3)
	1/2"	1 1/2"	3000#	NPT	Cap	ASTM A403 WP316L-S To ASME B16.11 (Note 4)
	1/2"	1 1/2"	3000#	SW	Sockolets	ASTM A182-F316L To MSS SP-97 (Note 3)
	2"	6"	SCH40S	BW	Elbow (LR), Tee, Reducing Tee, Reducer, Cap	ASTM A403 WP316L-S To ASME B16.9 (Note 5)
	2"	6"	SCH40S	BW	Weldolets	ASTM A182-F316L To MSS SP-97 (Note 5)
Flanges	1/2"	1 1/2"	300#	SW/RF	Socket Welding (Note 5)	ASTM A182-F316L To ASME B16.5
	2"	6"	300#	Flanged, RF	Welding Neck (Note 5)	ASTM A182-F316L To ASME B16.5
	1/2"	6"	300#	Flanged, RF	Blind	ASTM A182-F316L To ASME B16.5
	1/2"	6"	300#	RF	Spectacle Blank	ASTM A182-F316L To ASME B16.48
Studs/ Nuts	1/2"	6"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/ B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	6"	300#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/RPTFE 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Socket weld shall be as per ASME B16.11.
4. Threaded end as per ASME B1.20.1.
5. Thickness to suit pipe.

3D3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	300 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, RF	BA-3D31S (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, RF	BA-3D32S (Floating Ball, Full Bore)	
	6"	18"	300#	Flanged, RF	BA-3D33S (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	300#	Flanged, RF	BA-3D34S (Floating Ball, Reduced Bore)	
	6"	18"	300#	Flanged, RF	BA-3D35S (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, RF	GA-3D31S (Wedge Gate)	(Note 1)
	2"	8"	300#	Flanged, RF	GA-3D32S (Wedge Gate)	
	2"	8"	300#	Flanged, RF	GA-3D33S (Flat Gate)	
	10"	18"	300#	Flanged, RF	GA-3D34S (Wedge Gate & /W Gear Operator)	
	10"	18"	300#	Flanged, RF	GA-3D35S (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, RF	GL-3D31S (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, RF	GL-3D32S (Swivel Type Plug & Renewable Seat)	
	8"	16"	300#	Flanged, RF	GL-3D33S (Swivel Type Plug & Renewable Seat With Gear Operator)	

3D3	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	3 mm
Rating	300 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	300#	Flanged, RF	CK-3D31S (Lift)	(Note 1)
	2"	18"	300#	Flanged, RF	CK-3D32S (Wafer)	
Pipe	1/2"	11/2"	SCH160	BE	Seamless, Steel Pipe	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10 (Note 2)
	2"	6"	SCH80	BE	Seamless, Steel Pipe	
	8"	12"	SCH60	BE	Seamless, Steel Pipe	
	14"	18"	SCH40	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	XXS	BE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10
	1/2"	1 1/2"	XXS	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	11/2"	SCH160	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3)
	2"	6"	SCH80	BW		
	8"	12"	SCH60	BW		
	14"	18"	SCH40	BW		
	6"	6"	SCH80	BW	Elbow (5D)	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3&4)
	8"	12"	SCH60	BW		
	14"	18"	SCH40	BW		
	1/2"	11/2"	SCH160	BW	Weldolets	ASTM A105N (SSC&HIC) To MSS SP-97 (Note 3)
	2"	6"	SCH80	BW		
	8"	8"	SCH60	BW		
Flanges	1/2"	18"	300#	Flanged, RF	Welding Neck (Note 3)	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	18"	300#	Flanged, RF	Blind	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	10"	300#	RF	Spectacle Blank	ASTM A105N (SSC&HIC) To ASME B16.48
	12"	18"	300#	RF	Blinds and Spacer	

3D3	Piping Material Specification					
Service	See Appendix A			Corrosion Allowance	3 mm	
Rating	300 #			Piping Material	C.S. (NACE)	
PWHT	YES					
Pressure–Temperature Rating				ASME B16.5		
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1/2"	18"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ 194-2HM Hot Dip Galvanized To ASTM A153
Gasket	1/2"	18"	300#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. Each end with 1D straight pipe (Not less than 250mm).

