COMMENTS RESOLUTION SHEET (CRS)

CONTRACT NUMBER				**GC21109200**	
CONTRACT TITLE:				**FEED for MM Re-Development and PS-3 Life Extension Projects**	
QP EXTERNAL TRANSMITTAL REFERENCE, DATED:				**POH_GC21109200_EXT_TN_11593, 13-05-2024**	
DOCUMENT NUMBER, REV & TITLE:				**4355-GENOF-5-14-0001-2, MAYDAN MAHZAM (MM) AND BUL HANINE (BH) FIELD (GENOF) - PIPING MATERIALS SPECIFICATION**	**Last Revision status: ADD**
PREVIOUS ISSUED DRAWING NUMBER MADE VOID (IF ANY)					
SR. NO	**QP COMMENTS**			**CONTRACTOR'S RESPONSE**	**REMARKS**
	QE Engineer Ref id.	**Section**	**Comments**		
1			Code ADD	Reason for revision = Revised to include Maydan Mahzam (MM) work scope	

CONTRACT NO.: GC21109200

CONTRACT TITLE: FEED FOR MM RE-DEVELOPMENT AND PS-3 LIFE EXTENSION.

DOCUMENT TITLE:

MAYDAN MAHZAM (MM) & BUL HANINE (BH) FIELD (GENOF) PIPING MATERIALS SPECIFICATION

Wood.
Compass Point,
79-87 Kingston Road,
Staines,
Surrey,
TW18 1DT

	APPROVED FOR DETAILED DESIGN
APPROVED BY:	PHH/11 – Sunil Abubaker
DATE:	24/09/2024

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13/09/2024	3	Approved for Detailed Design	ARR	HAA	DSG	
26/04/2024	2	Approved for Detailed Design	ARR	HAA	DSG	
31/01/2024	1	Issued For Approval	ARR	HAA	DSG	
17/05/2023	0	Issued For Comments	ARR	HAA	DSG	
Date	**Rev**	**Description**	**Prepared**	**Checked**	**Approved**	**Approved QatarEnergy**
Document No.		**4355-GENOF-5-14-0001**			**Page 1 of 15**	

CONTENTS

1.0 PURPOSE AND SCOPE

1.1 Project Description

Maydan Mahzam (MM) and Bul Hanine (BH) fields are two mature oil fields in Qatar Offshore, operated by QatarEnergy. The two fields have been producing oil and associated gas for over 50 years with the production rates continuously declining. The existing facilities have already exceeded their design life whilst significant quantity of oil and gas reserves remain to be recovered from the reservoirs. However, such potential cannot be realized through the existing facilities alone due to ageing and/or specific process requirements, and therefore QatarEnergy is undertaking extension of the field life through redevelopment of the assets under the "MM Redevelopment and PS-3 Life Extension Project".

Each of these fields have an existing central production complex called PS2 (in MM field) and PS3 (in BH field) and several remote Well Head Platforms (hereafter commonly referred to as WHJ) with one or more wells. Well fluid from the WHJs is transported through a network of sub-sea pipelines to their respective Production Stations. Each Production Station complex has eight (8) bridge-linked platforms where oil, water and gas are separated and processed. The partially stabilized oil from PS2 and PS3 are routed to Halul Island for further dewatering, storage, and export. The excess associated gas is routed to onshore facilities through PS1 production station.

The Project aims to extend the life of these two fields by 30 years, by maximizing the use of existing facilities to the extent possible and by installing new facilities, as summarised below, to support the forecasted production profiles.

a. The existing PS2 and PS3 production complex facilities and platforms will largely be redundant and shall be decommissioned, except for riser and production manifold platforms (1 no. in PS2 and 2 nos. in PS3), a support platform in PS2 and a WHJ in PS3. Following new platforms will be installed, bridge linked to existing complex:

- Process Platform, Utilities and Living Quarters Platform, Riser platform, Flare Platform, and bridge support props at PS2.
- Process Platform, Utilities and Living Quarters Platform, Gas Injection Compression Platform, Riser platform, Flare Platform, and bridge support props at PS3.

b. New 16-slot WHJ in MM field with associated pipelines and umbilical.
c. Selected existing WHJs will be modified in both BH and MM fields to support the field life extension goals.
d. Number of new pipelines and umbilical/power cables in BH and MM Fields. Majority of these are to replace existing pipelines, power cables, umbilical(s) and flatpacks which are rendered redundant and will be decommissioned.
e. New 132kV subsea power cable from Halul to PS2 and PS3 with associated modifications at Halul.
f. Modifications at PS1 for installation of new gas export and condensate return pipelines.

The engineering design will be developed in FEED to an acceptable level of detail, where QatarEnergy can initiate the bidding process and enter into the EPIC phase, on a lumpsum basis, efficiently without further work.

2.0 DEFINITIONS AND ABBREVIATIONS

2.1 DEFINITIONS

Abbreviation	Description
Shall	the word “shall” is to be understood as mandatory
Should	the word “should” is to be understood as being strongly recommended
May	the word “may” is used where alternatives are equally acceptable
QE	QatarEnergy and its representatives or inspectors
Contractor / Purchaser	Company / Firm or Party appointed by QatarEnergy to perform the works in accordance with this specification
Manufacturer	The Party that manufacturers, fabricates or produces materials or products covered by this specification
Supplier / Vendor	Company / Firm or Party appointed by Contractor to supply material, equipment, or other products in accordance with this specification
Assembly	Pre-designed standard configuration for vents, drains, orifice meter runs, thermowells and pressure points within a piping class
Piping	Assembly of straight and bent pipes, fittings, flanges, gaskets, valves, and other components (e.g expansion separating, distributing, metering and flow control). Piping does not include supporting structures (such as frames of buildings, stanchions, or foundations) or equipment (e.g heat exchangers, vessels, columns, pumps) or instrument impulse pipes.
Piping Class	Assembly of piping components in a piping system, suitable for a defined service within design limits. All components in pipe classes are covered by an MESC buying description. The piping classes are based from Version 45 of DEP 31.38.01.15.

Table 1 – Definitions

2.2 ABBREVIATIONS & ACRONYMS

Abbreviation	Description
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
BS	British Standards
CPVC	Chlorinated Poly Vinyl Chloride
CRA	Corrosion Resistance Alloy
DEP	Design & Engineering Practice
FB	Full Bore
H2S	Hydrogen Sulphide
ISO	International Organization of Standardization
ITP	Inspection and Test Plan
MESC	Materials and Equipment Standards and Code
MSS	Manufacturer's Standardization Society
MT	Magnetic-particle Testing
MTO	Material Take Off
NACE	National Association of Corrosion Engineer
NDE	Non Destructive Examination
NPS	Nominal Pipe Size (inch)
P&ID	Piping and Instrument Diagram
PMC	Piping Material Class
PMS	Piping Material Specification
PT	Penetrant Testing
PTFE	Polytetrafluoroethylene
PEEK	Polyetheretherketone
PWHT	Post Weld Heat Treatment
QA/QC	Quality Assurance/Quality Control
RB	Reduced Bore
RT	Radiographic Testing
SP	Special Piping Item
SPIR	Spare Parts Interchangeability Record
TPC	Third Party Contractor
TPI	Third Party Inspector
TSA	Thermal Sprayed Aluminium
UT	Ultrasonic Testing

Table 2 – Abbreviations & Acronyms

3.0 REFERENCES

This section identifies the applicable QatarEnergy Standards, SHELL's DEP and International Codes and Standards to be used for piping design of this project but not limited to. Latest edition shall be used unless specified otherwise. The codes and standards shall include but not limited to those listed below. Alternative standards may be considered, provided it can be shown that they are equivalent.

3.1 QATARENERGY CORPORATE STANDARDS

Document Title	Document No.
Specification for Painting & Wrapping of Metal Surfaces	QP-SPC-L-002
QatarEnergy Corporate Philosophy for Fire and Safety	QP-PHL-S-001
QatarEnergy Engineering Standard for Specification for Sour Services Material	QP-STD-R-001
QatarEnergy Standard for Fabrication, Inspection and Installation of Carbon, Carbon-Manganese and Low Alloy Ferritic Steel Process Pipe Work	QP-STD-R-002
QatarEnergy Standard for Fabrication, Inspection and Installation of Austenitic and 25% Cr. Super Duplex Stainless Steel, Copper Base and Nickel Base Alloys Process Pipework.	QP-STD-R-003
QatarEnergy Standard for Non-Destructive Testing (NDT) Part 1: Management System and Personnel Qualification	QP-STD-R-008-1
QatarEnergy Standard for Non-Destructive Testing Part 2: Radiographic Testing (RT).	QP-STD-R-008-2
QatarEnergy Standard for Non-Destructive Testing Part 3: Ultrasonic Testing (UT).	QP-STD-R-008-3
QatarEnergy Standard for Non-Destructive Testing Part 4: Magnetic Particle Testing (MT).	QP-STD-R-008-4
QatarEnergy Standard for Non-Destructive Testing Part 5: Penetrant Testing (PT).	QP-STD-R-008-5
Quality Requirement for Procurement of Materials & Equipment	QP-STD-Q-003
Quality Requirements for Projects	QP-STD-Q-004
Procedure for Evaluating Deviations from Project Specification	QPR-VP-013
Procedure for Vendor Evaluation for PVL for Engineering Projects	QPR-VP-054

Table 3 – QatarEnergy Corporate Standards

3.2 SHELL DEP (VERSION 45)

Document Title	Document No.
Human Factor Engineering In Projects.	DEP.30.00.60.10-Gen
Human Factor Engineering Physical Workspace	DEP.30.00.60.20-Gen
Positive Material Identification Program	DEP.31.10.00.10-Gen
Metallic Material – Selected Standards.	DEP.30.10.02.11-Gen
Non-Metallic Materials – Selection and Application	DEP.30.10.02.13-Gen
Metallic Materials – Prevention of Brittle Fracture in New Asset	DEP. 30.10.02.31-Gen
Thermal Insulation	DEP. 30.46.00.31-Gen
Technical Requirements for the Supply of Components in 6MO Austenitic, 22CRr Duplex and 25CR Super Duplex Stainless Steel	DEP.30.10.02.35-Gen
Welding of Metals (Amendments / Supplements to API RP 582)	DEP 30.10.60.18-Gen
Protective Coatings for Onshore and Offshore Facilities (Including adoption of IOGP S-715)	DEP 30.48.00.31-Gen
Pipeline Transportation Systems - Pipeline Valves (Amendments or Supplements To ISO 14313)	DEP.31.36.00.30-Gen
Piping Class – Basis Of Design	DEP.31.38.01.10-Gen
Piping – Engineering and Layout Requirements	DEP.31.38.01.24-Gen
Piping – Process Design Requirements	DEP.31.38.01.25-Gen
Piping – Pipe Stress Analysis Requirements	DEP.31.38.01.26-Gen
Piping Classes – Exploration And Production	DEP.31.38.01.84-Gen
Shop and Field Fabrication of Piping Systems	DEP.31.38.01.31-Gen
Glass-Fibre Reinforced Plastic Pipeline and Piping Systems	DEP.31.40.10.19-Gen
Line Pipe for Critical Service (Amendments / Supplements to ISO 3183:2012 and API SPEC 5L 45th edition)	DEP.31.40.20.37
Selection Of Materials For Life Cycle Performance (Upstream Equipment) – Materials Selection and Corrosion Management	DEP 39.01.10.11-Gen
Selection Of Materials For Life Cycle Performance (Upstream Equipment) Including H2S-Containing Environments (Amendments And Supplements To ISO 15156:2009)	DEP 39.01.10.12-Gen
Selection of Materials for Upstream Equipment (Amendments and Supplements to ISO 15156:2015)	DEP 39.01.10.12-Gen
Age-Hardened Nickel-Based Alloys for Oil and Gas Drilling and Production Equipment (Amendments/Supplements to API STD 6ACRA)	DEP 39.01.10.32-Gen
Hydrogen Induced Cracking Sensitivity Test (Amendments/Supplements to NACE TM0284)	SPE 74/125
Flanges (Amendments/Supplements to ASME B16.5)	SPE 76/100

Flanges (Amendments/Supplements to ASME B16.47)	SPE 76/101
Carbon Steel Forgings (Amendments/Supplements to ASTM A105)	SPE 76/210
Valves General Requirements.	SPE 77/302
Alloy And Stainless Steel Bolts (Amendments/Supplements to ASTM A 193)	SPE 81/001
Carbon And Alloy Steel Nuts (Amendments/Supplements to ASTM A194)	SPE 81/002
Coating Requirements for Bolts and Nuts (Amendments/Supplements to ASTM B 841)	SPE 81/007
Non-Metallic Flat Gaskets, With or Without Insert (Amendments/Supplements to ASME B16.21)	SPE 85/101
Spiral Wound Gaskets (Amendments/Supplements to ASME B16.20)	SPE 85/103
Flange Insulation Sets	SPE 85/201
Graphite Packing Material (Amendments/Supplements to ASTM F 2168)	SPE 85/203
Packing Material Graphite and Carbon Braided Yarn (Amendments / Supplements to ASTM F 2191)	SPE 85/204
Type acceptance testing of gaskets	SPE 85/300

Table 4 – Shell DEP

3.3 SHELL'S STANDARD DRAWINGS

Document Title	Document No.
Spectacle Blinds for ASME Flanges	S 38.011
Spade Blinds for ASME Flanges	S 38.042
Spacer for ASME Flanges, for Replacement of Spades	S 38.043
Branch Fittings	S 38.090
Flanged Thermowell DN40 ASME Classes up to 1500 Incl.	S 38.113
Flanged Thermowell DN50 ASME Classes up to 2500 Incl.	S 38.114
Orifice Flanges, Raised Face with Flanged Tapping ASME Classes 300 to 2500 Incl. Nom. Size DN50 – 600 Incl.	S 38.130
Orifice Flanges, Raised Face with Corner Tapping ASME Classes 300 to 600 Nom. Size DN50 – 600 Incl.	S 38.131
Orifice Meter Runs with Flanged Ends ASME Classes 150 – 1500 Incl. Nom. Size DN15 – 40 Incl.	S 38.134

Table 5 – Shell's Standard Drawings

3.4 PROJECT DOCUMENTS

Document Title	Document No.
Bul Hanine (BH) Field (BHTY) Material Selection and Corrosion Management Report	4355-BHTY-5-17-0004
Maydan Mahzam (MM) Field PS2 (MMTY) Material Selection and Corrosion Management Report	4355-MMTY-5-17-0005
Topside Coating Selection Report	4355-GENOF-5-17-0020
Piping and Equipment Layout Design Basis	4355-GENOF-5-29-0001
Piping Wall Thickness Calculations Report	4355-GENOF-5-12-0001
Specification for SP Items	4355-GENOF-5-14-0003
Valve Specification	4355-GENOF-5-14-0005
Valve Index and Valve Data Sheets	4355-GENOF-5-13-0002

Table 6 – Project Documents

3.5 INTERNATIONAL CODES AND STANDARDS

Document Title	Document No.
Specification for Line Pipe	API 5L
Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems	API RP 14E
Unified Inch Screw Threads (UN and UNR Thread form)	ASME B1.1
Forged Steel Fittings, Socket-welding and Threaded	ASME B16.11
Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral-Wound, and Jacketed	ASME B16.20
Non Metallic Flat Gaskets For Pipe Flanges	ASME B16.21
Butt Welding Ends	ASME B16.25
Line Blanks	ASME B16.48
Pipe Flanges and Flanged Fittings	ASME B16.5
Large diameter Steel Flanges	ASME B16.47
Factory Made Wrought Butt Welding Fittings	ASME B16.9
Square and Hex Bolts and Screws (Inch series)	ASME B 18.2.1
Square and Hex Nuts (Inch Series)	ASME B 18.2.2
Process Piping	ASME B31.3
Welded and Seamless Wrought Steel Pipe	ASME B36.10
Stainless Steel Pipe	ASME B36.19
Surface Texture (Surface Roughness, Waviness and lag)	ASME B 46.1

Non Destructive Examinations	ASME Sec V
Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators	ASME SEC IX
Section II - Materials Specification	ASME: Boiler and Pressure Vessel Code
90/10 Copper nickel alloy piping for offshore applications (Specification)	EEMUA Publication 234:2015
Metallic Products – Types of Inspection Documents	BS EN 10204
Plastic piping systems for drainage and sewerage with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Specifications for pipes, fittings and joints.	BS EN 14364
Petroleum and natural gas Industries Glass- Reinforced Plastics (GRP) Piping	ISO-14692
Glass Fibre Reinforced Thermosetting Plastics (GRP) Pipes and Fittings - Nominal Diameters, Specified Diameters and Standard Lengths	ISO 7370
Specification for High test Wrought Butt Welding Fitting	MSS-SP-75
Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded and Butt-welding Ends	MSS SP-97
Petroleum and Natural Gas Industries: Materials for Use in H2S Containing Environments in Oil and Gas Production	NACE MR 0175 / ISO 15156
Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H2S Environments	TM 0177
Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking	TM 0284

Table 7 – International Codes and Standards

The above listing from section 3.1 to 3.5 is not an exhaustive list. Each material shall comply with its own ASTM standard and any other code / standard /requirements, that are deemed to be applicable as listed in individual MESC datasheets. The latest / current revisions, version, year of publication, etc. are to be followed.

