

NIOEC-SP-50-64(0)							
DOCUMENT CODE						NO. OF PAGES: 81	
PLAN/PRJ/SUB	UNIT	PHASE	DISCIPLINE	DOCUMENT TYPE	SERIAL NO.	REV. NO.	DATE
NIOEC	000	EG	PL	SP	5064	A0	DECEMBER, 2015



NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION
FOR
Pipeline & Piping Material

FIRST EDITION

DECEMBER, 2015

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IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

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NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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0	DECEMBER, 2015	M.ASKARI	M.R.HABIBZADEH	M.R.FARZAM	A.ARMAN MOGHADAM
REV.	DATE	PREPARED	CHECKED	APPROVED	AUTHORIZED

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1. SCOPE

This specification defines NIOEC's minimum requirements for materials of pipes, fittings, flanges, valves and other piping components for use in product and crude oil onshore pipeline transportation systems.

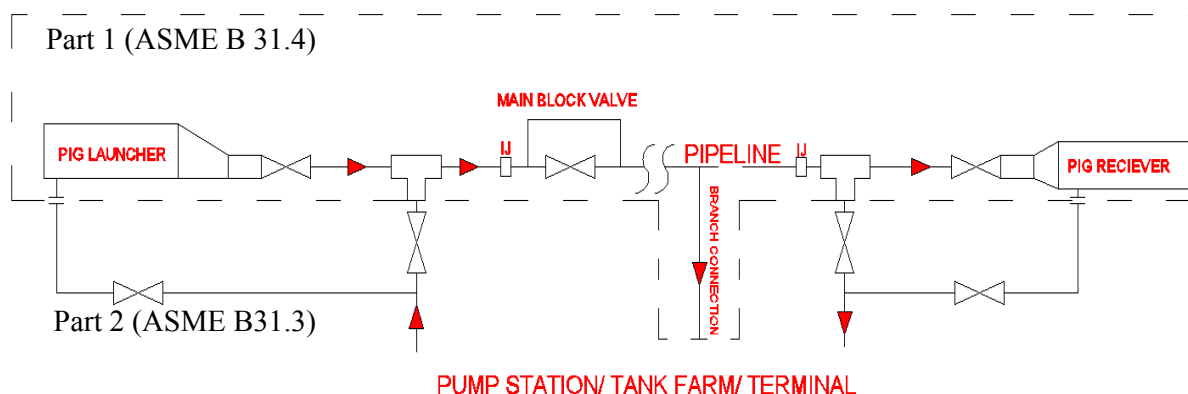
Deviations from this specification will only be permitted on obtaining written approval from NIOEC.

Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced/relevant IPS and the international standards, shall be made through written consent and approval of NIOEC.

This specification contains two parts (as indicated in Fig.1):

Part1: Pipeline Material Specification

Part 2: Piping Material Specification



2. REFERENCES

The following standards, codes, and specifications, to the extent specified hereinafter, shall constitute a part of this NIOEC Specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references, after the cited date shall be mutually agreed upon between NIOEC and the Vendor /Contractor.

NIOEC- SP (NIOEC SPECIFICATION)

NIOEC-SP-00-10	NIOEC Specification for Units
NIOEC-SP-50-01	NIOEC Specification for Plant Piping Systems
NIOEC-SP-50-05	NIOEC Specification for Field Pressure Testing
NIOEC-SP-50-09	NIOEC Specification for Piping Material Purchase Pipe
NIOEC-SP-50-10	NIOEC Specification for Piping Material Purchase Flanges
NIOEC-SP-50-11	NIOEC Specification for Piping Material Purchase Fitting
NIOEC-SP-50-17	NIOEC Specification for Protection of Underground Steel Pipe
NIOEC-SP-50-18	NIOEC Specification for Piping Material Purchase Valves
NIOEC-SP-50-27	NIOEC Specification for Identification of Piping Material
NIOEC-SP-50-50	NIOEC Specification for Pipeline Design Criteria