3D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	300 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, RF	BA-3D61S (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, RF	BA-3D62S (Floating Ball, Full Bore)	
	6"	20"	300#	Flanged, RF	BA-3D63S (Trunnion Mounted, Full Bore& /W Gear Operator	
	2"	4"	300#	Flanged, RF	BA-3D64S (Floating Ball, Reduced Bore)	
	6"	20"	300#	Flanged, RF	BA-3D65S (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, RF	GA-3D61S (Wedge Gate)	(Note 1)
	2"	8"	300#	Flanged, RF	GA-3D62S (Wedge Gate)	
	2"	8"	300#	Flanged, RF	GA-3D63S (Flat Gate)	
	10"	20"	300#	Flanged, RF	GA-3D64S (Wedge Gate & /W Gear Operator)	
	10"	20"	300#	Flanged, RF	GA-3D65S (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, RF	GL-3D61S (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, RF	GL-3D62S (Swivel Type Plug & Renewable Seat)	
	8"	16"	300#	Flanged, RF	GL-3D63S (Swivel Type Plug & Renewable Seat With Gear Operator)	

3D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	300 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	300#	Flanged, RF	CK-3D61S (Lift)	(Note 1)
	2"	20"	300#	Flanged, RF	CK-3D62S (Wafer)	
Pipe	1/2"	2"	XXS	BE	Seamless, Steel Pipe	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10 (Note 2)
	3"	3"	SCH160	BE	Seamless, Steel Pipe	
	4"	6"	SCH120	BE	Seamless, Steel Pipe	
	8"	14"	SCH80	BE	Seamless, Steel Pipe	
	16"	20"	SCH60	BE	Seamless, Steel Pipe	
Nipple	1/2"	1 1/2"	XXS	BE xMNPT	Seamless, Steel Pipe (80mm Long)	ASTM A106 Gr.B (SSC&HIC) To ASME B36.10
	1/2"	1 1/2"	XXS	MNPT xMNPT	Seamless, Steel Pipe (80mm Long)	
Fittings	1/2"	2"	XXS	BW	Elbow (LR), Tee, Reducer Tee, Reducer, Cap	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3)
	3"	3"	SCH160	BW		
	4"	6"	SCH120	BW		
	8"	14"	SCH80	BW		
	16"	20"	SCH60	BW		
	6"	6"	SCH120	BW	Elbow (5D)	ASTM A234 Gr.WPB (SSC&HIC) To ASME B16.9 (Note 3&4)
	8"	14"	SCH80	BW		
	16"	20"	SCH60	BW		
	1/2"	2"	XXS	BW	Weldolets	ASTM A105N (SSC&HIC) To MSS SP-97 (Note 3)
	3"	3"	SCH160	BW		
	4"	6"	SCH120	BW		
	8"	8"	SCH80	BW		
Flanges	1/2"	20"	300#	Flanged, RF	Welding Neck (Note 3)	ASTM A105N (SSC&HIC) To ASME B16.5
	1/2"	20"	300#	Flanged, RF	Blind	ASTM A105N (SSC&HIC) To ASME B16.5

3D6	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	6 mm
Rating	300 #				Piping Material	C.S. (NACE)
PWHT	YES					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 125°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	1/2"	10"	300#	RF	Spectacle Blank	ASTM A105N (SSC&HIC) To ASME B16.48
	12"	20"	300#	RF	Blinds and Spacer	
Studs/ Nuts	1/2"	20"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ 194-2HM Hot Dip Galvanized To ASTM A153
Gasket	1/2"	20"	300#	RF	Spirally Wound /W Inner & Outer Rings	SS 316L/FG 4.5mm Thk OR/IR:316L To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. Each end with 1D straight pipe (Not less than 250mm).