3.6 ORDER OF PRECEDENCE

The FEED for the Redevelopment of MM & BH shall comply with all relevant rules and regulations in Qatar. In the event of conflict between the requirements of QatarEnergy Corporate Regulations and Philosophies and the DEPs, CONTRACTOR shall report the conflict to QatarEnergy for decision-making. The following order of precedence shall apply:

1. Qatar Statutory Regulations
2. QatarEnergy Corporate Regulations
3. QatarEnergy Corporate Philosophies
4. QatarEnergy Corporate Standards
5. QatarEnergy Addenda to Shell DEPs
6. Shell DEPs and MESCs
7. Project Specific Specifications
8. QatarEnergy Engineering Standards & Specifications (for items not covered by DEPs)
9. QatarEnergy recognized International / regional / national / industry Code & Standards for requirements not specified in any of above listed documents.

4.0 DESIGN AND ENGINEERING REQUIRMENTS

4.1 SCOPE OF WORK

This specification together with the attachments covers the general requirements for the piping material and components including valves used in the design, fabrication, construction and testing of process and utility piping of FEED for Maydan Mahzam and Bul Hanine fields.

4.2 DESIGN LIFE

The design life shall be 30 years, with due consideration of the operating and environmental conditions.

4.3 GENERAL

- Design of piping system shall comply with relevant project piping classes as per ASME B31.3, DEP 31.38.01.24-Gen Piping – Engineering and Layout Requirements, DEP 31.38.01.84 Piping Classes – Exploration and Production, together with other relevant Industry Codes and Standards as stated within this specification in the order of precedence.

- SHELL DEP Piping Classes are modified to suit the project requirements with respect to pressure, temperature, size, corrosion allowance etc, which shall not be changed/revised/updated without QatarEnergy approval.

- The wall thickness calculations have been carried out for such SHELL DEP Piping Classes to suit the project requirements with respect to pressure, temperature, size, corrosion allowance etc and can be referred to in the Piping Wall Thickness Calculations report 4355-GENOF-5-12-0001.

- Piping materials for each piping component and limitation (pressure, temperature, size etc) are stated in the piping classes. Pressure and temperature stated in each piping class are the design limitations and shall not be exceeded except for short duration pressure excursion as allowed in clause no. 302.2.4 of ASME B31.3 with QatarEnergy approval.

- The types of branch connections to be used are shown in each pipe class. The piping shall also confirm to HSE detailed requirement stipulated in process flow diagrams and utility flow diagrams.

- All metallic components in sour service shall meet the requirements of QP-STD-R-001, DEP 39.01.10.12 and NACE MR0175; in case of conflict, QP-STD-R-001 shall apply. Fabrication shall be in accordance with QP-STD-R-002 and NACE MR0175 in case of conflict, QP-STD-R-002 shall apply.

- Wherever cladding is specified as Alloy 825 material, it shall be weld overlaid with Alloy 625 welding consumable.

- Non-Metallic pipe and fittings shall meet the requirements of ISO 14692 as a minimum, and shall be manufactured, fabricated, inspected and certified by an established supplier, with at least 5-years' experience in the supply of non-metallic pipe and fittings.

- Coating, painting, and wrapping for all piping shall be as per project specification, including inspection and certification, shall meet the requirements of QP-SPC-L-002 and DEP 30.48.00.31; in case of conflict, QP-SPC-L-002 shall apply.

- Additional requirements (if any) for respective items are in reference to codes / standards stated in MESC datasheets.

- For valves, details are covered in Doc No. 4355-GENOF-5-14-0005 Valve Specification and in Doc No. 4355-GENOF-5-13-0002 Valve Data Sheets.

5.0 PIPING CLASSES

Piping classes shall be applied in accordance with DEP 31.38.01.24 – Gen, Piping - Engineering and Layout Requirements. The identification of piping classes shall be in accordance with DEP 31.38.01.10 Piping Class - Basis of Design. Summary of selected piping class are tabulated in ATTACHMENT 1. Amendments to the detailed piping classes to be used for this project are selected from DEP 31.38.01.15 – Gen - Piping Classes - Exploration and Production are as in ATTACHMENT 3 of this specification. All DEPs used in this specification shall be from Version 45. Due to copyright constraints the DEP piping classes are not included in the specification. The DEP piping classes accessible to the contractor shall be used and amended in accordance with the piping class amendments provided in ATTACHMENT 3.

ATTACHMENT 2 is a piping class summary of all wall schedules and calculated wall thicknesses for easy reference. Pipe materials, gaskets and bolting and valve materials are also summarised.

Piping classes are categorized as below:

• Piping classes derived from DEP Piping Classes and modified with respect to pressure, temperature and size ranges. In addition components like socket weld fittings, socket weld flanges, mono flanged valves etc have been removed. The piping class amendments can be seen in ATTACHMENT 3.

- 18011
- 11432
- 31432
- 61432
- 91432
- 151432
- 11441
- 31441
- 11503
- 31503
- 61503
- 91503
- 151503
- 11093KS
- 31093KS
- 13411
- 33411
- 13461
- 33461
- 63461
- 93461
- 153461
- 16620
- 36620
- 66620
- 96620
- 13831
- 153831
- 253831
- 13844
- 33844
- 63864
- 16410
- 17012
- 17320

• Specific piping classes created for the MM BH Re-Development project have been provided. The new piping classes can be seen in ATTACHMENT 3 and are;

- 251503
- 61093KS
- 91093KS
- 151093KS
- 253461
- 156620
- 256620
- 17060X
- 31ZZZ
- 61ZZZ
- 91ZZZ
- 151ZZZ
- 151ZZZH
- 251ZZZ
- 17240

6.0 ATTACHMENTS LIST

Attachment No.	Description	No. of Pages
1	SUMMARY OF PIPING CLASSES (INDEX)	5
2	PIPING MATERIAL CLASSES – WALL THICKNESS / SCHEDULE SUMMARY	1
3	PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.	76

Table 8 - Attachments

	Piping Class	Fluid Code	Service	Flange Rating / Face	NB size range	Piping Class Rating		Matl Group	Design Code	Material	Corr. All. (mm)	Remarks
						Pressure (BarG)	Temperature (°C)					
1	18011	AI	INSTRUMENT AIR (DRY)	150 RF	1/2" - 4"	19.6 19.6 19.2 18.15	-29 0 50 85	1.1	B31.3	Galvanised Carbon Steel	0	6" and above see 13411
2	11432	DF GI GN OL VA WU WT	DIESEL FUEL NITROGEN GAS (BF) NITROGEN GAS OIL LUBE VENT AIR & NITROGEN WATER UTILITY / DESALINATED WATER WATER TEMPERED (COOLING MED.)	150 RF	1/2" - 30"	19.6 19.6 19.2 17.7 17.32 15.8	-29 0 50 100 110 150	1.1	B31.3	Carbon Steel (Non Sour)	3	
3	31432	DO GI GN WT	OPEN DRAIN FIRE SUPPRESSION GAS NITROGEN GAS WATER TEMPERED (COOLING MED.)	300 RF	1/2" - 30"	51.1 51.1 50.1 46.6 46.3 45.1	-29 0 50 100 110 150	1.1	B31.3	Carbon Steel (Non Sour)	3	DO at 150lb rating = 17320
4	61432	GN WT	NITROGEN GAS WATER TEMPERED (COOLING MED.)	600 RF	1/2" - 24"	102.1 102.1 100.2 93.2 92.6 90.2	-29 0 50 100 110 150	1.1	B31.3	Carbon Steel (Non Sour)	3	
5	91432	GN WT	NITROGEN GAS WATER TEMPERED (COOLING MED.)	900 RF	1/2" - 24"	153.2 153.2 150.4 139.8 138.88 135.2	-29 0 50 100 110 150	1.1	B31.3	Carbon Steel (Non Sour)	3	
6	151432	GN WT	NITROGEN GAS WATER TEMPERED (COOLING MED.)	1500 RF	1/2" - 24"	255.3 255.3 250.6 233 231.48 225.4	-29 0 50 100 110 150	1.1	B31.3	Carbon Steel (Non Sour)	3	
7	11441	OD	OIL DRAIN (BH ONLY)	150 RF	1/2" - 24"	19.6 19.6 19.2 17.7 17.32	-29 0 50 100 110	1.1	B31.3	Carbon Steel (Sour)	3	
8	31441	OD	OIL DRAIN (BH ONLY)	300 RF	1/2" - 24"	51.1 51.1 50.1 46.6 46.3	-29 0 50 100 110	1.1	B31.3	Carbon Steel (Sour)	3	
9	11503	CG DC ¬ FH ~ FH FL GF GN GP # GV ** OC * OD **	CHEMICAL GLYCOL (LEAN) (MM ONLY) CLOSED DRAIN HP FLARE (FLARE STACK) HP FLARE (WET & DRY) (MM ONLY) LP FLARE GAS FUEL NITROGEN GAS (BOTTLE RACKS) PROCESS GAS-SOUR LP / HP FLARE (** BF ONLY) OIL CRUDE - SOUR OPEN DRAIN (** BF ONLY)	150 RF	1/2" - 50"	19.6 19.6 19.2 17.7 15.8 14.8	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) ~ ONLY K.O. Drum to Flare Stack # NOTE 3 (BH) # NOTE 11 (MM) * OC ONLY Upstream and Downstream of LP Separator & Downstream of MP Separators
10	31503	CG DC ¬ FH GC ~ GF GP # GV ** OC *	CHEMICAL GLYCOL (LEAN) (MM ONLY) CLOSED DRAIN HP FLARE (WET & DRY) (MM ONLY) GAS CONDENSATE GAS FUEL PROCESS GAS-SOUR HP FLARE (** BF ONLY) OIL CRUDE - SOUR	300 RF	1/2" - 30"	51.1 51.1 50.1 46.6 45.1 44.45	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) ~ NOTE 15 (MM) # NOTE 3 (BH) * OC ONLY downstream of LP Separator upto Barred Tee Inlet flange of MOL Pig Launcher
11	61503	CG DC ¬ FH GF GN GP # GV **	CHEMICAL GLYCOL (LEAN) (MM ONLY) CLOSED DRAIN HP FLARE (WET & DRY) (MM ONLY) GAS FUEL NITROGEN GAS (BOTTLE RACKS) PROCESS GAS-SOUR HP FLARE (** BF ONLY)	600 RF	1/2" - 24"	102.1 102.1 100.2 93.2 90.2 88.9	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) # NOTE 3 (BH) ~ NOTE 15 (MM)
12	91503	CG DC ¬ FH GC ~ GF GN GP # GV **	CHEMICAL GLYCOL (LEAN) (MM ONLY) CLOSED DRAIN HP FLARE (WET & DRY) (MM ONLY) GAS CONDENSATE GAS FUEL NITROGEN GAS (BOTTLE RACKS) PROCESS GAS-SOUR HP FLARE (** BF ONLY)	900 RF	1/2" - 24"	153.2 153.2 150.4 139.8 135.2 133.3	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) ~ NOTE 6 (BH) # NOTE 3 (BH) # NOTE 11 (MM)
13	151503	CG DC ¬ FH GC ~ GP # GN GV **	CHEMICAL GLYCOL (LEAN) (MM ONLY) CLOSED DRAIN HP FLARE (WET & DRY) (MM ONLY) GAS CONDENSATE PROCESS GAS-SOUR NITROGEN GAS (BOTTLE RACKS) HP FLARE (** BF ONLY)	1500 RF	1/2" - 36"	255.3 255.3 250.6 233 225.4 222.2	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) ~ NOTE 6 (BH) NOTE 14 (MM) # NOTE 3 (BH)

	Piping Class	Fluid Code	Service	Flange Rating / Face	NB size range	Piping Class Rating		Matl Group	Design Code	Material	Corr. All. (mm)	Remarks
						Pressure (BarG)	Temperature (°C)					
14	251503	DC ¬ FH GP #	CLOSED DRAIN HP FLARE (WET & DRY) (MM ONLY) PROCESS GAS-SOUR	2500 RF	1/2" - 14"	425.5 425.5 417.7 388.3 375.6 370.3 369	-50 0 50 100 150 175 181	1.1	B31.3	Low Temp Carbon Steel (Sour)	3	¬ NOTE 7 (BH) # NOTE 3 (BH)
15	11093KS	GC# OC PS	GAS CONDENSATE OIL CRUDE - SOUR PROCESS LIQUID - SOUR	150 RF	1/2" - 36"	19.6 19.6 19.2 17.7 15.8 14.8	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	6	# NOTE 16 (MM)
16	31093KS	GC# OC PS	GAS CONDENSATE OIL CRUDE - SOUR PROCESS LIQUID - SOUR	300 RF	1/2" - 24"	51.1 51.1 50.1 46.6 45.1 44.45	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	6	# NOTE 16 (MM)
17	61093KS	OC PS	OIL CRUDE - SOUR PROCESS LIQUID - SOUR	600 RF	1/2" - 24"	102.1 102.1 100.2 93.2 90.2 88.9	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	6	
18	91093KS	GP~ OC PS	PROCESS GAS-SOUR OIL CRUDE - SOUR PROCESS LIQUID - SOUR	900 RF	1/2" - 24"	153.2 153.2 150.4 139.8 135.2 133.3	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	6	~ NOTE 12 (MM)
19	151093KS	GC# OC PS	GAS CONDENSATE OIL CRUDE - SOUR PROCESS LIQUID - SOUR	1500 RF	1/2" - 36"	255.3 255.3 250.6 233 225.4 222.2	-50 0 50 100 150 175	1.1	B31.3	Low Temp Carbon Steel (Sour)	6	# NOTE 16 (MM)
20	13411	AI AI VA	INST AIR (WET) INST AIR (DRY) * VENT AIR & NITROGEN	150 RF	1/2" - 24"	19 19 18.4 16.86	-29 0 50 85	2.2	B31.3	Stainless Steel 316 (Non Sour)	0	* 6" and above (18011 for 4" and below)
21	33411	AI AI VA	INST AIR (WET) INST AIR (DRY) VENT AIR & NITROGEN	300 RF	1/2" - 24"	49.6 49.6 48.1 43.97	-29 0 50 85	2.2	B31.3	Stainless Steel 316 (Non Sour)	0	
22	13461	CG * CI * FH FH GC ~ GF ¬ GF GV GP # PW**	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) HP FLARE (COLD) DRY (MM NOTE 20) GAS CONDENSATE GAS FUEL GAS FUEL (MM ONLY) GAS VENT (DRY FLARE) PROCESS GAS-SOUR PRODUCED WATER	150 RF	1/2" - 36"	19 19 18.4 16.2 14.8 14.58	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CG lines SS316 upstream of XV valve * CI lines SS316 upstream of XV valve ~ NOTE 4 (BH), ~ NOTE 13 (MM) ¬ to Flame Front line to Flarestack unit only pilot gas to Flarestack unit only # NOTE 2 (BH), # NOTE 10 (MM) ** Only from Glycol Recovery Unit
23	33461	CG * CI * FH GC ~ GV GP #	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) GAS CONDENSATE GAS VENT (DRY FLARE) PROCESS GAS-SOUR	300 RF	1/2" - 24"	49.6 49.6 48.1 42.2 38.5 37.94	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CG lines SS316 upstream of XV valve * CI lines SS316 upstream of XV valve ~ NOTE 4 (BH) # NOTE 2 (BH)
24	63461	CG * CI * FH FH GC ~ GV GP #	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) HP FLARE (COLD) DRY (MM NOTE 20) GAS CONDENSATE GAS VENT (DRY FLARE) PROCESS GAS-SOUR	600 RF	1/2" - 24"	99.3 99.3 96.2 84.4 77 75.86	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CG lines SS316 upstream of XV valve * CI lines SS316 upstream of XV valve ~ NOTE 4 (BH) # NOTE 2 (BH)
25	93461	CG * CI * FH FH GV	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) HP FLARE (COLD) DRY (MM NOTE 20) GAS VENT (DRY FLARE)	900 RF	1/2" - 24"	148.9 148.9 144.3 126.6 115.5 113.8	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CG lines SS316 upstream of XV valve * CI lines SS316 upstream of XV valve
26	153461	CG * CI * FH FH GV	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) HP FLARE (COLD) DRY (MM NOTE 20) GAS VENT (DRY FLARE)	1500 RF	1/2" - 24"	248.2 248.2 240.6 211 192.5 189.66	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CG lines SS316 upstream of XV valve * CI lines SS316 upstream of XV valve
27	253461	CI * FH GV	CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) DRY (BH ONLY) GAS VENT (DRY FLARE)	2500 RF	1/2" - 6"	413.7 413.7 400.9 351.6 320.8 316.08	-85 0 50 100 150 160	2.2	B31.3	Stainless Steel LT 316 (Sour)	0	* CI lines SS316 upstream of XV valve