NIOEC-SP-50-51	NIOEC Specification for Line Pipe
NIOEC-SP-50-52	NIOEC Specification for Pipeline Valves
NIOEC-SP-50-53	NIOEC Specification for Anchor Flange
NIOEC-SP-50-57	NIOEC Specification for Insulating Joint
NIOEC-SP-50-59	NIOEC Specification for Expansion Joint
NIOEC-SP-50-60	NIOEC Specification for Hot Bend
NIOEC-SP-80-01	NIOEC Specification for Insulation
NIOEC-SP-80-51	NIOEC Specification for Three Layer Polyethylene Coating System
NIOEC-SP-80-24	NIOEC Specification for Cathodic Protection of Buried and Submerged Structures
NIOEC-SP-90-02	NIOEC Specification for Welding of Plant Piping System
NIOEC-SP-90-51	NIOEC Specification for Welding of Transportation Pipeline

NIOEC-SD (NIOEC STANDARD DRAWING)

NIOEC-SD-0100	NIOEC Standard Drawing for Piping and Instrument Diagram Symbols and Legends
NIOEC-SD-0101	NIOEC Standard Drawing for Piping and Instrument Diagram Abbreviations
NIOEC-SD-50-15	NIOEC Standard Drawing for Pressure Blind Detail

IPS (IRANIAN PETROLEUM STANDARD)

IPS-E-TP-740	Eng. Standard for Corrosion Consideration in Material Selection.
IPS-E-TP-820	Eng. Standard for Cathodic Protection
IPS-E-PI-221	Engineering Standard for Piping Material Selection

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ASME B1.20.1	Pipe Threads
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory- Made Wrought Butt Welding Fittings
ASME B16.10	Face to Face and End to End Dimensions of Valves
ASME B16.11	Forged Steel Fitting, Socket Welding and Threading
ASME B16.20	Metallic Gaskets for Pipe Flanges –Ring-Joint, Spiral-Wound, and Jacketed.
ASME B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.25	Butt Welding Ends
ASME B16.28	Wrought Steel Butt-welding Short Radius Elbows and Returns
ASME B16.3	Malleable Iron Threaded Fittings, Class 150 and 300

ASME B16.34	Valves-Flanged, Threaded and Welding Ends
ASME B16.36	Orifice Flanges
ASME B16.47	Large Diameter Steel Flanges NPS 26 Through NPS 60
ASME B16.48	Steel Line Blanks
ASME B18.2.1	Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws
ASME B18.2.2	Nuts for General Applications: Machine, Screw Nuts, Hex, Square Hex Flange, and Coupling Nuts
ASME B31.1	Power Piping
ASME B31.3	Process piping
ASME B36.19M	Stainless Steel Pipe
ASME B46.1	Surface Texture (Surface Roughness, Waviness and Lay)
ASME B31.4	Pipeline Transportation Systems for Liquids and Slurries
ASME B36.10M	Welded and Seamless Wrought Steel Pipe

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

ASTM A105	Carbon Steel Forgings for Piping Applications
ASTM A106	Seamless Killed Carbon Steel
ASTM A193	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A194	Carbon and Alloy Steel Nuts for Bolts
ASTM A216	Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A234	Seamless and Welded Carbon Steel and Alloy Steel Pipe Fittings
ASTM A350	Forgings, Carbon and Low-alloy Steel, requiring notch toughness testing for Piping Components
ASTM A516	Impact Tested Carbon Steel Plate
ASTM A671	Electric Fusion Welded Steel Pipe for Atmospheric and Lower Temperature
ASTM A694	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High Pressure Transmission Service
ASTM A860	Wrought High-Strength Ferritic Steel Butt-Welding Fittings

API (AMERICAN PETROLEUM INSTITUTE)

API 5L	Specification for Line Pipe
API 594	Check Valves: Flanged, Lug, Wafer, and Butt-welding
API 598	Valve Inspection and Testing
API 599	Metal Plug Valves—Flanged, Threaded, and Welding Ends
API 600	Steel Gate Valves, Flanged and Butt Welding Ends