3L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, RF	BA-3L01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, RF	BA-3L02 (Floating Ball, Full Bore)	
	6"	18"	300#	Flanged, RF	BA-3L03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	300#	Flanged, RF	BA-3L04 (Floating Ball, Reduced Bore)	
	6"	18"	300#	Flanged, RF	BA-3L05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, RF	GA-3L01 (Wedge Gate)	(Note 1)
	2"	8"	300#	Flanged, RF	GA-3L02 (Wedge Gate)	
	2"	8"	300#	Flanged, RF	GA-3L03 (Flat Gate)	
	10"	18"	300#	Flanged, RF	GA-3L04 (Wedge Gate & Gear Operator)	
	10"	18"	300#	Flanged, RF	GA-3L05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, RF	GL-3L01 (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, RF	GL-3L02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	300#	Flanged, RF	GL-3L03 (Swivel Type Plug & Renewable Seat With Gear Operator)	

3L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	300#	Flanged, RF	CK-3L01 (Lift)	(Note 1)
	2"	18"	300#	Flanged, RF	CK-3L02 (Wafer)	
Pipe	1/2"	1 1/2"	SCH80S	BE	Seamless, Duplex Stainless Pipe	ASTM A790-S32760 To ASME B36.19 (Note 2)
	2"	12"	SCH40S	BE	Seamless, Duplex Stainless Pipe	
	14"	18"	SCH40S	BE	EFW, Duplex Stainless Pipe	ASTM A928-S32760 CLASS 1 Welded To ASME B36.19
Nipple	1/2"	1 1/2"	SCH160	BE xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	ASTM A790-S32760 To ASME B36.10
	1/2"	1 1/2"	SCH160	MNPT xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	SCH80S	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A815-S32760 WP-S To ASME B16.9 (Note 3)
	2"	12"	SCH40S	BW		
	14"	18"	SCH40S	BW	Welded, Elbow (LR), Tee, Reducer, Cap	ASTM A815-S32760 WP-WX To ASME B16.9 (Note 3)
	1/2"	1 1/2"	SCH80S	BW	Weldolets	ASTM A182-F55 To MSS SP-97 (Note 3)
	2"	8"	SCH40S	BW		
Flanges	1/2"	18"	300#	Flanged, RF	Welding Neck (Note 3)	ASTM A182-F55 To ASME B16.5
	1/2"	18"	300#	Flanged, RF	Blind	
	1/2"	10"	300#	RF	Spectacle Blank	ASTM A182-F55 To ASME B16.48
	12"	18"	300#	RF	Blinds and Spacer	

3L0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S32760
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	2.2Mpa @ 100°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1/2"	18"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	18"	300#	RF	Spirally Wound /W Inner & Outer Rings	S32760/FG 4.5mm Thk OR/IR:S32760 To ASME B16.20

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.

3N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, RF	BA-3N01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, RF	BA-3N02 (Floating Ball, Full Bore)	
	6"	20"	300#	Flanged, RF	BA-3N03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	300#	Flanged, RF	BA-3N04 (Floating Ball, Reduced Bore)	
	6"	20"	300#	Flanged, RF	BA-3N05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, RF	GA-3N01 (Wedge Gate)	(Note 1)
	2"	8"	300#	Flanged, RF	GA-3N02 (Wedge Gate)	
	2"	8"	300#	Flanged, RF	GA-3N03 (Flat Gate)	
	10"	20"	300#	Flanged, RF	GA-3N04 (Wedge Gate & Gear Operator)	
	10"	20"	300#	Flanged, RF	GA-3N05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, RF	GL-3N01 (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, RF	GL-3N02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	300#	Flanged, RF	GL-3N03 (Swivel Type Plug & Renewable Seat With Gear Operator)	