	Piping Class	Fluid Code	Service	Flange Rating / Face	NB size range	Piping Class Rating		Matl Group	Design Code	Material	Corr. All. (mm)	Remarks
						Pressure (BarG)	Temperature (°C)					
28	16620	CG * CI * FH FH GP # GC ¬ GV GV ** OC ~ OR PW	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) WET (BH ONLY) HP FLARE (COLD) WET (MM NOTE 19) PROCESS GAS-SOUR GAS CONDENSATE GAS VENT (WET FLARE) GAS VENT OIL CRUDE - SOUR OIL REJECT / OIL RECOVERY (HYDROCYCLONES) PRODUCED WATER	150 RF	1/2" - 42"	20 20 19.5 17.7 15.8 13.8	-85 0 50 100 150 200	3.8 1.1	B31.3	Alloy 825 Low Temp (Sour) ≥8" LTCS + Clad 825 (3mm Thk) Solid 825 for temps down to -85degC LTCS + 825 Clad limited to -50degC	0	* CG lines 825 downstream of XV valve * CI lines 825 downstream of XV valve # NOTE 1 (BH), # NOTE 9 (MM) ¬ NOTE 5 (BH),¬ NOTE 14 (MM) ** MMI06C, WHJs & BF ONLY ~ OC only at outlet of HP Test Separator (BH) ~ OC only at outlet of MP Test Separator (MM)
29	36620	CG * CI * FH GC ¬ GP # GV GV ** PW WD **	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) WET (BH ONLY) GAS CONDENSATE PROCESS GAS-SOUR GAS VENT (WET FLARE) GAS VENT PRODUCED WATER PRODUCED WATER DISPOSAL	300 RF	1/2" - 24"	51.7 51.7 51.7 51.5 50.3 48.3	-85 0 50 100 150 200	3.8 1.1	B31.3	Alloy 825 Low Temp (Sour) ≥8" LTCS + Clad 825 (3mm Thk) Solid 825 for temps down to -85degC LTCS + 825 Clad limited to -50degC	0	* CG lines 825 downstream of XV valve * CI lines 825 downstream of XV valve ¬ NOTE 5 (BH), ¬ NOTE 14 (MM) # NOTE 1 (BH), # NOTE 9 (MM) ** MMI06C, WHJs & BF ONLY ** BF ONLY
30	66620	CG * CI * FH GC ¬ GP # GV GV ** PW	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) WET (BH ONLY) GAS CONDENSATE PROCESS GAS-SOUR GAS VENT (WET FLARE) GAS VENT PRODUCED WATER	600 RF	1/2" - 24"	103.4 103.4 103.4 103 100.3 96.7	-85 0 50 100 150 200	3.8 1.1	B31.3	Alloy 825 Low Temp (Sour) ≥6" LTCS + Clad 825 (3mm Thk) Solid 825 for temps down to -85degC LTCS + 825 Clad limited to -50degC	0	* CG lines 825 downstream of XV valve * CI lines 825 downstream of XV valve ¬ NOTE 14 (MM) # NOTE 1 (BH), # NOTE 9 (MM) ** MMI06C, WHJs & BF ONLY
31	96620	CG * CI * OC ~ FH FH GC ¬ GV GV ** PW	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION OIL CRUDE - SOUR HP FLARE (COLD) WET (BH ONLY) HP FLARE (COLD) WET (MM NOTE 19) GAS CONDENSATE GAS VENT (WET FLARE) GAS VENT PRODUCED WATER	900 RF	1/2" - 24"	155.1 155.1 155.1 154.6 150.6 145	-85 0 50 100 150 200	3.8 1.1	B31.3	Alloy 825 Low Temp (Sour) ≥6" LTCS + Clad 825 (3mm Thk) Solid 825 for temps down to -85degC LTCS + 825 Clad limited to -50degC	0	* CG lines 825 downstream of XV valve * CI lines 825 downstream of XV valve ~ OC only at outlet of MJ & MJ Test Separators upto MP Separators (84-V-003/004) Inlet ¬ NOTE 5 (BH), ¬ NOTE 14 (MM) # NOTE 9 (MM) ** MMI06C, WHJs & BF ONLY
32	156620	CG * CI * FH FH GV GV **	CHEMICAL GLYCOL (RICH, LEAN, MEG) CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) WET (BH ONLY) HP FLARE (COLD) WET (MM NOTE 19) GAS VENT (WET FLARE) GAS VENT	1500 RF	1/2" - 8"	258.6 258.6 258.6 257.6 250.8 241.7	-85 0 50 100 150 200	3.8 1.1	B31.3	Alloy 825 Low Temp (Sour) ≥6" LTCS + Clad 825 (3mm Thk)	0	* CG lines 825 downstream of XV valve * CI lines 825 downstream of XV valve ** MMI06C, WHJs & BF ONLY
33	256620	CI * FH GV	CORROSION INHIBITOR / CHEMICAL INJECTION HP FLARE (COLD) WET (BH ONLY) GAS VENT (WET FLARE)	2500 RF	1/2" - 4"	430.9 430.9 430.9 429.4 418.2 402.8	-85 0 50 100 150 200	3.8	B31.3	Alloy 825 Low Temp (Sour)	0	* CI lines 825 downstream of XV valve
34	13831	OH	HYDRAULIC OIL	150 RF	1/2" - 1.1/2"	20 20 19.5 17.7 16.94	-29 0 50 100 120	2.8	B31.3	Duplex Stainless Steel	0	for Brownfield scope
35	153831	OH	HYDRAULIC OIL	1500 RF	1/2" - 1.1/2"	258.6 258.6 258.6 253.3 243.82	-29 0 50 100 120	2.8	B31.3	Duplex Stainless Steel	0	for Brownfield scope
36	253831	OH	HYDRAULIC OIL	2500 RF	1/2" - 1.1/2"	430.9 430.9 430.9 422.2 406.4	-29 0 50 100 120	2.8	B31.3	Duplex Stainless Steel	0	for Brownfield scope
37	13844	DC ¬	CLOSED DRAIN	150 RF	1" - 6"	20 20 19.5 17.7	-50 0 50 100	2.8	B31.3	Super Duplex Stainless Steel	0	¬ NOTE 8 (BH)
38	33844	DC ¬	CLOSED DRAIN	300 RF	1" - 6"	51.7 51.7 51.7 49.7	-50 0 50 100	2.8	B31.3	Super Duplex Stainless Steel	0	¬ NOTE 8 (BH)
39	63864	DC ¬	CLOSED DRAIN	600 RF	1" - 6"	103.4 103.4 103.4 101.3	-50 0 50 100	2.8	B31.3	Super Duplex Stainless Steel	0	¬ NOTE 8 (BH)
40	16410	HI	HYPOCHLORITE INJECTION	150 RF	1/2" - 1.1/2"	19 18.4 16.86	4 50 85	2.2	B31.3	Titanium 2" and above UPVC/GRVE (17240)	0	
41	17060X	WF	WATER FIRE (SEA WATER) (DRY)	150 FF	3/4" - 24"	20 19.7 18.6 17.3	0 50 75 100		EEMUA 234	90/10 Copper Nickel	0	WP used for flushing the firemain system.

	Piping Class	Fluid Code	Service	Flange Rating / Face	NB size range	Piping Class Rating Pressure (BarG)	Piping Class Rating Temperature (°C)	Matl Group	Design Code	Material	Corr. All. (mm)	Remarks
42	31ZZZ	PW	PRODUCED WATER	300 RF	16"	50 50	-35 110	-	DNV-ST-F101	High Strength Carbon Steel (Sour) + Clad 825 (3mm Thk)	0	
43	61ZZZ	OC	OIL CRUDE - SOUR	600 RF	10"	46 46	0 85	-	DNV-ST-F101	High Strength Carbon Steel (Sour)	3	
44	91ZZZ	GC GP OC	GAS CONDENSATE PROCESS GAS-SOUR OIL CRUDE - SOUR	900 RF	6" - 10"	153 153	-45 110	-	DNV-ST-F101	High Strength Carbon Steel (Sour)	3	
45	151ZZZ	GP OC PS	PROCESS GAS-SOUR OIL CRUDE - SOUR PROCESS LIQUID - SOUR	1500 RF	6" - 16"	228 228	-45 120	-	DNV-ST-F101	High Strength Carbon Steel (Sour)	3	
46	151ZZZH	OC PS	OIL CRUDE - SOUR PROCESS LIQUID - SOUR	1500 RF	6" - 16"	228 228	-45 110	-	DNV-ST-F101	High Strength Carbon Steel (Sour)	6	
47	251ZZZ	GP	PROCESS GAS-SOUR	2500 RF	14"	371 371	-45 85	-	DNV-ST-F101	High Strength Carbon Steel (Sour)	3	
48	17012	SD SL WP WF	SEWAGE DRAIN SEWAGE WATER WATER POTABLE (HOT OR COLD) WATER FIRE (SEA WATER) (WET)	150 FF	1" - 30"	20 20	0 85		DEP 31.40.10.19 ISO 14692	GRVE	0	Material Selection to be revisited in EPIC WP used for flushing the firemain system.
49	17320	DO OD OD ** WR	OPEN DRAIN OIL DRAIN OPEN DRAIN (** BF ONLY) WATER RAW (SEA WATER)	150 FF	1" - 44"	20 20	0 85		DEP 31.40.10.19 ISO 14692	GRUP	0	Material Selection to be revisited in EPIC WR used for flushing the Raw Water system.
50	17240	HI	HYPOCHLORITE INJECTION	150 FF	2" - 6"	20 20	4 85		DEP 31.40.10.19 ISO 14692	2" and above GRVE 1.5" and below Titanium (16410)	0	Material Selection to be revisited in EPIC

BUL HANINE (BH) - Material Selection Specific Notes (GP, GC and DC lines)					
NOTE 1	GP	Gas Process	Alloy 825	150#, 300#, 600#	-from LP Compr. 1st Stage to 1st Stage Disch Cooler (LP Compr) (including recycling and inlet line to 1st Stage KO Drum (LP Compr) -from LP Compr. 2nd to 1st Stage KO Drum (GLBC) (including recycling) -from GLBC 1st Stage to 1st Stage Dish Cooler (GLBC) (including recycling) -from GLBC 2nd Stage to 2nd Stage Dish Cooler (GLBC) (including recycling) -1st stage and 2nd stage GLBC hot gas bypass
NOTE 2	GP	Gas Process	SS316	150#, 300#, 600#	-from 1st Stage KO Drum (LP Compr) to LP Compr. 1st Stage -from 1st Stage Disch Cooler (LP Compr) to 2nd Stage KO Drum (LP Compr) -from 2nd Stage KO Drum (LP Compr) to LP Compr 2nd Stage -from 1st Stage KO Drum (GLBC) to GLBC 1st Stage -from 1st Stage Dish Cooler (GLBC) to 2nd Stage KO Drum (GLBC) -from 2nd Stage KO Drum (GLBC) to GLBC 2nd Stage -from 2nd Stage Dish Cooler (GLBC) to Arab Glycol Contactor -flash gas line from glycol regeneration to the LP separator
NOTE 3	GP	Gas Process	LTCS	150#, 600#, 900#, 1500#, 2500#	-from HP Sep to 1st Stage KO Drum inlet line (Gas Lift Booster Compr) -from LP Sep to UZV upstream of 1st Stage KO Drum (LP Compr) -from Arab Glycol Contactor thru Gas Lift Compr. up to gas lift distribution. -from MJ Sep thru MJ Glycol Contactor to Injection Gas Comp and distribution. -from/to IGF Vessel to/from flare and fuel gas.
NOTE 4	GC	Gas Condensate	SS316	150#, 300#, 600#	-from 1st Stage KO Drum (LP Compr) to mixing point with 2nd stage condensate (LP Comp KOD) -from 2nd Stage KO Drum (LP Compr) to mixing point with 1st stage condensate (LP Comp KOD) -from Level Control Valve (1st Condensate GLBC) to mixing point with 2nd Stage Condensate GLBC -from 2nd Stage KO Drum (GLBC) to LP Separator inlet line -from Arab Glycol Contactor to HP Sep inlet line
NOTE 5	GC	Gas Condensate	Alloy 825	150#, 300#, 900#	-from mixing point of condensates 1st & 2nd stage (LP Comp KOD) to LP Sep inlet line -from 1st Stage KO Drum (GLBC) to Level Control Valve (1st Condensate GLBC) -from MJ Glycol Contactor to MJ Sep outlet lines -from the flare KO drum pumps to the LP separator
NOTE 6	GC	Gas Condensate	LTCS	900#, 1500#	-from KO Drum (GLC) to HP Sep inlet line -from Level Control valve at KO Drum (Inj Gas Compr) to Arab Production Manifolds
NOTE 7	DC	Closed Drain	LTCS	150#, 300#, 600#, 900#, 1500#, 2500#	-Collection headers upstream of Closed Drain Vessel
NOTE 8	DC	Closed Drain	SDSS	150#, 300#	-from Closed Drain Vessel to Closed Drain Pump -from Closed Drain Pump to LP Sep/ Main Export Line