API 602	Steel Gate, Globe, and Check Valves for Sizes NPS 4 (DN 100) and Smaller for the Petroleum and Natural Gas Industries
API-609	Butterfly valves, Double-flanged, Lug- and Wafer-Type
API 6D	Pipeline Valves
API 6FA	Specification for Fire Test for Valves

BS (BRITISH STANDARD INSTITUTION)

BS 1873	Steel globe and globe stop check valves, (flanged and butt welding ends) for the petroleum, petrochemical and allied industries
BS EN ISO 17292	Metal ball valves for petroleum, petrochemical and allied industries
BS EN 1983	Industrial valves —Steel ball valves

MSS (MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY INC)

MSS SP - 6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting - Ends Flanges of Valves and Fittings
MSS SP-43	Wrought Stainless Steel Butt welding Fittings for Low Pressure, Corrosion Resistant Applications
MSS SP-44	Steel pipe Line Flanges
MSS SP-75	Specification for High-Test, Wrought, Butt-Welding Fittings
MSS SP-80	Bronze Gate, Globe, Angle and Check Valves
MSS SP-83	Class 3000 Steel Pipe Unions, Socket-welding and Threaded
MSS SP-97	Integrally Reinforced Forged Carbon Steel Branch Outlet Fittings Socket Welding, Threaded and Butt Welding Ends.

NACE (NATIONAL ASSOCIATION OF CORROSION ENGINEERS)

MR0175 /ISO15156	Petroleum and Natural Gas Industries Materials for Use in H ₂ S Containing Environments in Oil and Gas Production
TM-0284	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking
TM-0177	Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H ₂ S Environments

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

ISO 15761	Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries
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3. UNITS

International System of Units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. ABBREVIATIONS

AISI: American Iron and Steel Institute

ANSI: American National Standard Institute

API: American Petroleum Institute

ASME: American Society of Mechanical Engineers

ASTM: American Society of Testing and Materials

BV: Ball Valve

BB: Bolted Bonnet

BBE: Bevel Both End

BC: Bolted Cover

BE: Beveled End

BG: Bolted Gland

BS: British Standards

BU: Butterfly Valve

BW: Butt Welding

CA: Corrosion Allowance

CHV: Check Valve

CAF: Compressed Asbestos Fiber

CONC: Concentric

CR: Chromium

CRA: Corrosion Resistance Alloy

CS: Carbon Steel

DIAPH: Diaphragm

ECC: Eccentric

ENP: Electroless Nickel Plating

EPC: Engineering, Procurement, Construction

ERW: Electric Resistance Welded

FCS: Forged Carbon Steel

FF: Flat Face

FLEX: Flexible

FLGD: Flanged

GALV: Galvanized

HEX: Hexagonal

LR: Long Radius

MDMT: Minimum Design Metal Temperature

MOP: Maximum Operating Pressure

MOV: Motor Operated Valve

NPS: Nominal Pipe Size

NPT: Nominal Pipe Thread

OLET: Weldolet, Sockolet, Nipolet, Sweepolet, Flangolet, OS & Y Outside Screw and Yoke

PE: Plain End

PWHT: Post Weld Heat Treatment

RED: Reducer

RF: Raised Face

RTJ: Ring Type Joint

SAW: Submerged Arc Weld

SAWL: Submerged Arc Longitudinal Weld

SCH: Schedule

SMLS: Seamless

SPB: Split Body

STD: Standard

SW: Socket Welding

TOE: Thread Both End

TBE: Thread One End

TPE: Top Entry

TP.E: TYPE E

TP.S: TYPE S

WN: Welding Neck

XS: Extra Strong

XXS: Double Extra Strong

UG: Underground

For more information about abbreviations see NIOEC-SD-0101-1/1-A1.

5. GENERAL NOTES

5.1. Item Descriptions

5.1.1. The ITEM DESCRIPTION shown in the individual Line Classes are abbreviated and will be used for Purchase.

5.1.2. Full size and reducing size like components shall have the different item code number.

5.2. Manufacturers Reference

5.2.1. Items specified or referenced by manufacturer and figure number are not intended to exclude equal items offered by other manufacturers. Products of reputable manufacturers and of comparable type, quality and characteristics may be submitted for NIOEC Engineer's approval.