3N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Check Valve	1/2"	1 1/2"	300#	Flanged, RF	CK-3N01 (Lift)	(Note 1)
	2"	20"	300#	Flanged, RF	CK-3N02 (Wafer)	
Pipe	1/2"	1 1/2"	SCH80S	BE	Seamless, Duplex Stainless Pipe	ASTM A790-S31803 To ASME B36.19 (Note 2)
	2"	12"	SCH40S	BE	Seamless, Duplex Stainless Pipe	
	14"	20"	SCH40S	BE	EFW, Duplex Stainless Pipe	ASTM A928-S31803 CLASS 1 Welded To ASME B36.19
Nipple	1/2"	1 1/2"	SCH160	BE xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	ASTM A790-S31803 To ASME B36.10
	1/2"	1 1/2"	SCH160	MNPT xMNPT	Seamless, Duplex Stainless Pipe (80mm Long)	
Fittings	1/2"	1 1/2"	SCH80S	BW	Elbow (LR), Tee, Reducer, Cap	ASTM A815-S31803 WP-S To ASME B16.9 (Note 3)
	2"	12"	SCH40S	BW		
	14"	20"	SCH40S	BW	Welded, Elbow (LR), Tee, Reducer, Cap	ASTM A815-S31803 WP-WX To ASME B16.9 (Note 3)
	1/2"	1 1/2"	SCH80S	BW	Weldolets	ASTM A182-F51 To MSS SP-97 (Note 3)
	2"	8"	SCH40S	BW		
Flanges	1/2"	20"	300#	Flanged, RF	Welding Neck (Note 3)	ASTM A182-F51 To ASME B16.5
	1"	20"	300#	Flanged, FF	Flat Face (Note 4)	
	1/2"	20"	300#	Flanged, RF	Blind	

3N0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	ASTM A790-S31803
PWHT	NONE					
Pressure–Temperature Rating					ASME B16.5	
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
	1/2"	10"	300#	RF	Spectacle Blank	ASTM A182-F51 To ASME B16.48
	12"	20"	300#	RF	Blinds and Spacer	
Studs/ Nuts	1/2"	20"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts Alloy Steel ASTM A193-B7M/ A194-2HM XYLAN Fluoropolymer Coated
Gasket	1/2"	20"	300#	RF	Spirally Wound /W Inner & Outer Rings	S31803/FG 4.5mm Thk OR/IR:S31803 To ASME B16.20
Insulation Gasket	1/2"	20"	300#	RF	TYPE F FLANGE INSULATION KITS, MAX WATER ABSORPTION 0.1%, MIN INSULATION PROPERTY 10 MOHM ASME B16.5	NEMA GRADE G-10 GLASS REINFORCED EPOXY ELECTRICALLY INSULATED RETAINER W/VITON SEALING, NEMA GRADE G-10 SLEEVES, DOUBLE NEMA GRADE G-10 WASHERS AND DOUBLE ZP STEEL WASHERS PER SLEEVE, 3.2MM THK

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.
2. Bevelled end as per ASME B16.25.
3. Thickness to suit pipe.
4. Used for connection with GRE piping.