MAYDAN MAHZAM (MM) - Material Selection Specific Notes (FH, GP, GC and DC lines)					
NOTE 9	GP	Gas Process	Alloy 825	150#, 300# 600#, 900#	-from LP Compr. to LP recycle cooler -from LP recycle cooler to LP Suction KO Drum inlet (LP Compr.) -from LP Compr. to 1st Stage KO Drum (GLBC) -from GLBC 1st Stage Compr. to 1st Stage Dish Cooler (GLBC) (including recycling) -from 1st Stage Disch. Cooler (GLBC) to 2nd Stage KO Drum (GLBC) -from 2nd Stage KO Drum (GLBC) to GLBC 2nd Stage Compr. -from GLBC 2nd Stage Compr. to 1st Stage Suct. Cooler (GLC) (including recycling) -from 1st Stage Suct. Cooler (GLC) to 1st Stage Suction KO Drum (GLC) -from 1st Stage KO Drum (GLC) to GLC 1st Stage Compr. -from 1st Stage Compr. to 1st Stage Dish Cooler (GLC) (including recycling) -from 1st Stage Disch. Cooler (GLC) to 2nd Stage KO Drum (GLC) -from 2nd Stage KO Drum (GLC) to GLC 2nd Stage Compr. -from 2nd Stage Compr. to 2nd Stage Dish Cooler (GLC) (including recycling) -from 2nd Stage Disch. Cooler (GLC) to Arab Glycol contactor -LP Compr., 1st stage and 2nd stage GLBC, 1st stage and 2nd stage GLC hot gas bypass -from MJ Sep. to MJ Glycol contactor
NOTE 10	GP	Gas Process	SS316	150#	-from LP Suction KO Drum (LP Compr.) to LP Compr. -from 1st Stage KO Drum (GLBC) to GLBC 1st Stage Compr. -flash gas line from glycol regeneration to the LP separator -LP Compr., 1st stage GLBC hot gas bypass
NOTE 11	GP	Gas Process	LTCS + 3mm CA	150#, 900#	-from LP Sep to LP Suction KO Drum (LP Compr.) -from MP Sep to 1st Stage KO Drum inlet line (GLBC) -from Arab Glycol Contactor to gas lift distribution -from MJ Glycol Contactor to gas export line upstream of Barred Tee. -from/to IGF Vessel to/from flare and fuel gas
NOTE 12	GP	Gas Process	LTCS + 6mm CA	900#	-from MJ dehydration outlet KOD to gas export line upstream of Barred Tee.
NOTE 13	GC	Gas Condensate	SS316	150#	-Hydrocarbon Skimmed off from glycol regen regeneration package to the LP separator inlet.
NOTE 14	GC	Gas Condensate	Alloy 825	150#, 300# 600#, 900#	-from RO of Fuel Gas KOD (36-V-001) downstream to Inlet manifold of MP Separators (84-V-003/4) -from LP Suction KO Drum (LP Compr.) to LP Separator inlet header -from 1st Stage and 2nd Stage KO Drum (GLBC) to LP Separator inlet header -from 1st Stage and 2nd Stage KO Drum (GLC) to MP Separator inlet header -from MJ Glycol Contactor to MP Separator inlet header -from Arab Glycol Contactor to MP Separator inlet header
NOTE 15	GC	Gas Condensate	LTCS + 3mm CA	300#, 600#, 1500#	-Downstream of Barred Tee of NGL recycle riser to inlet of MP Separators (84-V-003/004) inlet header via PS2BR12.
NOTE 16	GC	Gas Condensate	LTCS + 6mm CA	150#, 300#, 1500#	-at downstream of all UZVs at the Inlet manifold of MP Separators (consists of gas condensates from 1st and 2nd stage suction KODs of GL Compressor, and Fuel Gas KOD.
NOTE 17	DC	Closed Drain	LTCS		
NOTE 18	DC	Closed Drain	SDSS	600#	-MOL pump discharge -from closed drain pumps 70-P-001A/B
NOTE 19	FH	HP Flare (Wet)	Alloy 825	150, 900#, 1500#	PS2K HP Flare Wet Sub-Header to PS2K HP Flare Wet Main Header From Arab Glycol Contactor (12-C-002) relief, blowdown and vent line to PS2K HP Flare Wet Sub-Header From MJ Test Separator (84-V-002) relief, blowdown, vent and pipeline depressurisation line to PS2K HP Flare Wet Sub-Header From MJ Separator (84-V-001) relief, blowdown, vent and pipeline depressurisation line to PS2K HP Flare Wet Sub-Header From 2nd Stage Gas Lift Compressor Discharge Cooler (11-E-105) blowdown line to PS2K HP Flare Wet Sub-Header From 2nd Stage Gas Lift Compressor Discharge Cooler (11-E-205) blowdown line to PS2K HP Flare Wet Sub-Header From PS2R MJ Production Header (Bridge 12) blowdown line to PS2R HP Flare Wet Sub-Header From PS2R MJ Test Manifold Header (Bridge 12) blowdown line to PS2R HP Flare Wet Sub-Header From PS2R MJ Production/Test Manifold blowdown line to PS2R HP Flare Wet Sub-Header From PS2R MJ Production Header (Bridge 13) blowdown line to PS2R HP Flare Wet Main Header From PS2R MJ Test Header (Bridge 13) blowdown line to PS2R HP Flare Wet Main Header From PS2C MJ Production Header blowdown line to PS2C HP Flare Wet Header
NOTE 20	FH	HP Flare (Dry)	SS316	150#, 600#, 900#, 1500#	From MJ Dehydration Outlet KO Drum (12-V-002) blowdown and spill-off line to PS2K HP Flare Dry Sub-Header From Arab dehydrated gas outlet pipework blowdown line to PS2K HP Flare Dry Sub-Header From PS2K Gas Lift Header (Bridge 12) blowdown line to PS2R HP Flare Dry Main Header From PS2K Gas Export Header (Bridge 12) blowdown line to PS2R HP Flare Dry Main Header From PS2R Gas Lift Riser (MMI07C) blowdown, vent and pipeline depressurisation line to PS2R HP Flare Dry Sub-Header From PS2R Gas Lift Riser (MMI06C) blowdown, vent and pipeline depressurisation line to PS2R HP Flare Dry Sub-Header From PS2R Gas Lift Header blowdown line to PS2R HP Flare Dry Sub-Header From PS2R Gas Export Header to PS2R HP Flare Dry Sub-Header blowdown and pipeline depressurisation line to PS2R HP Flare Dry Sub-Header From PS2R Gas Lift Header (Bridge 13) blowdown line to to PS2R HP Flare Dry Sub-Header

ATTACHMENT 2 : PIPING MATERIAL CLASSES - WALL THICKNESS / SCHEDULE SUMMARY

	PMC	Rating	Base Material	Gasket/Bolt Material	Valve Material		NB (mm)	15	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600	750	900	1000	1050	1100	1200	1250
							NB (")	1/2	3/4	1	1.1/2	2	3	4	6	8	10	12	14	16	18	20	24	30	36	40	42	44	48	50
							OD (mm)	21.3	26.7	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.1	323.9	355.6	406.4	457	508	610	762	914	1016	1067	1118	1219	1270
																										(GRE only)				
1	18011	150# Galvanised CS		316SS SPWD CS CR / SS IR	Body: Nickel Aluminium Bronze			80	80	80	80	80	40	40																	
		(B16.5 1.1)		B7 / 2H	Trim: Al Bronze, PTFE																									
2	11432	150# CS 3mm CA (non sour)		316SS SPWD CS CR / SS IR	Body: Carbon Steel			160	160	160	160	80	80	40	40	30	30	30	20	20	20	20	20	20						
3	31432	300# (B16.5 1.1)		B7 / 2H	Trim: SS316, PTFE/PEEK			160	160	160	160	80	80	40	40	40	40	40	40	40	40	40	40	20mm						
4	61432	600#						160	160	160	160	160	80	80	80	80	80	80	80	80	80	80	80							
5	91432	900#						160	160	160	160	160	160	120	120	120	120	120	120	120	120	120	120							
6	151432	1500#						XXS	XXS	XXS	XXS	XXS	XXS	XXS	XXS	26mm	32mm	36mm	40mm	44mm	50mm	54mm	64mm							
7	11441	150# CS 3mm CA (sour)		316SS SPWD CS CR / SS IR	Body: Carbon Steel			160	160	160	160	80	80	40	40	30	30	30	20	20	20	20	20							
8	31441	300# (B16.5 matl grp 1.1)		B7 / 2H	Trim: 825, PTFE			160	160	160	160	80	80	40	40	40	40	40	40	40	40	40	40							
9	11503	150# LTCS 3mm CA (sour)		316SS SPWD CS CR / SS IR	Body: Low Temp Carbon Steel			160	160	160	160	80	80	40	40	30	30	30	20	20	20	20	20	20	20		XS		14mm	14mm
10	31503	300# (B16.5 matl grp 1.1)		L7M / 7M	Trim: 825, PTFE/PEEK			160	160	160	160	80	80	40	40	40	40	40	40	40	40	40	40	20mm						
11	61503	600#						160	160	160	160	160	80	80	80	80	80	80	80	80	80	80	80							
12	91503	900#						160	160	160	160	160	160	120	120	120	120	120	120	120	120	120	120							
13	151503	1500#						XXS	XXS	XXS	XXS	XXS	XXS	XXS	XXS	26mm	32mm	36mm	40mm	44mm		54mm	64mm	80mm						
14	251503	2500#						XXS	XXS	XXS	12mm	14mm	18mm	22mm	30mm	38mm	48mm	56mm	60mm											
15	11093KS	150# LTCS 6mm CA (sour)		316SS SPWD CS CR / SS IR	Body: Low Temp Carbon Steel			XXS	XXS	XXS	XXS	160	80	80	80	60	40	STD	40	40	30	30	XS	30	30					
16	31093KS	300# (B16.5 matl grp 1.1)		L7M / 7M	Trim: 825, PTFE/PEEK			XXS	XXS	XXS	XXS	160	160	120	80	80	60	60	60	60	60	60	60							
17	61093KS	600#			6mm CA			8mm	8mm	XXS	XXS	XXS	160	160	120	120	100	100	100	100	100	100	100							
18	91093KS	900#						10mm	10mm	XXS	XXS	XXS	XXS	XXS	160	140	140	140	140	140	120	120	120							
19	151093KS	1500#						10mm	10mm	12mm	12mm	14mm	16mm	20mm	24mm	30mm	34mm	40mm	42mm	48mm	52mm	58mm	68mm	82mm	98mm					
20	13411	150# SS (non sour)		316SS SPWD SS CR	Body: SS316			40S	40S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S							
21	33411	300# (B16.5 matl grp 2.2)		B8M / 8M	Trim: SS316, PTFE			40S	40S	10S	10S	10S	10S	10S	40S	40S	40S	40S	30	40	30	30	40							
22	13461	150# SS (sour)		316SS SPWD SS CR	Body: SS316			40S	40S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10mm					12mm
23	33461	300# (B16.5 matl grp 2.2)		L7M / 7M	Trim: SS316, PTFE			40S	40S	10S	10S	10S	10S	10S	40S	40S	40S	40S	30	40	30	30	40							
24	63461	600#						40S	40S	40S	40S	40S	40S	40S	80S	80S	80S	60	60	60	60	60	60							
25	93461	900#		Alloy 625 bolting below -73°C				40S	40S	40S	40S	80S	80S	80S	120	120	100	100	100	100	100	100	100							
26	153461	1500#						80S	80S	80S	160	160	160	160	160	160	160	160	160	160	160	160	160							
27	253461	2500#						160	160	160	XXS	XXS	XXS	18mm	26mm															
28a	16620	150# Alloy 825		825 SPWD CS CR / 825 IR	Body: 825	NOTE 1		40S	40S	10S	10S	10S	10S	10S	10S	*10S*	*10S*	*10S*	*10S*	*10S*	*10S*	*10S*	*10S*	*10S*	*10*		*STD*			*10mm*
29a	36620	300# (solid 825 below -50degC)		L7M / 7M	Trim: 825, PTFE/PEEK	NOTE 1		40S	40S	10S	10S	10S	10S	10S	10S	*20*	*20*	*20*	*20*	*20*	*STD*	*20*	*XS*							
30a	66620	600# (B16.5 matl grp 3.8)				NOTE 1		40S	40S	10S	10S	10S	40S	40S	*40S*	*40S*	*80S*	*80S*	*60*	*60*	*60*	*60*	*60*							
31a	96620	900#		Alloy 625 bolting below -73°C		NOTE 1		40S	40S	10S	10S	40S	40S	80S	*80S*	*80S*	*80*	*80*	*80*	*100*	*100*	*100*	*100*							
32a	156620	1500#				NOTE 1		40S	40S	40S	80S	80S	160	120	*160*	*140*														
33	256620	2500#						80S	80S	160	160	160	XXS	XXS																
28b	16620	150# LTCS + 825 Clad (3mm)		825 SPWD CS CR / 825 IR	Body: LTCS + 825 Clad	NOTE 1										20	20	20	20	20	20	20	20	20	20		STD			12mm
29b	36620	300# (not to fall below -50degC)		L7M / 7M	Trim: 825, PTFE/PEEK	NOTE 1										20	20	30	30	30	30	30	30							
30b	66620	600# (B16.5 matl grp 1.1)				NOTE 1									40	60	60	60	60	80	60	80	80							
31b	96620	900#				NOTE 1									80	100	100	100	100	100	100	100	100							
32b	156620	1500#				NOTE 1									160	XXS														
34	13831	150# Duplex SS		DSS SPWD DSS CR IR	Body: Duplex SS			40S	40S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S	10S							
35	153831	1500# (B16.5 matl grp 2.8)		B7 / 2H	Trim: Duplex SS, PTFE/PEEK			80S	80S	80S	80S	80S	80S	80S	120	120	120	120	120	120										
36	253831	2500#						80S	80S	80S	160	160	160	160	XXS															
37	13844	150# Super Duplex SS		6Mo SPWD CS CR, 6Mo IR	Body: Super Duplex SS					10S	10S	10S	10S	10S	10S															
38	33844	300# (B16.5 matl grp 2.8)		L7M / 7M	Trim: Super Duplex SS, PTFE					10S	10S	10S	10S	10S	10S															
39	63864	600#								40S	40S	40S	40S	40S	40S															
40	16410	150# Titanium		FLAT RING PTFE	Body: Titanium			10S	10S	10S	10S																			
				B8M / 8M	Trim: Titanium, PTFE																									
41	17060X	150# 90/10 CuNi		FF 2mm ARAMID / NBR	Body: Nickel Aluminium Bronze	EEMUA 234	2mm	2.5mm	2.5mm	2.5mm	2.5mm	3mm	3.5mm	4.5mm	5.5mm	7mm	8mm	9mm	9.5mm	11mm	13mm									
				B7 / 2H	Trim: Al Bronze, PTFE	derived wall thicknesses																								
42	31ZZZ	300# HS CS + 825 Clad (3mm)		316SS SPWD CS CR / SS IR	Body: Low Temp Carbon Steel													12.7mm												
43	61ZZZ	600# HS CS 3mm CA		L7M / 7M	Trim: 825, PEEK	Wall thicknesses provided by Pipelines									12.7mm															
44	91ZZZ	900# HS CS 3mm CA			Welded both ends								12.7mm	12.7mm	12.7mm							ALL CONTROLLED ID - REFER TO PIPING MATERIAL SPECIFICATION									
45	151ZZZ	1500# HS CS 3mm CA											14.27mm	15.1mm	18.3mm	20.6mm	20.62mm	22.23mm		ALL CONTROLLED ID - REFER TO PIPING MATERIAL SPECIFICATION									
46	151ZZZH	1500# HS CS 6mm CA											14.27mm	15.1mm	18.3mm	20.6mm	20.62mm	22.23mm		ALL CONTROLLED ID - REFER TO PIPING MATERIAL SPECIFICATION									
47	251ZZZ	2500# HS CS 3mm CA															26.97mm			ALL CONTROLLED ID - REFER TO PIPING MATERIAL SPECIFICATION									
48	17012	20 Barg GRVE		FLAT RING EPDM	Body: Nickel Aluminium Bronze	NOTE 2			*2mm	*2mm	*2mm	*2mm	*2mm	2.4mm	3.3mm	4.1mm	4.9mm	5.7mm	6.5mm	7.3mm	8.1mm	9.8mm	12.2mm							
49	17320	20 Barg GRUP		B7 / 2H	Trim: Al Bronze, PTFE	NOTE 2			*2mm	*2mm	*2mm	*2mm	*2mm	2.4mm	3.3mm	4.1mm	4.9mm	5.7mm	6.5mm	7.3mm	8.1mm	9.8mm	12.2mm	*14mm	*18mm		*20mm			
50	17240	20 Barg GRVE		FLAT RING PTFE	Body: Nickel Alloy	NOTE 2					*2mm	*2mm	*2mm	*2.4mm																
				B7 / 2H	Trim: Hastelloy C276, PTFE																									

NOTE 1 : Classes 28a, 29a, 30a, 31a & 32a should be used for all pipe sizes (1/2" to 50") below the design temperature of -50 degC.
If line minimum design temperature is -50DegC or above the classes 28b, 29b, 30b, 31b & 32b to be used for larger bores as shown above.
Default selection is LTCS+825 clad as per DEP piping class. Italic/grey font denotes secondary option.

NOTE 2 :
green = WT based on Future Pipe Wavistrong EST20 (* = estimated)
non-metallic pipe ID is the nominal bore, i.e. 8" NB has 200mm ID

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

	PMC	Material	CA (mm)	Rating	0	1	2	3
3.1	18011	Galvanised Carbon Steel	0	150	✓	✓	✓	✓
3.2	11432	Carbon Steel (Non Sour)	3	150	✓	✓	✓	✓
3.3	31432	Carbon Steel (Non Sour)	3	300	✓	✓	✓	✓
3.4	61432	Carbon Steel (Non Sour)	3	600	✓	✓	✓	✓
3.5	91432	Carbon Steel (Non Sour)	3	900	✓	✓	✓	✓
3.6	151432	Carbon Steel (Non Sour)	3	1500	✓	✓	✓	✓
3.7	11441	Carbon Steel (Sour)	3	150	✓	✓	✓	✓
3.8	31441	Carbon Steel (Sour)	3	300	✓	✓	✓	✓
3.9	11503	Low Temp Carbon Steel (Sour)	3	150	✓	✓	✓	✓
3.10	31503	Low Temp Carbon Steel (Sour)	3	300	✓	✓	✓	✓
3.11	61503	Low Temp Carbon Steel (Sour)	3	600	✓	✓	✓	✓
3.12	91503	Low Temp Carbon Steel (Sour)	3	900	✓	✓	✓	✓
3.13	151503	Low Temp Carbon Steel (Sour)	3	1500	✓	✓	✓	✓
3.14	251503	Low Temp Carbon Steel (Sour)	3	2500		✓	✓	✓
3.15	11093KS	Low Temp Carbon Steel (Sour)	6	150		✓	✓	✓
3.16	31093KS	Low Temp Carbon Steel (Sour)	6	300		✓	✓	✓
3.17	61093KS	Low Temp Carbon Steel (Sour)	6	600		✓	✓	✓
3.18	91093KS	Low Temp Carbon Steel (Sour)	6	900		✓	✓	✓
3.19	151093KS	Low Temp Carbon Steel (Sour)	6	1500		✓	✓	✓
3.20	13411	Stainless Steel (Non Sour)	0	150	✓	✓	✓	✓
3.21	33411	Stainless Steel (Non Sour)	0	300	✓	✓	✓	✓
3.22	13461	Stainless Steel LT (Sour)	0	150	✓	✓	✓	✓
3.23	33461	Stainless Steel LT (Sour)	0	300	✓	✓	✓	✓
3.24	63461	Stainless Steel LT (Sour)	0	600	✓	✓	✓	✓
3.25	93461	Stainless Steel LT (Sour)	0	900	✓	✓	✓	✓