PART 1: PIPELINE MATERIAL SPECIFICATION

1. GENERAL NOTES**1.1. Design Conditions**

- 1.1.1. Allowable stress for the materials specifications contained in the piping class has been established in line with ASME B31.4 para. 402.3 (2012)
- 1.1.2. Pressure design criteria shall be in accordance with NIOEC Specification NIOEC-SP-50-50.
- 1.1.3. Nominal wall thicknesses and outside diameter of pipes, as specified in piping classes, are in accordance with ASME B36.10M and ASME B36.19M.

1.2. Material Identification

- 1.2.1. Valves and Specialty Items shall be supplied with a metal tag attached, bearing the applicable Item Code Number.
- 1.2.2. The materials shall be identified according to NIOEC-SP-50-27.

2. NOTES PERTAINING TO SPECIFIC LINE CLASSES**2.1. Pipeline Wall Thickness**

The nominal pipeline wall thickness shall be calculated according to NIOEC-SP-50-50.

2.2. Pipe

- 2.2.1. All line pipes shall comply with the requirements of NIOEC-SP-50-51.
- 2.2.2. Line pipes shall be seamless (SMLS), Submerged Arc Longitudinal Welded (SAWL-100% RT) or High Frequency Welded
- 2.2.3. No pipe diameter smaller than ½" shall be used, except for instruments. Pipe diameters of 1"¼, 2"½, 3"½, 5", 7 and 9" shall not be used. Equipment supplied with connections of these sizes shall be adjusted to a standard size immediately adjacent to the equipment by means of a suitable reducing fitting.
- 2.2.4. All metallic pipelines shall be externally protected by a suitable anti-corrosion coating/painting comply with NIOEC relevant specification. Underground pipeline shall be also protected by cathodic protection where as electrically isolated from the pump stations and facilities to which they are connected.
- 2.2.5. The design of cathodic protection systems shall be carried out in accordance with NIOEC-SP-80-24.

2.3. Fittings

- 2.3.1. General requirements of fittings shall be in accordance with NIOEC-SP-50-11.
- 2.3.2. Fittings which will be welded to API 5L line pipe shall be specified as being compatible for welding to the particular grade considered.
- 2.3.3. The allowable internal-pressure ratings for pipe fittings shall be calculated as for straight seamless pipe (or welded pipe with a joint efficiency factor of 1.0) of equivalent grade, diameter and wall thickness in accordance with the rules established in ASME B31.4.
- 2.3.4. Bends shall comply with the requirements of NIOEC SP-50-60.
- 2.3.5. All elbows shall be long radius unless otherwise stated in drawings.
- 2.3.6. For acceptable butt welded Joint designs for unequal wall thicknesses refer to ASME B31.4.

2.3.7. Isolating joint material shall be in accordance with NIOEC-SP-50-57.

2.4. Flanges, Spectacle Blinds and Spacers

2.4.1. All flanges shall be in accordance with MSS SP 44.

2.4.2. For high pressure flow lines, with ASME rating class 900# and above, "Ring Type Joint" flanges shall be employed. All other pipelines shall incorporate "Raised Face" flanges.

2.4.3. For 2" Flanges and above shall be of the "Welding Neck" type.

2.4.4. Gasket contact surface finish shall be as per MSS SP 6, unless otherwise stated.

Surface finish roughness (for raised face flanges which shall be serrated): Ra 3.2 to 6.3 μm (125 to 250 μin AARH)

Surface finish roughness (for RTJ flanges): Ra 1.6 μm max (63 μin AARH)

2.4.5. Anchor flanges shall comply with the requirements of NIOEC SP-50-53.

2.4.6. Spectacle Blinds and Spacers up to and including 24" shall be in accordance with ASME B16.48, 26" and above shall be calculated in accordance with ASME B31.3.