3P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Ball Valve	1/2"	1 1/2"	300#	Flanged, FF	BA-3P01 (Floating Ball, Full Bore)	(Note 1)
	2"	4"	300#	Flanged, FF	BA-3P02 (Floating Ball, Full Bore)	
	6"	18"	300#	Flanged, FF	BA-3P03 (Trunnion Mounted, Full Bore/W Gear Operator	
	2"	4"	300#	Flanged, FF	BA-3P04 (Floating Ball, Reduced Bore)	
	6"	18"	300#	Flanged, FF	BA-3P05 (Trunnion Mounted, Reduced Bore& /W Gear Operator	
Gate Valve	1/2"	1 1/2"	300#	Flanged, FF	GA-3P01 (Wedge Gate)	(Note 1)
	2"	8"	300#	Flanged, FF	GA-3P02 (Wedge Gate)	
	2"	8"	300#	Flanged, FF	GA-3P03 (Flat Gate)	
	10"	18"	300#	Flanged, FF	GA-3P04 (Wedge Gate & Gear Operator)	
	10"	18"	300#	Flanged, FF	GA-3P05 (Flat Gate & /W Gear Operator)	
Globe Valve	1/2"	1 1/2"	300#	Flanged, FF	GL-3P01 (Swivel Type Plug)	(Note 1)
	2"	6"	300#	Flanged, FF	GL-3P02 (Swivel Type Plug & Renewable Seat)	
	8"	16"	300#	Flanged, FF	GL-3P03 (Swivel Type Plug & Renewable Seat With Gear Operator)	
Check Valve	1/2"	1 1/2"	300#	Flanged, FF	CK-3P01 (Lift)	(Note 1)
	2"	18"	300#	Flanged, FF	CK-3P02 (Wafer)	

3P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Pipe	1"	18"	4Mpa	Taper/ Taper Type, Socket End	Pipe, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 4Mpa @ 65°C	GRE, Epoxy Resins API 15LR
Fitting	1"	18"	4Mpa	Taper/ Taper Type, Socket End	Elbow, Tee, Reducing Tee, Coupling, Cap, Union, Reducer, Saddle, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 4Mpa @ 65°C	GRE, Epoxy Resins API 15LR (Note 2)
Adaptor	2"	18"	4Mpa	Taper/ Taper Type, Socket End	Adaptor , Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 4Mpa @ 65°C	GRE, Epoxy Resins API 15LR
Flanges	1"	18"	300#	Flanged, FF/ Taper/ Taper Type, Socket End	Flange, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 4Mpa @ 65°C (Note 2)	GRE, Epoxy Resins API 15LR To ASME B16.5
	1"	18"	300#	Flanged, FF	Blind, Filament Wound, UV Inhibition (Above Ground), Safety Factor 4, As Per Design Condition 4Mpa @ 65°C	

3P0	Piping Material Specification					
Service	See Appendix A				Corrosion Allowance	0 mm
Rating	300 #				Piping Material	GRE
PWHT	NONE				Fire Resistance	L3
Design Parameter	4Mpa @ 65°C					
Items	Inch Size		Rating Sch./Thk.	End	Tag No. & Description	Main Material
	From	To				
Studs/ Nuts	1"	18"	300#	N/A	Full Length, /W Two HVY Hexagonal Nuts & 2 Washers, To ASME B16.5/B18.31.2 /B18.2.2	Stud Bolts, Alloy Steel, ASTM A193-B7M /A194-2HM XYLAN Fluoropolymer Coated
Gasket	1"	18"	300#	FF	Non-Metal Gasket, Asbestos Free	RPTFE 3.2mm Thk To ASME B16.21

Notes:

1. For details, see CMIT-240048-728-PIP-15.03-3002_SPECIFICATION FOR MANUAL VALVES.

2. Thickness to suit pipe.

APPENDIX C

BRANCH CONNECTIONS

BRANCH CONNECTION TABLE 1
Piping class 1A1, 1C0, 3C0

	Branch Pipe															
Main-Header		1/2	3/4	1	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24
	1/2	T															
	3/4	RT	T														
	1	RT	RT	T													
	1 1/2	RT	RT	RT	T												
	2	SO	SO	TSN	TSN	T											
	3	SO	SO	SO	TSN	RT	T										
	4	SO	SO	SO	SO	RT	RT	T									
	6	SO	SO	SO	SO	WO	RT	RT	T								
	8	SO	SO	SO	SO	WO	WO	RT	RT	T							
	10	SO	SO	SO	SO	WO	WO	RT	RT	RT	T						
	12	SO	SO	SO	SO	WO	WO	WO	RT	RT	RT	T					
	14	SO	SO	SO	SO	WO	WO	WO	RT	RT	RT	RT	T				
	16	SO	SO	SO	SO	WO	WO	WO	RT	RT	RT	RT	RT	T			
	18	SO	SO	SO	SO	WO	WO	WO	WO	RT	RT	RT	RT	RT	T		
	20	SO	SO	SO	SO	WO	WO	WO	WO	RT	RT	RT	RT	RT	RT	T	