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

	PMC	Material	CA (mm)	Rating	0	1	2	3
3.26	153461	Stainless Steel LT (Sour)	0	1500	✓	✓	✓	✓
3.27	253461	Stainless Steel LT (Sour)	0	2500		✓	✓	✓
3.28	16620	Alloy 825 LT (Sour)	0	150	✓	✓	✓	✓
3.29	36620	Alloy 825 LT (Sour)	0	300	✓	✓	✓	✓
3.30	66620	Alloy 825 LT (Sour)	0	600	✓	✓	✓	✓
3.31	96620	Alloy 825 LT (Sour)	0	900	✓	✓	✓	✓
3.32	156620	Alloy 825 LT (Sour)	0	1500		✓	✓	✓
3.33	256620	Alloy 825 LT (Sour)	0	2500		✓	✓	✓
3.34	13831	Duplex Stainless Steel	0	150	✓	✓	✓	✓
3.35	153831	Duplex Stainless Steel	0	1500		✓	✓	✓
3.36	253831	Duplex Stainless Steel	0	2500	✓	✓	✓	✓
3.37	13844	Super Duplex Stainless Steel	0	150		✓	✓	✓
3.38	33844	Super Duplex Stainless Steel	0	300		✓	✓	✓
3.39	63864	Super Duplex Stainless Steel	0	600				✓
3.40	16410	Titanium	0	150	✓	✓	✓	✓
3.41	31ZZZ	High Strength Carbon Steel (Sour)	3	300		✓	✓	✓
3.42	61ZZZ	High Strength Carbon Steel (Sour)	3	600				✓
3.43	91ZZZ	High Strength Carbon Steel (Sour)	3	900	✓	✓	✓	✓
3.44	151ZZZ	High Strength Carbon Steel (Sour)	3	1500	✓	✓	✓	✓
3.45	91ZZZH	High Strength Carbon Steel (Sour)	6	900		✓	✓	✓
3.46	151ZZZH	High Strength Carbon Steel (Sour)	6	1500		✓	✓	✓
3.47	251ZZZ	High Strength Carbon Steel (Sour)	3	2500			✓	✓
3.48	17012	GRVE	0	150	✓	✓	✓	✓
3.49	17320	GRUP	0	150	✓	✓	✓	✓
3.50	17240	GRVE lined UPVC	0	150	✓	✓	✓	✓

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.1 Piping Class 18011 Amendments to Shell DEP

- Design Temperature from -29 degC to 85 degC
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.6 BarG
- Size Range ½" to 4" NB. 6" NB and above shall be piping class 13411.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 to be used with project approval.
- All valve bodies to be ASTM B148 UNS C95800 with Aluminium Bronze trim.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Flanged RF Balls valves 3" and 4" added.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.2 Piping Class 11432 Amendments to Shell DEP

- Design Temperature from -29 degC to 150 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.6 BarG.
- Size Range ½" to 30" NB.
- 30" and larger flanges to ASME B16.47 Series A.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 11432 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

3.3 Piping Class 31432 Amendments to Shell DEP

- Design Temperature from -29 degC to 150 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.1 BarG.
- Size Range ½" to 30" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Remove all socket weld fittings. 31432 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

3.4 Piping Class 61432 Amendments to Shell DEP

- Design Temperature from -29 degC to 150 degC.
- Fully flanged rated to ASME B16.5 Class 600. Ambient being 102.1 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 61432 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

3.5 Piping Class 91432 Amendments to Shell DEP

- Design Temperature from -29 degC to 150 degC.
- Fully flanged rated to ASME B16.5 Class 900. Ambient being 153.2 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 91432 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.6 Piping Class 151432 Amendments to Shell DEP

- Design Temperature from -29 degC to 150 degC.
- Fully flanged rated to ASME B16.5 Class 1500. Ambient being 255.3 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 151432 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.7 Piping Class 11441 Amendments to Shell DEP

- Design Temperature from -29 degC to 110 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.6 BarG.
- Size Range ½" to 24" NB.
- Pipe material up to and including DN600 (24") Seamless ASTM A106 GrB. DN750 (30") and above to be welded ASTM A671 Gr.CC65.
- Pipe fittings up to and including DN600 (24") Seamless ASTM A234 WPB-S. DN750 (30") and above to be welded ASTM A234 WPB-W.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 11441 to have butt weld fittings only.
- Up to and including DN600 (24") the branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. DN750 (30") and above, reducing fittings to ASME B16.9.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

3.8 Piping Class 31441 Amendments to Shell DEP

- Design Temperature from -29 degC to 110 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.1 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 31441 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

3.9 Piping Class 11503 Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.6 BarG.
- Size Range ½" to 50" NB.
- Pipe material up to and including DN600 (24") Seamless ASTM A333 Gr.6. DN750 (30") and above to be welded ASTM A671 Gr.CC65.
- Pipe fittings up to and including DN600 (24") Seamless ASTM A420 WPL6. DN750 (30") and above to be welded ASTM A860 Gr WPHY 65.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Remove all socket weld fittings. 11503 to have butt weld fittings only.
- Up to and including DN600 (24") the branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. DN750 (30") and above, reducing fittings to ASME B16.9.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added.
  2" Flanged both ends, and 2" Flanged x ½" NPT.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Strainers to be supplied as SP items and to have flanged end connections.

3.10 Piping Class 31503 Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.1 BarG.
- Size Range ½" to 30" NB.
- Pipe material up to and including DN600 (24") Seamless ASTM A333 Gr.6. DN750 (30") and above to be welded ASTM A671 Gr.CC65.
- Pipe fittings up to and including DN600 (24") Seamless ASTM A420 WPL6. DN750 (30") and above to be welded ASTM A860 Gr WPHY 65.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Remove all socket weld fittings. 31503 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. 2" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Strainers to be supplied as SP items and to have flanged end connections.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.11 Piping Class 61503 Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 600. Ambient being 102.1 Bar.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 61503 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. 2" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.

3.12 Piping Class 91503 Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 900. Ambient being 153.2 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Remove all socket weld fittings. 91503 to have butt weld fittings only.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added.
  ½", 1" and 2" Flanged both ends, and 2" Flanged x ½" NPT.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PEEK limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.13 Piping Class 151503 Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 1500. Ambient being 255.3 BarG.
- Size Range ½" to 36" NB.
- Pipe material up to and including DN600 (24") Seamless ASTM A333 Gr.6. DN750 (30") and above to be welded ASTM A671 Gr.CC65.
- Pipe fittings up to and including DN600 (24") Seamless ASTM A420 WPL6. DN750 (30") and above to be welded ASTM A860 Gr WPHY 65.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Remove all socket weld fittings. 151503 to have butt weld fittings only.
- Up to and including DN400 (16") the branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. DN450 (18") and above, reducing fittings to ASME B16.9.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added.
  1" and 2" Flanged both ends, and 2" Flanged x ½" NPT.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PEEK limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.

CLASS 251503

(Created for MM BH FEED)

Design limits

Temperature (°C)

	-50	0	50	100	150	175	181
Pressure (Barg)							
DN 15- 350	425.5	425.5	417.7	388.3	375.6	370.3	369

Notes

- Design limits acc. to ASME B16.5 flange rating mat. grp 1.1 and ASME B31.3 allowable internal pressure
- Select BNRF or BNFF if extended valve bonnets are not required
- For bending of pipe see DEP 31.38.01.31-Gen.
- For basis of design see DEP 31.38.01.10-Gen.
- Use of coated bolt sets should be considered when exposed to marine environments.
- Piping class design meets full vacuum at ambient temperature condition
- Non-extended bonnet valves in this piping class are intended for short term low temperature excursion (e.g non-operable during depressurization) (or) non-insulated piping only.
- The use of red. bore ball valves is considered most economical. Use full bore ball valves only when necessary for process/operating requirements.
- Piston type check valves (DN 15-50) [NPS 1/2- 2] for horizontal mounting only.
- Valves above 120 deg C to be metal seated.
- Flanges and flanged fitting faces NB 14" and larger to be generally in accordance to ASME B16.5, and to be designed as unlisted components in line with ASME B31.3 304.7.2.

Table of schedules

DN	Schedule
15	XXS
20	XXS
25	XXS
40	12mm
50	14mm
80	18mm
100	22mm
150	30mm
200	38mm
250	48mm
300	56mm
350	60mm

Branch connections 90 degrees

Branch Size

Run size	15	20	25	40	50	80	100	150	200	250	300	350
350	E	E	E	E	E	E	E	B	B	B	B	A
300	E	E	E	E	E	E	E	B	B	B	A	
250	E	E	E	E	E	E	B	B	B	A		
200	E	E	E	E	E	E	B	B	A			
150	E	E	E	E	E	B	B	A				
100	E	E	E	B	B	B	A					
80	E	E	E	B	B	A						
50	E	B	B	B	A							
40	B	B	B	A								
25	B	B	A									
20	B	A										
15	A											

Code	Explanation of characters
A	Equal tee
B	Reducing tee
E	Branch outlet

Carbon steel LT F-Gr Sour		Plant
Class no.	251503	Consignee
ASME rating	CLASS 2500	Engineered by
Corrosion allowance	3 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-350	ASTM A333-6

Flanges

BLFL	Blind flange	DN 15-350	ASTM A350-LF2 cl 1
SBNF	Spectacle blind	DN 15-250	ASTM A516-60/65/70
SPNF	Spade	DN 15-350	ASTM A516-60/65/70
SRNF	Spacer ring	DN 15-350	ASTM A516-60/65/70
WNFL	Welding neck flange	DN 15-350	ASTM A350-LF2 cl 1

Fittings

CAPB	Cap bw	DN 15-350	ASTM A420-WPL6
E45B	Elbow 45 deg LR bw	DN 15-350	ASTM A420-WPL6
E90B	Elbow 90 deg LR bw	DN 15-350	ASTM A420-WPL6
TEEB	Tee equal bw	DN 15-350	ASTM A420-WPL6

Reducing fittings

BN6B	Branch fitting bw	DN 40-350	ASTM A350-LF2 cl 1
BN6F	Branch fitting flgd	DN 40-350	ASTM A350-LF2 cl 1
BR6B	Branch outlet bw	DN 150-350	ASTM A350-LF2 cl 1
BROB	Branch outlet bw	DN 350-350	ASTM A350-LF2 cl 1
RECB	Reducer concentric bw	DN 20-350	ASTM A420-WPL6
REEB	Reducer eccentric bw	DN 20-350	ASTM A420-WPL6
TERB	Tee reducing bw	DN 20-350	ASTM A420-WPL6

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BARF	Ball valve float RB flgd	DN 50-50	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 50-350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BTRF	Ball valve trunn RB flgd	DN 80-350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
CHVF	Check valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1 Trim: Alloy 825
CHVF	Check valve flgd	DN 80-350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
GAVF	Gate valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1 Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
GLVF	Globe valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1 Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-100	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
DBB	Double Block and Bleed valve flgd	DN 50-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK

Miscellaneous

GKSW	Gasket spiral wound	DN 15-350	AISI 316, Graphite CS centring-/SS inner ring
ORFS	Orifice flange set	DN 50-350	ASTM A350-LF2 cl 1
PLUG	Plug NPT	DN 15-50	ASTM A350-LF2 cl 1
STB1	Studbolt with nuts	---	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts	---	ASTM A320-L7M/A194-7M

3.15 Piping Class 11093KS Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.6 BarG.
- Size Range ½" to 36" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Piping class 11093KS chosen specifically for the 6mm corrosion allowance. This piping class is to be as per 11503 piping class with the corrosion allowance being 6mm for all the x1093KS classes.
- Branch table to be as per 11503, reducing fittings to ASME B16.9 may be used with project approval. Lateral tees to be removed.
- All branching tees to be equal or reducing tees in accordance to ASME B16.9. Lateral Tees only to be used as a design and layout requirements.
- Spectacle Blinds, Spade and Spacer Rings to be as per 11503.
- Valves to have body and trim materials selection as per 11503 and specifying 6mm Corrosion Allowance. LTCS body material with Alloy 825, PTFE Trim.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.

3.16 Piping Class 31093KS Amendments to Shell DEP

- Design Temperature from -50 degC to 175 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.1 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Piping class 31093KS chosen specifically for the 6mm corrosion allowance. This piping class is to be as per 31503 piping class with the corrosion allowance being 6mm for all the x1093KS classes.
- Branch table to be as per 31503, reducing fittings to ASME B16.9 may be used with project approval. Lateral tees to be removed.
- All branching tees to be equal or reducing tees in accordance to ASME B16.9. Lateral Tees only to be used as a design and layout requirements.
- Spectacle Blinds, Spade and Spacer Rings to be as per 31503.
- Valves to have body and trim materials selection as per 31503 and specifying 6mm Corrosion Allowance. LTCS body material with Alloy 825, PTFE Trim.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.

3.17

CLASS 61093-KS

(Created for MM BH FEED)

Design limits

Temperature (°C)

	-50	0	50	100	150	175
Pressure (Barg)						
DN 15- 600	102.1	102.1	100.2	93.2	90.2	88.9

Notes

Design limits acc. to ASME B16.5 flange rating mat. grp 1.1.
For bending of pipe see DEP 31.38.01.31-Gen.
For basis of design see DEP 31.38.01.10-Gen.
Piping class design meets full vacuum at ambient temperature condition
This piping class is restricted to the maintenance of existing facilities
This piping class is designed for acid service; see DEP 31. 3B.01.24-Gen. appendix B
Valves shall be ordered with additional thickness to meet 6mm CA.
Valves above 150 deg C to be metal seated

Table of schedules

DN	Schedule
15	8mm
20	8mm
25	XXS
40	XXS
50	XXS
80	160
100	160
150	120
200	120
250	100
300	100
350	100
400	100
450	100
500	100
600	100

Branch connections 90 degrees

Run size \ Branch Size	15	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600
600	E	E	E	E	E	E	E	E	E	B	B	B	B	B	B	A
500	E	E	E	E	E	E	E	E	B	B	B	B	B	B	A	
450	E	E	E	E	E	E	E	E	B	B	B	B	B	A		
400	E	E	E	E	E	E	E	B	B	B	B	B	A			
350	E	E	E	E	E	E	E	B	B	B	B	A				
300	E	E	E	E	E	E	E	B	B	B	A					
250	E	E	E	E	E	E	B	B	B	A						
200	E	E	E	E	E	E	B	B	A							
150	E	E	E	E	E	B	B	A								
100	E	E	E	B	B	B	A									
80	E	E	E	B	B	A										
50	E	B	B	B	A											
40	B	B	B	A												
25	B	B	A													
20	B	A														
15	A															

Code	Explanation of characters
A	Equal tee
B	Reducing tee
E	Branch outlet

Carbon steel LT F-Gr Sour		Plant
Class no.	61093-KS	Consignee
ASME rating	CLASS 600	Engineered by
Corrosion allowance	6 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-600	ASTM A333-6

Flanges

BLFL	Blind flange	DN 15-600	ASTM A350-LF2 cl 1
LJFL	Lap joint flange		ASTM A350-LF2 cl 1
SBNF	Spectacle blind	DN 15-400	ASTM A516-60/65/70
SPNF	Spade	DN 15-600	ASTM A516-60/65/70
SRNF	Spacer ring	DN 15-600	ASTM A516-60/65/70
WNFL	Welding neck flange	DN 15-600	ASTM A350-LF2 cl 1

Fittings

CAPB	Cap bw	DN 15-600	ASTM A420-WPL6
E45B	Elbow 45 deg LR bw	DN 15-600	ASTM A420-WPL6
E90B	Elbow 90 deg LR bw	DN 15-600	ASTM A420-WPL6
TEEB	Tee equal bw	DN 15-600	ASTM A420-WPL6

Reducing fittings

BN6F	Branch fitting flgd	DN 40-600	ASTM A350-LF2 cl 1
BN6P	Branch fitting plain	DN 40-600	ASTM A350-LF2 cl 1
BR3B	Branch outlet bw	DN 150-600	ASTM A350-LF2 cl 1
BROB	Branch outlet bw	DN 400-600	ASTM A350-LF2 cl 1
BRSB	Branch outlet bw	DN 300-600	ASTM A350-LF2 cl 1
RECB	Reducer concentric bw	DN 20-600	ASTM A420-WPL6
REEB	Reducer eccentric bw	DN 20-600	ASTM A420-WPL6
TERB	Tee reducing bw	DN 20-600	ASTM A420-WPL6

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PTFE
BARF	Ball valve float RB flgd	DN 50-250	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PTFE
BTFF	Ball valve trunn FB flgd	DN 200-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, filled PTFE
BTRF	Ball valve trunn RB flgd	DN 300-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, filled PTFE
BUTF	Butterfly valve triple of flgd	DN 200-600	Body: ASTM A352-LCC, 6mm CA Trim: LTCS, Alloy 825, Stellite
CHDF	Check valve dual plate flgd	DN 300-600	Body: ASTM A352-LCC, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 80-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-200	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825