2.5. Gaskets

2.5.1. Metallic Gaskets for Pipe Flanges (Ring Joint, Spiral Wound gaskets) shall comply with ASME B16.20.

2.5.2. Non-metallic gaskets for flanged pipe joints shall conform to ASME B16.21.

2.5.3. All gaskets shall be asbestos free.

2.6. Bolt & Nuts

2.6.1. Bolt & Nuts material shall comply with the requirements of ASTM A193, ASTM A194.

2.6.2. For sour service piping material classes, A193 B7 and A194 2H material are acceptable for stud and nuts except when confined under insulation. In this case A193 B7M and A194 2HM shall be used.

2.6.3. Stud-bolt length shall be the effective thread length according to ASME B16.5.

2.7. Valves

2.7.1. All pipeline valves shall comply with the requirements of NIOEC-SP-50-52.

2.7.2. The end of all pipeline valves shall be welded except pig trap mainline valve and unless otherwise stated. Butt-welding ends of valves shall comply with ASME B 16.25, and their bores shall match those of the pipes to which they are connected. All butt-welding end valves must be supplied with pup pieces and/or transition pieces to allow for transition between the valve body (material grade and thickness) and the adjacent pipe (material grade and thickness) to which the valve is intended to be connected. The total length (pup piece + transition piece, or pup piece alone if no transition piece is found necessary) must be, on each side, equal to a minimum of twice the valve port diameter, with a maximum of 1 meter.

2.7.3. Buried gate valves shall be provided with an extended stem with oil-filled outer casing and aboveground weatherproof gearbox.

2.7.4. Gear operator requirements for valves shall be in accordance with the following minimum requirements, as shown in Table 1. However, gear operators may have to be provided beyond

these requirements in order to meet the maximum allowable force applied to hand-wheels or levers as stated in NIOEC-SP-50-52.

- 2.7.5. Gear operators for gate valve shall be bevel types unless spur type is specifically stated in the requisition. In case of frequency of operation or high operating torque, valves of other sizes may be equipped with gear operators, and the Valve Data Sheet shall indicate such requirements.

Table-1

VALVE	Valve pressure class	Nominal diameter
Gate	150 lb	14" and larger
	300 lb	14" and larger
	600 lb	12" and larger
	900 lb	8" and larger
	1500lb	6" and larger

2.8. Welding

2.8.1. The requirement of pipeline welding shall be in accordance with NIOEC-SP-90-51.

3. IDENTIFICATION OF PIPELINE CLASSES

Each pipeline class is identified by minimum four characters. The first through forth characters indicate material group, pressure rating of flange (ASME class), fluid service and corrosion allowance respectively. For some classes the fifth character is also provided to show special requirements.

Example:

Pipeline class B1A1 (A) is compiled from:

B	for	material "Killed Carbon Steel"
1	for	ASME rating 150
A	for	fluid service "Hydrocarbon without H2 (Crude Oil, Fuel Oil, Products,Gas Condensate)"
1	for	corrosion allowance 1.0
(A)	for	special requirements "ABOVEGROUND "

The following table describes characters which are used in identification of pipeline classes.

Table-2

1ST CHARACTER MATERIAL	2ND CHARACTER FLANGE CLASS	3RD CHARACTER FLUID SERVICES	4TH CHARACTER CORROSION ALLOWANCE	5TH CHARACTER SPECIAL REQUIREMENTS
B KILLED CARBON STEEL*	1 150	A HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS,GAS CONDENSATE)	0 NONE	A ABOVEGROUND**
	3 300		1 1-1.6 mm	N NACE
	6 600		2 2-2.6 mm	Z ABOVEGROUND + NACE
	7 900		3 3-3.6 mm	
	8 1500			