Notes: T - Straight Tee
RT - Reducing Tee
SO - Sockolets
WO - Weldolets
TSN – Tee or Reducing Tee with Swaged Nipple

1) Any deviation from the connection type shown in the above table or branch connections for larger piping sizes shall be approved in writing by COMPANY.

BRANCH CONNECTION TABLE 2
Piping class 1A4, 1D3, 1D6,1G3 (NPS≥6"), 1L0, 1N0, 3D3, 3D6, 3L0, 3N0

	Branch Pipe																
Main-Header		1/2	3/4	1	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24
	1/2	T															
	3/4	RT	T														
	1	RT	RT	T													
	1 1/2	RT	RT	RT	T												
	2	WO	WO	RT	RT	T											
	3	WO	WO	WO	RT	RT	T										
	4	WO	WO	WO	WO	RT	RT	T									
	6	WO	WO	WO	WO	WO	RT	RT	T								
	8	WO	WO	WO	WO	WO	WO	RT	RT	T							
	10	WO	WO	WO	WO	WO	WO	RT	RT	RT	T						
	12	WO	WO	WO	WO	WO	WO	WO	RT	RT	RT	T					
	14	WO	WO	WO	WO	WO	WO	WO	RT	RT	RT	RT	T				
	16	WO	WO	WO	WO	WO	WO	WO	RT	RT	RT	RT	RT	T			
	18	WO	WO	WO	WO	WO	WO	WO	WO	RT	RT	RT	RT	RT	T		
	20	WO	WO	WO	WO	WO	WO	WO	WO	RT	RT	RT	RT	RT	RT	T	

Notes: T - Straight Tee
RT - Reducing Tee
WO - Weldolets

1) Any deviation from the connection type shown in the above table or branch connections for larger piping sizes shall be approved in writing by COMPANY.

BRANCH CONNECTION TABLE 3 –
PIPING CLASS 1G0, 1G3 (NPS≤4")

		BRANCH					
	inches	3/4	1	1 1/2	2	3	4
HEADER	3/4	T					
	1	RT	T				
	1 1/2	RT	RT	T			
	2	RT	RT	RT	T		
	3	TSN	TSN	RT	RT	T	
	4	TSN	TSN	RT	RT	RT	T

Notes: T - Straight Tee Threaded
RT - Reducing Tee Threaded
TSN - Tee or Reducing Tee with Swaged Nipple

1) All branch connections shall be designed and reinforced so that the branch line connection is equal to the pressure and temperature rating of the header.

2) Any deviation from the connection type shown in the above table or branch connections for larger piping sizes shall be approved in writing by COMPANY.

APPENDIX D

REDUCING CONNECTIONS

	Main-Header														
Branch Pipe		3/4	1	1 1/2	2	3	4	6	8	10	12	14	16	18	20
	1/2	SNP	SNP	SNP											
	3/4		SNP	SNP	SNP										
	1			SNP	SNP										
	1 1/2				SNP	SNP +R	SNP +R								
	2					R	R								
	3						R	R							
	4							R	R	R					
	6								R	R	R	R			
	8									R	R	R	R		
	10										R	R	R	R	
	12											R	R	R	R
	14												R	R	R
	16													R	R
	18														R
	20														

Notes: SNP - Swaged Nipple

R - Reducer

SNP+R - Swaged Nipple with Reducer (When the branch pipe size is below 2", the large end of the swaged nipple is 2".)