Miscellaneous

GKSW	Gasket spiral wound	DN 15-600	AISI 316, Graphite CS centring-/SS inner ring
ORFS	Orifice flange set	DN 50-600	ASTM A350-LF2 cl 1
PLUG	Plug NPT	DN 15-50	ASTM A350-LF2 cl 1
STB1	Studbolt with nuts		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts		ASTM A320-L7M/A194-7M

Metric units

3.18

CLASS 91093-KS

(Created for MM BH FEED)

Design limits

Temperature (°C)

	-50	0	50	100	150	175
Pressure (Barg)						
DN 15- 600	153.2	153.2	150.4	139.8	135.2	133.3

Notes

Design limits acc. to ASME B16.5 flange rating mat. grp 1.1.
For bending of pipe see DEP 31.38.01.31-Gen.
For basis of design see DEP 31.38.01.10-Gen.
Piping class design meets full vacuum at ambient temperature condition
This piping class is restricted to the maintenance of existing facilities
This piping class is designed for acid service; see DEP 31. 3B.01.24-Gen. appendix B
Valves shall be ordered with additional thickness to meet 6mm CA.
Valves above 150 deg C to be metal seated

Table of schedules

DN	Schedule
15	10mm
20	10mm
25	XXS
40	XXS
50	XXS
80	XXS
100	XXS
150	160
200	140
250	140
300	140
350	140
400	140
450	120
500	120
600	120

Branch connections 90 degrees

Run size \ Branch Size	15	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600
600	E	E	E	E	E	E	E	E	E	B	B	B	B	B	B	A
500	E	E	E	E	E	E	E	E	E	B	B	B	B	B	A	
450	E	E	E	E	E	E	E	E	B	B	B	B	B	A		
400	E	E	E	E	E	E	E	B	B	B	B	B	A			
350	E	E	E	E	E	E	E	B	B	B	B	A				
300	E	E	E	E	E	E	E	B	B	B	A					
250	E	E	E	E	E	E	B	B	B	A						
200	E	E	E	E	E	E	B	B	A							
150	E	E	E	E	E	B	B	A								
100	E	E	E	B	B	B	A									
80	E	E	E	B	B	A										
50	E	B	B	B	A											
40	B	B	B	A												
25	B	B	A													
20	B	A														
15	A															

Code	Explanation of characters
A	Equal tee
B	Reducing tee
E	Branch outlet

Carbon steel LT F-Gr Sour		Plant
Class no.	91093-KS	Consignee
ASME rating	CLASS 900	Engineered by
Corrosion allowance	6 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-600	ASTM A333-6

Flanges

BLFL	Blind flange	DN 15-600	ASTM A350-LF2 cl 1
LJFL	Lap joint flange		ASTM A350-LF2 cl 1
SBNF	Spectacle blind	DN 15-400	ASTM A516-60/65/70
SPNF	Spade	DN 15-600	ASTM A516-60/65/70
SRNF	Spacer ring	DN 15-600	ASTM A516-60/65/70
WNFL	Welding neck flange	DN 15-600	ASTM A350-LF2 cl 1

Fittings

CAPB	Cap bw	DN 15-600	ASTM A420-WPL6
E45B	Elbow 45 deg LR bw	DN 15-600	ASTM A420-WPL6
E90B	Elbow 90 deg LR bw	DN 15-600	ASTM A420-WPL6
TEEB	Tee equal bw	DN 15-600	ASTM A420-WPL6

Reducing fittings

BN6F	Branch fitting flgd	DN 40-600	ASTM A350-LF2 cl 1
BN6P	Branch fitting plain	DN 40-600	ASTM A350-LF2 cl 1
BR3B	Branch outlet bw	DN 150-600	ASTM A350-LF2 cl 1
BROB	Branch outlet bw	DN 400-600	ASTM A350-LF2 cl 1
BRSB	Branch outlet bw	DN 300-600	ASTM A350-LF2 cl 1
RECB	Reducer concentric bw	DN 20-600	ASTM A420-WPL6
REEB	Reducer eccentric bw	DN 20-600	ASTM A420-WPL6
TERB	Tee reducing bw	DN 20-600	ASTM A420-WPL6

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK
BARF	Ball valve float RB flgd	DN 50- 250	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 200-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, filled PEEK
BTRF	Ball valve trunn RB flgd	DN 300-600	Body: ASTM A350-LF2 cl 1/A352-LCC,6mmCA Trim: Alloy 825, filled PEEK
BUTF	Butterfly valve triple of flgd	DN 200-600	Body: ASTM A352-LCC, 6mm CA Trim: LTCS, Alloy 825, Stellite
CHDF	Check valve dual plate flgd	DN 300-600	Body: ASTM A352-LCC, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 80-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-200	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825

Miscellaneous

GKSW	Gasket spiral wound	DN 15-600	AISI 316, Graphite CS centring-/SS inner ring
ORFS	Orifice flange set	DN 50-600	ASTM A350-LF2 cl 1
PLUG	Plug NPT	DN 15-50	ASTM A350-LF2 cl 1
STB1	Studbolt with nuts		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts		ASTM A320-L7M/A194-7M

Metric units

CLASS 151093-KS

(Created for MM BH FEED)

Design limits

Temperature (°C)

Pressure (Barg) DN	-50	0	50	100	150	175
15- 750	255.3	255.3	250.6	233.0	225.4	222.2

Notes

Design limits acc. to ASME B16.5 flange rating mat. grp 1.1.
For bending of pipe see DEP 31.38.01.31-Gen.
For basis of design see DEP 31.38.01.10-Gen.
Piping class design meets full vacuum at ambient temperature condition
This piping class is restricted to the maintenance of existing facilities
This piping class is designed for acid service; see DEP 31. 3B.01.24-Gen. appendix B
Valves shall be ordered with additional thickness to meet 6mm CA.
Valves above 150 deg C to be metal seated.

Table of schedules

DN	Schedule
15	10mm
20	10mm
25	12mm
40	12mm
50	14mm
80	16mm
100	20mm
150	24mm
200	30mm
250	34mm
300	40mm
350	42mm
400	48mm
450	52mm
500	58mm
600	68mm
750	82mm
900	98mm

Branch connections 90 degrees

Run size \ Branch Size	15	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600	750	900
900	E	E	E	E	E	E	E	E	E	E	E	E	B	B	B	B	B	A
750	E	E	E	E	E	E	E	E	E	B	B	B	B	B	B	B	A	
600	E	E	E	E	E	E	E	E	E	E	B	B	B	B	B	A		
500	E	E	E	E	E	E	E	E	B	E	B	B	B	B	A			
450	E	E	E	E	E	E	E	E	B	B	B	B	B	A				
400	E	E	E	E	E	E	E	B	B	B	B	B	A					
350	E	E	E	E	E	E	E	B	B	B	B	A						
300	E	E	E	E	E	E	E	B	B	B	A							
250	E	E	E	E	E	E	B	B	B	A								
200	E	E	E	E	E	E	B	B	A									
150	E	E	E	E	E	B	B	A										
100	E	E	E	B	B	B	A											
80	E	E	E	B	B	A												
50	E	B	B	B	A													
40	B	B	B	A														
25	B	B	A															
20	B	A																
15	A																	

Code	Explanation of characters
A	Equal tee
B	Reducing tee
E	Branch outlet

Carbon steel LT F-Gr Sour		Plant
Class no.	151093-KS	Consignee
ASME rating	CLASS 1500	Engineered by
Corrosion allowance	6 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-600	ASTM A333-6
PIPE	Pipe	DN 750-900	ASTM A671 GR CC65

Flanges

BLFL	Blind flange	DN 15-900	ASTM A350-LF2 cl 1
SBNF	Spectacle blind	DN 15-400	ASTM A516-60/65/70
SPNF	Spade	DN 15-900	ASTM A516-60/65/70
SRNF	Spacer ring	DN 15-900	ASTM A516-60/65/70
WNFL	Welding neck flange	DN 15-900	ASTM A350-LF2 cl 1

Fittings

CAPB	Cap bw	DN 15-600	ASTM A420-WPL6
CAPB	Cap bw	DN 750-900	ASTM A860 GR WPHY 65
E45B	Elbow 45 deg LR bw	DN 15-600	ASTM A420-WPL6
E45B	Elbow 45 deg LR bw	DN 750-900	ASTM A860 GR WPHY 65
E90B	Elbow 90 deg LR bw	DN 15-600	ASTM A420-WPL6
E90B	Elbow90 deg LR bw	DN 750-900	ASTM A860 GR WPHY 65
TEEB	Tee equal bw	DN 15-600	ASTM A420-WPL6
TEEB	Tee equal bw	DN 750-900	ASTM A860 GR WPHY 65

Reducing fittings

BN6F	Branch fitting flgd	DN 40-900	ASTM A350-LF2 cl 1
BN6P	Branch fitting plain	DN 40-900	ASTM A350-LF2 cl 1
BR3B	Branch outlet bw	DN 150-900	ASTM A350-LF2 cl 1
BROB	Branch outlet bw	DN 400-900	ASTM A350-LF2 cl 1
BRSB	Branch outlet bw	DN 300-900	ASTM A350-LF2 cl 1
RECB	Reducer concentric bw	DN 20-600	ASTM A420-WPL6
RECB	Reducer concentric bw	DN 750-900	ASTM A860 GR WPHY 65
REEB	Reducer eccentric bw	DN 20-600	ASTM A420-WPL6
REEB	Reducer eccentric bw	DN 750-900	ASTM A860 GR WPHY 65
TERB	Tee reducing bw	DN 20-600	ASTM A420-WPL6
TERB	Tee reducing bw	DN 750-900	ASTM A860 GR WPHY 65

Miscellaneous

GKSW	Gasket spiral wound	DN 15-900	AISI 316, Graphite CS centring-/SS inner ring
ORFS	Orifice flange set	DN 50-900	ASTM A350-LF2 cl 1
PLUG	Plug NPT	DN 15-50	ASTM A350-LF2 cl 1
STB1	Studbolt with nuts		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts		ASTM A320-L7M/A194-7M

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK
BARF	Ball valve float RB flgd	DN 50-50	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 50-900	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, filled PEEK
BTRF	Ball valve trunn RB flgd	DN 80-900	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, filled PEEK
BUTF	Butterfly valve triple of flgd	DN 200-900	Body: ASTM A352-LCC, 6mm CA Trim: LTCS, Alloy 825, Stellite
CHDF	Check valve dual plate flgd	DN 300-900	Body: ASTM A352-LCC, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
CHVF	Check valve flgd	DN 80-600	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-900	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 15-50	Body: ASTM A350-LF2 cl 1, 6mm CA Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-200	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825
DBB	Double Block and Bleed valve flgd	DN 15-200	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK

3.20 Piping Class 13411 Amendments to Shell DEP

- Design Temperature from -29 degC to 85 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.0 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. Welded- in contour inserts not applicable.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.21 Piping Class 33411 Amendments to Shell DEP

- Design Temperature from -29 degC to 85 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 49.6 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

3.22 Piping Class 13461 Amendments to Shell DEP

- Design Temperature from -85 degC to 160 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.0 BarG.
- Size Range ½" to 36" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. Welded- in contour inserts not applicable.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Instrument Double Block and Bleed isolation valves to be added.
  2" Flanged both ends, and 2" Flanged x ½" NPT.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Strainers to be supplied as SP items and to have flanged end connections.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

3.23 Piping Class 33461 Amendments to Shell DEP

- Design Temperature from -85 degC to 160 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 49.6 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Instrument Double Block and Bleed isolation valves to be added.
  2" Flanged both ends, and 2" Flanged x ½" NPT.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

3.24 Piping Class 63461 Amendments to Shell DEP

- Design Temperature from -85 degC to 160 degC.
- Fully flanged rated to ASME B16.5 Class 600. Ambient being 99.3 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

3.25 Piping Class 93461 Amendments to Shell DEP

- Design Temperature from -85 degC to 160 degC.
- Fully flanged rated to ASME B16.5 Class 900. Ambient being 148.9 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 120°C to be metal seated. PCTFE limited to 120°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

3.26 Piping Class 153461 Amendments to Shell DEP

- Design Temperature from -85 degC to 160 degC.
- Fully flanged rated to ASME B16.5 Class 1500. Ambient being 248.2 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Instrument Double Block and Bleed isolation valves to be added.
  ½", ¾" and 1" Flanged both ends.
- Valves above 120°C to be metal seated. PCTFE limited to 120°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

3.27

CLASS 253461

(Created for MM BH FEED)

Design limits

Temperature (°C)

	-85	0	50	100	150	160
Pressure (Barg)						
DN 15- 150	413. 7	413. 7	400. 9	351.6	320.8	316.08

Notes

Design limits acc. to ASME B16.5 flange rating mat. grp 2.2.
For bend ng of pipe see DEP 31.38.01.31-Gen.
For basis of design see DEP 31.38.01.10-Gen.
Use of coated bolt sets should be considered when exposed to marine environments.
External protection is required for design temperatures > 50 degr. C [120 °F] in saliferous atmospheres to prevent chloride stress corrosion cracking.
When chlorides are present in the process fluid in conjunction with free oxygen, the max. temperature is limited to 50 deg C [120 °F], to prevent chloride stress corrosion cracking
Piping class design meets full vacuum at ambient temperature condition
Non-extended bonnet valves in this piping class are intended for short term low temperature excursion (e.g non-operable during depressurization) (or) non-insulated piping only.
The use of red. bore ball valves is considered most economical. Use full bore ball valves only when necessary for process/operating requirements
Piston type check valves (DN 15-50) [NPS 1/2- 2] for horizontal mounting only
Valves above 120 deg C to be metal seated.
A lloy 625 bolting to be used below -73 deg C.

Table of schedules

DN	Schedule
15	160
20	160
25	160
40	XXS
50	XXS
80	XXS
100	18 mm
150	26 mm

Branch connections 90 degrees

Branch Size

Run size	15	20	25	40	50	80	100	150
150	C	C	C	C	C	B	B	A
100	C	C	C	B	B	B	A	
80	C	C	C	B	B	A		
50	C	B	B	B	A			
40	B	B	B	A				
25	B	B	A					
20	B	A						
15	A							

Code	Explanation of characters
A	Equal tee
B	Reducing tee
C	Branch fitting

Stainl steel AISI 316 LT Sour		Plant
Class no.	253461	Consignee
ASME rating	CLASS 2500	Engineered by
Corrosion allowance	0 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material descr ption see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-150	ASTM A312-TP316

Flanges

BLFL	Blind flange	DN 15-150	ASTM A182-F316
SBNF	Spectacle blind	DN 15-150	ASTM A240-TP316
WNFL	Welding neck flange	DN 15-150	ASTM A182-F316

Fittings

CAPB	Cap bw	DN 15-150	ASTM A403-WP316
E45B	Elbow 45 deg LR bw	DN 15-150	ASTM A403-WP316
E90B	Elbow 90 deg LR bw	DN 15-150	ASTM A403-WP316
TEEB	Tee equal bw	DN 15-150	ASTM A403-WP316

Reducing fittings

BN3F	Branch fitting flgd	DN 80-80	ASTM A182-F316
BN3P	Branch fitting plain	DN 80-80	ASTM A182-F316
BN6F	Branch fitting flgd	DN 40-150	ASTM A182-F316
BN6P	Branch fitting plain	DN 40-150	ASTM A182-F316
BR6B	Branch outlet bw	DN 150-150	ASTM A182-F316
RECB	Reducer concentric bw	DN 20-150	ASTM A403-WP316
REEB	Reducer eccentric bw	DN 20-150	ASTM A403-WP316
TERB	Tee reducing bw	DN 20-150	ASTM A403-WP316

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, PCTFE
BARF	Ball valve float RB flgd	DN 50-50	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, PCTFE
BTFF	Ball valve trunn FB flgd	DN 50-150	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, PCTFE
BTRF	Ball valve trunn RB flgd	DN 80-150	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, PCTFE
CHVF	Check valve flgd	DN 15-50	Body: ASTM A182-F316 Trim: AISI 316, Stellite
CHVF	Check valve flgd	DN 80-150	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, Stellite
GAVF	Gate valve flgd	DN 15-50	Body: ASTM A182-F316 Trim: AISI 316, Stellite
GAVF	Gate valve flgd	DN 80-150	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, Stellite
GLVF	Globe valve flgd	DN 15-50	Body: ASTM A182-F316 Trim: AISI 316, Stellite
GLVF	Globe valve flgd	DN 80-100	Body: ASTM A182-F316/A351-CF8M Trim: AISI 316, Stellite