*) MDMT higher than or equal minus 5 degree C

**) All pipelines are normally buried, otherwise letter A for aboveground pipelines shall be mentioned.

4. NIOEC LINE CLASS INDEX

NIOEC LINE CLASS	MATERIAL	FLANGE RATING	SERVICE	CORROSION ALLOWANCE (mm)	TEMP. LIMIT (°C)	REMARKS	BRANCH TABLE
B1A0	KCS	CL.150 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)	0	-29 TO 100		----
B3A0	KCS	CL.300 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)	0	-29 TO 100		
B6A0	KCS	CL.600 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)	0	-29 TO 100		
B7A0	KCS	CL.900 RTJ	HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)	0	-29 TO 100		
B8A0	KCS	CL.1500 RTJ	HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)	0	-29 TO 100		
B1A0(N)	KCS	CL.150 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)	0	-29 TO 100	NACE	
B3A0(N)	KCS	CL.300 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)	0	-29 TO 100	NACE	
B6A0(N)	KCS	CL.600 RF	HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)	0	-29 TO 100	NACE	
B7A0(N)	KCS	CL.900 RTJ	HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)	0	-29 TO 100	NACE	
B8A0(N)	KCS	CL.1500 RTJ	HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)	0	-29 TO 100	NACE	

5. NIOEC LINE CLASS

Material : Killed Carbon Steel							Rating:150 Lbs RF										CLASS B1A0									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					19.6					19.6					17.6				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48				
	Schedule/ Thickness	80					40			According to relevant pipeline hydraulic gradient and wall thickness calculation (2)																
	Ends	PE				BE, AS PER ASME B 16.25																				
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (3)									API 5 L, PSL 2 SAWL(100% RT) ASME B 36.10						
Fittings (4)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11				ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																				
Flanges (1)		ASTM A105, CL.150 Lbs RF, SW				ASTM A105, WN, CL. 150 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE																				
						ASTM A105, WN, CL. 300 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE, SUPPLIED WITH BOLTING, WITH JACK SCREW , FOR INSTRUMENT CONNECTIONS																				
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y				ASTM A216 GR WCB, TRIM 13% CR, CL.150 Lbs, FLANGED, RF, SERRATED API600, BB-BG- OS&Y				ASTM A216 GR.WCB, CL.150 Lbs, TRIM ENP COATED, API 6D, BB-BG- OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT				A216 WCB BODY TRIM:13%CR, BS 1873,FLANGED, OS&Y,BB																				
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT				ASTM A216 GR WCB, Trim13% CR, CL.150 Lbs, FLANGED, RF, SERRATED API600, SWING TYPE, BC (1)				ASTM A216 GR.WCB, CL.150 Lbs, TRIM ENP COATED, API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX NUTS, AS PER ASME B18.2.2																								
NOTES (1) Flanges shall be in accordance with MSS SP 44. (2) The criteria of D/t shall be considered as per NIOEC – SP – 50 – 50. (3) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC. (4) For diameter above 6” and unpiggable pipelines, the fitting shall be in accordance with ASTM A234.																										

Material : Killed Carbon Steel							Rating: 300 Lbs RF										CLASS B3A0									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					51					51					46.3				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26			48					
	Schedule/ Thickness	80					40			According to relevant pipeline hydraulic gradient and wall thickness calculation (2)																
	Ends	PE				BE, AS PER ASME B 16.25																				
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL (100% RT) - ASME B 36.10 (3)									API 5 L, PSL 2 – SAWL (100% RT) ASME B 36.10						
Fittings (4)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11				ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																				
Flanges (1)		ASTM A105, CL.300 Lbs RF, SW				ASTM A105, WN, CL. 300 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE, BLIND FLANGES																				
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y				ASTM A216 GR WCB, TRIM 13% CR, CL.300 Lbs, FLANGED, RF, SERRATED API600, BB-BG-OS&Y				ASTM A216 GR.WCB, CL.300 Lbs, TRIM ENP COATED, API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y-REMOVABLE SEAT				A216 WCB BODY TRIM:13%CR ,CL.300 Lbs BS 1873,FLANGED, OS&Y,BB																				
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT				ASTM A216 GR WCB, Trim13% CR, CL.300 Lbs, FLANGED, RF, SERRATED API600, SWING TYPE, BC (1)				ASTM A216 GR.WCB, CL.300 Lbs, TRIM ENP COATED, API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																								
NOTES																										
(1) Flanges shall be in accordance with MSS SP 44.																										
(2) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50)																										
(3) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																										
(4) For diameter above 6’’ and unpiggable pipelines, the fitting shall be in accordance with ASTM A234.																										