Miscellaneous

GKSW	Gasket spiral wound	DN 15-150	AISI 316, Graphite CS centring-/SS inner ring
ORFS	Orifice flange set	DN 50-150	ASTM A182-F316
STB1	Studbolt with nuts (limited to -73 deg C)		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts (limited to -73 deg C)		ASTM A320-L7M/A194-7M

3.28 Piping Class 16620 Amendments to Shell DEP

- Design Temperature from -85 degC to 200 degC.
- Both LTCS and Alloy 825 are fully flanged rated to ASME B16.5 Class 150. Ambient being 20 BarG.
- Size Range ½" to 42" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30" and larger flanges to ASME B16.47 Series A.
- All pipe sizes to DN150 (6") are solid Alloy 825.
- Pipe sizes DN200 (8") and above are LTCS cladded with 3mm Alloy 825, when minimum design temperature is above -50degC.
- If design temperature falls below -50degC, all line sizes are solid Alloy 825 as LTCS is limited to -50degC.
- LTCS cladded pipe material up to and including DN600 (24") Seamless ASTM A333 Gr.6. DN750 (30") and above LTCS base material to be welded ASTM A671 Gr.CC65 cl22.
- Solid Alloy 825 Seamless pipe to ASTM B423 can be specified up to and including DN250 (10"). Solid Alloy 825 pipe DN300 (12") and above to be welded ASTM B705 / B775.
- LTCS cladded pipe fittings up to and including DN600 (24") Seamless ASTM A420 WPL6. DN750 (30") and above LTCS base material to be welded ASTM A860 Gr WPHY 65.
- Solid Alloy 825 Seamless pipe fittings to ASTM B366 can be specified up to and including DN250 (10"). Solid Alloy pipe fittings DN300 (12") and above to be welded ASTM B366 / B564.
- Up to and including DN600 (24") the branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval. DN750 (30") and above, reducing fittings to ASME B16.9.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. 2" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.
- Strainers to be supplied as SP items and to have flanged end connections.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.29 Piping Class 36620 Amendments to Shell DEP

- Design Temperature from -85 degC to 200 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.7 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- All pipe sizes to DN150 (6") are solid Alloy 825.
- Pipe sizes DN200 (8") and above are LTCS cladded with 3mm Alloy 825, when minimum design temperature is above -50degC.
- If design temperature falls below -50degC, all line sizes are solid Alloy 825 as LTCS is limited to -50degC.
- Solid Alloy 825 Seamless pipe to ASTM B423 can be specified up to and including DN250 (10"). Solid Alloy 825 pipe DN300 (12") and above to be welded ASTM B705 / B775.
- Solid Alloy 825 Seamless pipe fittings to ASTM B366 can be specified up to and including DN250 (10"). Solid Alloy pipe fittings DN300 (12") and above to be welded ASTM B366 / B564.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added.
  2" Flanged both ends, and 2" Flanged x ½" NPT.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.
- Strainers to be supplied as SP items and to have flanged end connections.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.30 Piping Class 66620 Amendments to Shell DEP

- Design Temperature from -85 degC to 200 degC.
- Fully flanged rated to ASME B16.5 Class 600. Ambient being 103.4 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- All pipe sizes to DN100 (4") are solid Alloy 825.
- Pipe sizes DN150 (6") and above are LTCS cladded with 3mm Alloy 825, when minimum design temperature is above -50degC.
- If design temperature falls below -50degC, all line sizes are solid Alloy 825 as LTCS is limited to -50degC.
- Solid Alloy 825 Seamless pipe to ASTM B423 can be specified up to and including DN250 (10"). Solid Alloy 825 pipe DN300 (12") and above to be welded ASTM B705 / B775.
- Solid Alloy 825 Seamless pipe fittings to ASTM B366 can be specified up to and including DN250 (10"). Solid Alloy pipe fittings DN300 (12") and above to be welded ASTM B366 / B564.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PTFE limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.31 Piping Class 96620 Amendments to Shell DEP

- Design Temperature from -85 degC to 200 degC.
- Fully flanged rated to ASME B16.5 Class 900. Ambient being 155.1 BarG.
- Size Range ½" to 24" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- All pipe sizes to DN100 (4") are solid Alloy 825.
- Pipe sizes DN150 (6") and above are LTCS cladded with 3mm Alloy 825, when minimum design temperature is above -50degC.
- If design temperature falls below -50degC, all line sizes are solid Alloy 825 as LTCS is limited to -50degC.
- Solid Alloy 825 Seamless pipe to ASTM B423 can be specified up to and including DN250 (10"). Solid Alloy 825 pipe DN300 (12") and above to be welded ASTM B705 / B775.
- Solid Alloy 825 Seamless pipe fittings to ASTM B366 can be specified up to and including DN250 (10"). Solid Alloy pipe fittings DN300 (12") and above to be welded ASTM B366 / B564.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. 2" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Valves above 150°C to be metal seated. PEEK limited to 150°C. DEP 31.38.01.24-Gen Section 8.8.9 Table 10.
- Bolting materials to be Alloy 625 below temperatures of -73°C.

CLASS 156620

(Created for MM BH FEED)

Design limits

Temperature (°C)

	-85	0	50	100	150	200
Pressure (Barg)						
DN 15-100	258.6	258.6	258.6	257.6	250.8	241.7
DN 150-200	255.3	255.3	250.6	233.0	225.4	219.0

Notes

Design limits acc. to ASME B16.5 flange rating mat. grp 1.1 and ASME B31.3 allowable internal pressure
DN 15-100 [NPS 1/2 - 4]: Design limits acc. to ASME B16.5 flange rating mat. grp 3.8
For basis of design see DEP 31.38.01.10-Gen.
Piping class contains a combination of solid and carbon steel with clad material
Use of coated bolt sets should be considered when exposed to marine environments.
Piping class design meets full vacuum at ambient temperature condition
The use of red. bore ball valves is considered most economical. Use full bore ball valves only when necessary for process/operating requirements
Piston type check valves (DN 15-50) [NPS 1/2- 2] for horizontal mounting only
The choice of gate valves, swing type check valves vs triple eccentric butterfly valves, dual plate check valves shall be based upon total purchase and installation cost, as well as weight and space savings. Eccentric butterfly valves and dual plate check valves shall not be used in fouling or abrasive services.
Valves above 120 deg C to be metal seated.
Bolting below -73 deg C to be Alloy 625.

Table of schedules

DN	Schedule
15	40S
20	40S
25	40S
40	80S
50	80S
80	160
100	120
150	160
200	XXS

Branch connections 90 degrees

Run size \ Branch Size	15	20	25	40	50	80	100	150	200
200	C	C	C	C	C	C	B	B	A
150	C	C	C	C	C	B	B	A	
100	C	C	C	B	B	B	A		
80	C	C	C	B	B	A			
50	C	B	B	B	A				
40	B	B	B	A					
25	B	B	A						
20	B	A							
15	A								

Code	Explanation of characters
A	Equal tee
B	Reducing tee
C	Branch fitting

Alloy 825 LT Sour		Plant
Class no.	156620	Consignee
ASME rating	CLASS 1500	Engineered by
Corrosion allowance	0 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 15-100	ASTM B423 UNS N08825
PIPE	Pipe	DN 150-200	ASTM A333-6/A671-CC65 cl 22 + Clad UNS N08825

Flanges

BLFL	Blind flange	DN 15-100	ASTM B564 UNS N08825
BLFL	Blind flange	DN 150-200	ASTM A350-LF2 cl 1 + Clad UNS N08825
SBNF	Spectacle blind	DN 15-200	ASTM B424 UNS N08825
SPNF	Spade	DN 15-200	ASTM B424 UNS N08825
SRNF	Spacer ring	DN 15-200	ASTM B424 UNS N08825
WNFL	Welding neck flange	DN 15-100	ASTM B564 UNS N08825
WNFL	Welding neck flange	DN 150-200	ASTM A350-LF2 cl 1 + Clad UNS N08825

Fittings

CAPB	Cap bw	DN 15-100	ASTM B366-WPNICMC
CAPB	Cap bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825
E45B	Elbow 45 deg LR bw	DN 15-100	ASTM B366-WPNICMC
E45B	Elbow 45 deg LR bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825
E90B	Elbow 90 deg LR bw	DN 15-100	ASTM B366-WPNICMC
E90B	Elbow 90 deg LR bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825
TEEB	Tee equal bw	DN 15-100	ASTM B366-WPNICMC
TEEB	Tee equal bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825

Reducing fittings

BN3F	Branch fitting flgd	DN 40-100	ASTM B564 UNS N08825
BN3P	Branch fitting plain	DN 40-100	ASTM B564 UNS N08825
BR3B	Branch outlet bw	DN 150-200	ASTM B564 UNS N08825
RECB	Reducer concentric bw	DN 20-100	ASTM B366-WPNICMC
RECB	Reducer concentric bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825
REEB	Reducer eccentric bw	DN 20-100	ASTM B366-WPNICMC
REEB	Reducer eccentric bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825
TERB	Tee reducing bw	DN 20-100	ASTM B366-WPNICMC
TERB	Tee reducing bw	DN 150-200	ASTM A420-WPL6 + Clad UNS N08825

Valves

BAFF	Ball valve float FB flgd	DN 15-40	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK
BARF	Ball valve float RB flgd	DN 50-50	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 150-150	Body: ASTM B564 UNS N08825 Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 200-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 50-100	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK
BTRF	Ball valve trunn RB flgd	DN 150-150	Body: ASTM B564 UNS N08825 Trim: Alloy 825, PEEK
BTRF	Ball valve trunn RB flgd	DN 200-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BTRF	Ball valve trunn RB flgd	DN 80-100	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK
BUTF	Butterfly valve triple off flgd	DN 200-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
CHVF	Check valve flgd	DN 15-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
CHVF	Check valve flgd	DN 200-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
CHVF	Check valve flgd	DN 80-150	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825
GAVF	Gate valve flgd	DN 15-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
GAVF	Gate valve flgd	DN 200-200	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-150	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825
GLVF	Globe valve flgd	DN 15-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-150	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825
DBB	Double Block and Bleed valve flgd	DN 15-50	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK

Miscellaneous

GKSW	Gasket spiral wound	DN 15-200	Alloy 825, Graphite CS centring ring/Alloy 825 inner ring
ORFS	Orifice flange set	DN 50-200	ASTM B564 UNS N08825
STB1	Studbolt with nuts (limited to -73 deg C)		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts (limited to -73 deg C)		ASTM A320-L7M/A194-7M

3.33

CLASS 256620

(Created for MM BH FEED)

Design limits

Temperature (°C)	-85	0	50	100	150	200
Pressure (Barg)						
DN 50 - 100	430.9	430.9	430.9	429.4	418.2	402.8

Notes

Design limits acc. to ASME B16.5 flange ratings and ASME B31.3 allowable internal pressure
DN 50-100 [NPS 2 - 4]: Design limits acc. to ASME B16.5 flange rating mat. grp 3.8
For basis of design see DEP 31.38.01.10-Gen.
Piping class contains a combination of solid and carbon steel with clad material
Use of coated bolt sets should be considered when exposed to marine environments.
Piping class design meets full vacuum at ambient temperature condition
The use of red. bore ball valves is considered most economical. Use full bore ball valves only when necessary for process/operating requirements
Piston type check valves (DN 50) [NPS 2] for horizontal mounting only
The choice of gate valves, swing type check valves vs triple eccentric butterfly valves, dual plate check valves shall be based upon total purchase and installation cost, as well as weight and space savings. Eccentric butterfly valves and dual plate check valves shall not be used in fouling or abrasive services.
Valves above 120 deg C to be metal seated.
Bolting below -73 deg C to be Alloy 625.

Table of schedules

DN	Schedule
20	80S
25	160
40	160
50	160
80	XXS
100	XXS

Branch connections 90 degrees

Run size \ Branch Size	20	25	40	50	80	100
100	C	C	B	B	B	A
80	C	C	B	B	A	
50	B	B	B	A		
40	B	B	A			
25	B	A				
20	A					

Code	Explanation of characters
A	Equal tee
B	Reducing tee
C	Branch Fitting

Alloy 825 LT Sour		Plant
Class no.	256620	Consignee
ASME rating	CLASS 2500	Engineered by
Corrosion allowance	0 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 20-100	ASTM B423 UNS N08825

Flanges

BLFL	Blind flange	DN 20-100	ASTM B564 UNS N08825
SBNF	Spectacle blind	DN 20-100	ASTM B424 UNS N08825
WNFL	Welding neck flange	DN 20-100	ASTM B564 UNS N08825

Fittings

CAPB	Cap bw	DN 20-100	ASTM B366-WPNICMC
E45B	Elbow 45 deg LR bw	DN 20-100	ASTM B366-WPNICMC
E90B	Elbow 90 deg LR bw	DN 20-100	ASTM B366-WPNICMC
TEEB	Tee equal bw	DN 20-100	ASTM B366-WPNICMC

Reducing fittings

RECB	Reducer concentric bw	DN 25-100	ASTM B366-WPNICMC
REEB	Reducer eccentric bw	DN 25-100	ASTM B366-WPNICMC
TERB	Tee reducing bw	DN 25-100	ASTM B366-WPNICMC
BN3F	Branch fitting flgd	DN 20-25	ASTM B564 UNS N08825
BN3P	Branch fitting plain	DN 20-25	ASTM B564 UNS N08825

Valves

BARF	Ball valve float RB flgd	DN 50-50	Body: ASTM B564 UNS N08825/A494-CU5MCUC Trim: Alloy 825, PEEK
BTFF	Ball valve trunn FB flgd	DN 50-100	Body: ASTM B564 UNS N08825/A494-CU 5MCUC Trim: Alloy 825, PEEK
BTRF	Ball valve trunn RB flgd	DN 80-100	Body: ASTM B564 UNS N08825/A494-CU 5MCUC Trim: Alloy 825, PEEK
CHVF	Check valve flgd	DN 50-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
			Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825
CHVF	Check valve flgd	DN 80-100	Body: ASTM B564 UNS N08825/A494-CU 5MCUC Trim: Alloy 825
GAVF	Gate valve flgd	DN 50-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
GAVF	Gate valve flgd	DN 80-150	Body: ASTM B564 UNS N08825/A494-CU 5MCUC Trim: Alloy 825
GLVF	Globe valve flgd	DN 50-50	Body: ASTM B564 UNS N08825 Trim: Alloy 825
GLVF	Globe valve flgd	DN 80-150	Body: ASTM B564 UNS N08825/A494-CU 5MCUC Trim: Alloy 825

Miscellaneous

GKSW	Gasket spiral wound	DN 20-100	Alloy 825, Graphite CS centring ring/Alloy 825 inner ring
ORFS	Orifice flange set	DN 50-100	ASTM B564 UNS N08825
STB1	Studbolt with nuts (limted to -73 deg C)		ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
STBT	Studbolt with nuts (limted to -73deg C)		ASTM A320-L7M/A194-7M

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.34 Piping Class 13831 Amendments to Shell DEP

- Design Temperature from -29 degC to 120 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 20.0 BarG.
- Size Range ½" to 1½" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. ¾" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.
- Strainers to be supplied as SP items and to have flanged end connections.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.35 Piping Class 153831 Amendments to Shell DEP

- Design Temperature from -29 degC to 120 degC.
- Fully flanged rated to ASME B16.5 Class 1500. Ambient being 258.6 BarG.
- Size Range ½" to 1½" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. ¾" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.36 Piping Class 253831 Amendments to Shell DEP

- Design Temperature from -29 degC to 120 degC.
- Fully flanged rated to ASME B16.5 Class 2500. Ambient being 430.9 BarG.
- Size Range ½" to 1½" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- Instrument Double Block and Bleed isolation valves to be added. ¾" Flanged both ends.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.37 Piping Class 13844 Amendments to Shell DEP

- Design Temperature from -50 degC to 100 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 20.0 BarG.
- Size Range 1" to 6" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.38 Piping Class 33844 Amendments to Shell DEP

- Design Temperature from -50 degC to 100 degC.
- Fully flanged rated to ASME B16.5 Class 300. Ambient being 51.7 BarG.
- Size Range 1" to 6" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

3.39 Piping Class 63864 Amendments to Shell DEP

- Design Temperature from -50 degC to 100 degC.
- Fully flanged rated to ASME B16.5 Class 600. Ambient being 103.4 BarG.
- Size Range 1” to 6” NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- Remove all Monoflange valves, and associated notes.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.40 Piping Class 16410 Amendments to Shell DEP

- Design Temperature from 4 degC to 85 degC.
- Fully flanged rated to ASME B16.5 Class 150. Ambient being 19.0 BarG.
- Size Range ½" to 1½" NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- All flanges to be Raised Face, Weld neck design.
- Branch table to be as per DEP, reducing fittings to ASME B16.9 may be used with project approval.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

3.41

CLASS 17060X

(Created for MM BH FEED)

Design limits

Temperature (°C)	0	50	75	100
Pressure (Barg)				
DN 15- 400	20.0	19.7	18.6	17.3

Notes

1. Design limits acc. to EEMUA 234 APPENDIX C
2. Materials used for valve body and internal trim wetted surfaces (including flange faces) and all elastomers and packing shall be suitable for use in sea water.
3. Fresh water will be used for flushing purposes

Table of schedules

DN	Schedule
20	2.0 mm
25	2.5 mm
40	2.5 mm
50	2.5 mm
80	2.5 mm
100	3.0 mm
150	3.5 mm
200	4.5 mm
250	5.5 mm
300	7.0 mm
350	8.0 mm
400	9.0 mm
450	9.5 mm
500	11.0 mm
600	13.0 mm

Branch connections

Run \ Branch Size	20	25	40	50	80	100	150	200	250	300	350	400	450	500	600
600	C	C	C	C	C	C	C	C	C	C	C	C	B	B	A
500	C	C	C	C	C	C	C	C	C	C	B	B	B	A	
450	C	C	C	C	C	C	C	C	B	B	B	B	A		
400	C	C	C	C	C	C	C	C	B	B	B	A			
350	C	C	C	C	C	C	C	B	B	B	A				
300	C	C	C	C	C	C	B	B	B	A					
250	C	C	C	C	C	B	B	B	A						
200	C	C	C	C	C	B	B	A							
150	C	C	C	C	B	B	A								
100	C	C	B	B	B	A									
80	C	C	B	B	A										
50	B	B	B	A											
40	B	B	A												
25	B	A													
20	A														

Code	Explanation of characters
A	Buttweld Equal Tee
B	Butteld Reducing Tee
C	O-let Fitting (Buttweld)

90/10 Cooper Nickel		Plant
Class no.	17060X	Consignee
ASME rating	CLASS 150	Engineered by
Corrosion allowance	0 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234

Flanges

			(ASME B16.5 / EEMUA 234)
BLFL	Blind Flange	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234
WNFL	Weldneck Flange	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234

Fittings

CAPB	Cap bw	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234
E45B	Elbow 45 deg LR bw	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234
E90B	Elbow 90 deg LR bw	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234
TEEB	Tee equal bw	DN 20-600	CUNI 90/10 UNS 7060X EEMUA 234

Reducing fittings

OLET	Branch fitting outlet	DN 80-600	CUNI 90/10 UNS 7060X EEMUA 234
TERB	Reducing Tee	DN 40-600	CUNI 90/10 UNS 7060X EEMUA 234
RECB	Reducer concentric bw	DN 40-600	CUNI 90/10 UNS 7060X EEMUA 234
REEB	Reducer eccentric bw	DN 40-600	CUNI 90/10 UNS 7060X EEMUA 234

Valves

BARF	Ball valve RB flgd	DN 20-600	ASTM B148 C95800, Ni Al Bronze Gr 96800
CHVF	Check valve flgd	DN 40-600	ASTM B148 C95800, Ni Al Bronze Gr 96800
GAVF	Gate valve flgd	DN 40-600	ASTM B148 C95800, Ni Al Bronze Gr 96800
GLVF	Globe valve flgd	DN 40-200	ASTM B148 C95800, Ni Al Bronze Gr 96800
BUTF	Butterfly valve flgd	DN 80-600	ASTM B148 C95800, Ni Al Bronze Gr 96800

Miscellaneous

GKST	Gasket FF, 2.0 mm thick	DN 15-600	Aramid/NBR (ASME B16.21)
STB1	Studbolt with nuts		ASTM A193-B7/A194-2H Zn-Ni Electro pl + PTFE top coat (ASME B18.2.1 / ASME B18.2.2)

CLASS 31ZZZ

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)

	-35	110
Pressure (Barg)		
DN 400	20	20

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule
400	WT 12.7 MM

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe (Note 5)	DN 400	DNV SMLS 450 SU + Clad UNS N08825
E90B	Elbow 90 deg LR bw	DN 400	DNV SMLS 450 SU + Clad UNS N08825

Flanges

BLFL	Blind Flange	DN 400	ASTM A694 F65 + Clad UNS N08825
WNFL	Weldneck Flange	DN 400	ASTM A694 F65 + Clad UNS N08825

Miscellaneous

GKSW	Gasket spiral wound	DN 400	Alloy 825, Graphite CS centering / Alloy 825 inner ring
STB1	Studbolt with nuts	DN 400	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat

High Strength Carbon Steel	Project no.
Class no. 31ZZZ	Contr. job no.
ASME rating CLASS 300	
Corrosion Allowance 0 mm	
Revision Letter	

Metric units

CLASS 61ZZZ

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)	0	85
Pressure (Barg) DN 150 - 250	46	46

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) Welded valves shall be with metal seated and the hard-facing coating on the ball shall be Stellite.
6) DNV 450S Piping and Bends to be impact tested to -45°C to DNV ST-F101.
7) ASTM A694 flanges to be impact tested to -45°C, Supplementary requirement S.1 (MSS SP-44)
8) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule	controlled ID
250	WT 12.7 mm	247.7 mm

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe (note 6)

PIPE	Pipe (Note 8)	DN 250	DNV SMLS 450S
BEND	Bend - 5D	DN 250	DNV SMLS 450S

Flanges (note 7)

	BLFL	DN 250	ASTM A694 F65 (S1)
	WNFL	DN 250	ASTM A694 F65 (S1)

Miscellaneous

GKSW	Gasket spiral wound	DN 250	AISI 316, Graphite CS centring / SS inner ring
STB1	Studbolt with nuts	DN 250	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
BATF	Ball valve trunnion FB flgd	DN 250	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATW	Ball valve trunnion FB welded	DN 250	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK

High Strength Carbon Steel Class no. 61ZZZ ASME rating CLASS 600 Corrosion Allowance 3 mm Revision Letter	Project no. Contr. job no.

Metric units

CLASS 91ZZZ

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)	-45	110
Pressure (Barg)		
DN 150 - 250	153	153

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) Welded valves shall be with metal seated and the hard-facing coating on the ball shall be Stellite.
6) DNV 450S Piping and Bends to be impact tested to -45°C to DNV ST-F101.
7) ASTM A694 flanges to be impact tested to -45°C, Supplementary requirement S.1 (MSS SP-44)
8) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule	controlled ID
150	WT 12.7 mm	142.9 mm
200	WT 12.7 mm	193.7 mm
250	WT 12.7 mm	247.7 mm

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe (note 6)

PIPE	Pipe (Note 8)	DN 150 - DN 250	DNV SMLS 450S
BEND	Bend - 5D	DN 150 - DN 250	DNV SMLS 450S

Flanges (note 7)

	BLFL	DN 150 - DN 250	ASTM A694 F65 (S1)
	WNFL	DN 150 - DN 250	ASTM A694 F65 (S1)

Miscellaneous

GKSW	Gasket spiral wound	DN 150 - DN 250	AISI 316, Graphite CS centring / SS inner ring
STB1	Studbolt with nuts	DN 150 - DN 250	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat

BARF	Ball valve float RB flgd	DN 25 - DN 50	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BAFF	Ball valve float FB flgd	DN 25 - DN 40	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATF	Ball valve trunnion FB flgd	DN 50 - DN 250	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATW	Ball valve trunnion FB welded	DN 150 - DN 250	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
DBB	Double Block and Bleed valve flgd	DN 50	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK

High Strength Carbon Steel	Project no.
Class no. 91ZZZ	Contr. job no.
ASME rating CLASS 900	
Corrosion Allowance 3 mm	
Revision Letter	

Metric units

3.45

CLASS 151ZZZ

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)

	-45	110
Pressure (Barg)		
DN 150 - DN 400	228	228

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) Welded valves shall be with metal seated and the hard-facing coating on the ball shall be Stellite.
6) DNV 450S Piping and Bends to be impact tested to -45°C to DNV ST-F101.
7) ASTM A694 flanges to be impact tested to -45°C, Supplementary requirement S.1 (MSS SP-44)
8) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule	controlled ID
150	WT 14.27 mm	139.8 mm
200	WT 15.1 mm	188.9 mm
250	WT 18.3 mm	236.5 mm
300	WT 20.6 mm	282.6 mm
350	WT 20.62 mm	314.4 mm
400	WT 22.23 mm	361.9 mm

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe (note 6)

PIPE	Pipe (Note 8)	DN 150 - 400	DNV SMLS 450 SU
BEND	Bend - 5D	DN 150 - 250	DNV SMLS 450 SU
	Bend - 3D	DN 300 - 400	DNV SMLS 450 SU

Flanges (note 7)

BLFL	Blind Flange	DN 150 - 400	ASTM A694 F65 (S1)
WNFL	Weldneck Flange	DN 150 - 400	ASTM A694 F65 (S1)

Miscellaneous

GKSW	Gasket spiral wound	DN 150 - 400	AISI 316, Graphite CS centring / SS inner ring
STB1	Studbolt with nuts	DN 150 - 400	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
BARF	Ball valve float RB flgd	DN 25 - DN 50	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BAFF	Ball valve float FB flgd	DN 25 - DN 40	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATF	Ball valve trunnion FB flgd	DN 50 - DN 400	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATW	Ball valve trunnion FB welded	DN 200 - DN 400	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK

High Strength Carbon Steel		Project no.
Class no.	151ZZZ	Contr. job no.
ASME rating	CLASS 1500	
Corrosion Allowance	3 mm	
Revision Letter		

Metric units

3.46

CLASS 151ZZZH

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)

	-45	110
Pressure (Barg)		
DN 250 - DN 400	228	228

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) Welded valves shall be with metal seated and the hard-facing coating on the ball shall be Stellite.
6) DNV 450S Piping and Bends to be impact tested to -45°C to DNV ST-F101.
7) ASTM A694 flanges to be impact tested to -45°C, Supplementary requirement S.1 (MSS SP-44)
8) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule	controlled ID
150	WT 14.27 mm	139.8 mm
200	WT 15.1 mm	188.9 mm
250	WT 18.3 mm	236.5 mm
300	WT 20.6 mm	282.6 mm
350	WT 20.62 mm	314.4 mm
400	WT 22.23 mm	361.9 mm

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe (note 6)

PIPE	Pipe (Note 8)	DN 150 - 400	DNV SMLS 450 SU
BEND	Bend - 5D	DN 150 - 250	DNV SMLS 450 SU
	Bend - 3D	DN 300 - 400	DNV SMLS 450 SU

Flanges (note 7)

BLFL	Blind Flange	DN 150 - 400	ASTM A694 F65 (S1)
WNFL	Weldneck Flange	DN 150 - 400	ASTM A694 F65 (S1)

Miscellaneous

GKSW	Gasket spiral wound	DN 150 - 400	AISI 316, Graphite CS centring / SS inner ring
STB1	Studbolt with nuts	DN 150 - 400	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
BAFF	Ball valve float FB flgd	DN 50	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK
BAFF	Ball valve trunnion FB welded	DN 200 - 400	Body: ASTM A350-LF2 cl 1/A352-LCC, 6mm CA Trim: Alloy 825, PEEK

High Strength Carbon Steel		Project no.
Class no.	151ZZZH	Contr. job no.
ASME rating	CLASS 1500	
Corrosion Allowance	6 mm	
Revision Letter		

Metric units

3.47

CLASS 251ZZZ

(Created for MM BH FEED)

Design limits (Note 1)

Temperature (°C)

	-45	85
Pressure (Barg)		
DN 350	371	371

Notes

1) The piping system shall be designed as per DEP 31.40.00.10-GEN. and ISO 13623. The Pressure Temperature ratings and schedule of pipes are specific to the FEED for MM Re-Development and PS3 Life Extension only.
2) All connections welded to DNV SMLS 450S pipe shall be of compatible material.
3) Flanges shall comply with the requirements of DEP 31.40.21.34 and ASME B16.5.
4) All studbolts and nuts shall be ZN-Ni Electroplated and PTFE Topcoat.
5) Welded valves shall be with metal seated and the hard-facing coating on the ball shall be Stellite.
6) DNV 450S Piping and Bends to be impact tested to -45°C to DNV ST-F101.
7) ASTM A694 flanges to be impact tested to -45°C, Supplementary requirement S.1 (MSS SP-44).
8) Flanges and flanged fitting faces NB 14" and larger to be generally in accordance to ASME B16.5, and to be designed as unlisted components in line with ASME B31.3 304.7.2.
9) API 5L Gr.65 pipe can be also be supplied with supplementary DNV requirements.

Table of Schedules

DN	Schedule	controlled ID
350	WT 20.62 mm	301.66 mm

COMPONENT MATERIAL DESCRIPTION
(For full material description see relevant MESC buying description.)

Pipe

PIPE	Pipe (Note 9)	DN 350	DNV SMLS 450 SU
BEND	Bend - 3D	DN 350	DNV SMLS 450 SU

Flanges

BLFL	Blind Flange	DN 350	ASTM A694 F65 (S1)
WNFL	Weldneck Flange	DN 350	ASTM A694 F65 (S1)

Miscellaneous

GKSW	Gasket spiral wound	DN 350	AISI 316, Graphite CS centring / SS inner ring
STB1	Studbolt with nuts	DN 350	ASTM A320-L7M/A194-7M Zn-Ni Electro pl + PTFE top coat
BATF	Ball valve trunnion FB flgd	DN 350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK
BATW	Ball valve trunnion FB welded	DN 350	Body: ASTM A350-LF2 cl 1/A352-LCC Trim: Alloy 825, PEEK

High Strength Carbon Steel Class no. 251ZZZ ASME rating CLASS 2500 Corrosion Allowance 3 mm Revision Letter	Project no. Contr. job no.

Metric units

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.48 Piping Class 17012 Amendments to Shell DEP

- Design Temperature from 0 degC to 85 degC.
- Maximum design pressure at ambient being 20.0 BarG.
- Size Range 1” to 30” NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- 30” and larger flanges to ASME B16.47 Series A.
- All valve bodies to be ASTM B148-UNS C95800. No liner required. Valve trim shall be Ni-Al bronze Grade 96800.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

ATTACHMENT 3: PIPING CLASSES, AMENDED AND CREATED FOR MM BH FEED.

3.49 Piping Class 17320 Amendments to Shell DEP

- Design Temperature from 0 degC to 85 degC.
- Maximum design pressure at ambient being 20.0 BarG.
- Size Range 1” to 44” NB.
- Refer to Attachment 2 Wall Thickness / Schedule Summary for the calculated wall thicknesses and other general piping class details.
- All valve bodies to be ASTM B148-UNS C95800. No liner required. Valve trim shall be Ni-Al bronze Grade 96800.
- All valves to be in accordance with Valve Index and Valve Data Sheets 4355-GENOF-5-13-0002, and to the process design requirements stated in Attachment 1 Summary of Piping Classes (Index). The MESC codes listed are to be used, or the referenced valve data sheets provided and generated for the MM BH Re-Development Project.

3.50

CLASS 17240

(Created for MM BH FEED)

Design limits

Temperature (°C)	4	85
Pressure (Barg)		
DN 50 - 150	20.0	20.0

Notes

- Design limits acc. to the nom. pressure of valves.
- For basis of design see DEP 31.38.01.10-Gen
- Valves in this piping class are in accordance with fugitive emission tightness class A (see MESC SPE 77/312)
- Bolts for GRP flanges to be provided with washers.
- For requirements regarding GRP piping system, see DEP 31.40.10.19-Gen
- Flanges to be drilled acc. to ASME B16.5, class 150
- Hypochlorite shall contain 1000-1200 mg/L free chlorine for continuous dosing and 1000-2000mg/L free chlorine for shock dosing. Dosing is 2ppm continuous, with shock dosing up to 6ppm for 15 minutes three times daily.

Table of schedules

DN	Schedule
50	
80	
100	
150	

Valves

BARF	Ball valve float RB flgd	DN 50 - 150	Body: Nickel Alloy ASTM B564 UNS10276 Trim: Hastelloy C276, PTFE
CHVF	Check valve flgd	DN 50 - 100	Body: Nickel Alloy ASTM B564 UNS10276 Trim: Hastelloy C276
GLVF	Globe valve flgd	DN 50 - 80	Body: Nickel Alloy ASTM B564 UNS10276 Trim: Hastelloy C276, PTFE

Miscellaneous

GKRF	Gasket flat ring (raised face)	DN 50 - 150	Expanded PTFE
STBT	Studbolt with nuts		ASTM A193-B7/A194-2H

GRVE-BisphenolA		Plant
Class no.	17240	Consignee
ASME rating	CLASS 150	Engineered by
Corrosion allowance	0 mm	Principal
Revision letter		Contr. job no.
Revision date		Project no.

Metric units