Material : Killed Carbon Steel							Rating: 600 Lbs RF										CLASS B6A0									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					102					102					92.7				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24	26			48					
	Schedule/ Thickness	80								According to relevant pipeline hydraulic gradient and wall thickness calculation (2)																
	Ends	PE					BE, AS PER ASME B 16.25																			
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10										API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (3)										API 5 L, PSL 2 SAWL(100% RT) ASME B 36.10				
Fittings (4)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11					ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																			
Flanges (1)		ASTM A105, CL.600 Lbs RF, SW					ASTM A105, WN, CL. 600 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE					ASTM A694 GR.F(GR.ACC TO LINE PIPE GRADE), WN, CL. 600 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE														
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y					ASTM A216 GR WCB, TRIM 13% CR, CL.600 Lbs, FLANGED, RF, SERRATED API600, BB-BG- OS&Y					ASTM A216 GR.WCB, CL.600 Lbs, TRIM ENP COATED, API 6D, BB-BG- OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL														
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT					A216 WCB BODY TRIM:13%CR ,CL.600 Lbs BS 1873,FLANGED, OS&Y,BB																			
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT					ASTM A216 GR WCB, Trim13% CR, CL.600 Lbs, FLANGED, RF, SERRATED, API600, SWING TYPE, BC (1)					ASTM A216 GRWCB, CL.600 Lbs, TRIM ENP COATED, API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL														
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																								
NOTES																										
(1) Flanges shall be in accordance with MSS SP 44. (2) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50) (3) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC. (4) For diameter above 6” and unpiggable pipelines, the fitting shall be in accordance with ASTM A860.																										

Material : Killed Carbon Steel										Rating: 900 Lbs RTJ										CLASS B7A0									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)										Corrosion allowance: 0 mm																			
										Pressure / Temperature Limits																			
										Pressure(barg)					153					153					139.1				
										Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48							
	Schedule/ Thickness	80									According to relevant pipeline hydraulic gradient and wall thickness calculation (3)																		
	Ends	PE					BE, AS PER ASME B 16.25																						
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (4)										API 5 L, PSL 2 SAWL(100% RT) ASME B 36.10								
Fittings (5)		ASTM A105, 6000 Lbs SW, AS PER ASME B16.11					ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																						
Flanges (1)(2)		ASTM A105, CL.900 Lbs RTJ, SW					ASTM A105, WN, CL. 900 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE					ASTM A694 GR.F(GR.ACC TO LINE PIPE GRADE), WN, CL. 900 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE																	
Gate valves (1)		ASTM A105, CL.1500Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y					ASTM A216 GR WCB, TRIM 13% CR, CL.900 Lbs, FLANGED, RTJ, API600, BB-BG-OS&Y					ASTM A216 GR.WCB, CL.900 Lbs, TRIM ENP COATED, API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																	
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT					A216 WCB BODY TRIM:13%CR ,CL.900 Lbs BS 1873,FLANGED, OS&Y,BB																						
Check valves		ASTM A105, TRIM 13% CR, CL. 1500 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT					ASTM A216 GR WCB, Trim13% CR, CL.900 Lbs, FLANGED, RJ, API600, SWING TYPE, BC (1)					ASTM A216 GRWCB, CL.900 Lbs, TRIM ENP COATED, API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																	
Gaskets		OCTOGONAL RING JOINT, PER ASME B 16.20 - 90 HB MAX, 900 Lbs RATING																											
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																											
NOTES																													
(1) Flanges shall be in accordance with MSS SP 44.																													
(2) Ring joint facing																													
(3) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50).																													
(4) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																													
(5) For diameter above 6’’ and unpiggable pipelines, the fitting shall be in accordance with ASTM A860.																													

Material : Killed Carbon Steel										Rating: 1500 Lbs RTJ										CLASS B8A0									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, FUEL OIL, PRODUCTS, GAS CONDENSATE)										Corrosion allowance: 0 mm																			
										Pressure / Temperature Limits																			
										Pressure(barg)					255.4					255.4					231.9				
										Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48							
	Schedule/ Thickness	160									According to relevant pipeline hydraulic gradient and wall thickness calculation (3)																		
	Ends	PE					BE, AS PER ASME B 16.25																						
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (4)										API 5 L, PSL 2 SAWL(100% RT) ASME B 36.10								
Fittings (5)		ASTM A105, 9000 Lbs SW, AS PER ASME B16.11					ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																						
Flanges (1)(2)		ASTM A105, CL.1500 Lbs RTJ, SW					ASTM A105, WN, CL. 1500 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE				ASTM A694 GR.F(GR.ACC TO LINE PIPE GRADE), WN, CL. 1500 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE																		
Gate valves (1)		ASTM A105, CL.1500lbs SW, API602,TRIM 13% CR BG - OS&Y					ASTM A216 GR WCB, TRIM 13% CR, CL.1500 Lbs, FLANGED, RTJ, API600, BB-BG- OS&Y				ASTM A216 GR.WCB, CL.1500 Lbs, TRIM ENP COATED, API 6D, BB-BG- OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																		
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT					A216 WCB BODY TRIM:13%CR ,CL.1500 Lbs BS 1873,FLANGED, OS&Y,BB																						
Check valves		ASTM A105, TRIM 13% CR, CL. 1500 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT					ASTM A216 GR WCB, Trim13% CR, CL.1500 Lbs, FLANGED, RTJ, API600, SWING TYPE, BC (1)				ASTM A216 GR WCB, CL.1500 Lbs, TRIM ENP COATED, API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																		
Gaskets		OCTOGONAL RING JOINT, PER ASME B 16.20 - 90 HB MAX, 1500 Lbs RATING																											
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																											
NOTES																													
(1) Flanges shall be in accordance with ASME B 16.5.																													
(2) Ring joint facing																													
(3) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50)																													
(4) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																													
(5) For diameter above 6” and unpiggable pipelines, the fitting shall be in accordance with ASTM A860.																													

Material: Killed Carbon Steel (2)							Rating:150 Lbs RF										CLASS B1A0(N)									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					19.6					19.6					17.6				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48				
	Schedule/ Thickness	80					40			According to relevant pipeline hydraulic gradient and wall thickness calculation (3)																
	Ends	PE				BE, AS PER ASME B 16.25																				
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (4)									API 5 L, PSL 2 – SAWL(100% RT) ASME B 36.10						
Fittings (5)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11				ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																				
Flanges (1)		ASTM A105, CL.150 Lbs RF, SW				ASTM A105, WN, CL. 150 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE																				
						ASTM A105, WN, CL. 300 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE, SUPPLIED WITH BOLTING, WITH JACK SCREW , FOR INSTRUMENT CONNECTIONS																				
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y				ASTM A216 GR WCB, TRIM 13% CR, CL.150 Lbs, FLANGED, RF, SERRATED API600, BB-BG-OS&Y				ASTM A216 GR.WCB, CL.150 Lbs, TRIM CRA(2), API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT				A216 WCB BODY TRIM:13%CR, BS 1873.FLANGED, OS&Y,BB																				
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT				ASTM A216 GR WCB, Trim13% CR, CL.150 Lbs, FLANGED, RF, SERRATED API600, SWING TYPE, BC (1)				ASTM A216 GR.WCB, CL.150 Lbs, TRIM CRA(2), API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																								
NOTES																										
(1) Flanges shall be in accordance with MSS SP 44.																										
(2) All materials shall comply with the NACE MR 01-75/ISO 15156 Standard.																										
(3) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50)																										
(4) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																										
(5) For diameter above 6” and unpiggable pipelines, the fitting shall be in accordance with ASTM A234.																										

Material :Killed Carbon Steel (2)							Rating: 300 Lbs RF										CLASS B3A0(N)									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					51					51					46.3				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26			48					
	Schedule/ Thickness	80					40			According to relevant pipeline hydraulic gradient and wall thickness calculation (3)																
	Ends	PE				BE, AS PER ASME B 16.25																				
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10										API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (4)										API 5 L, PSL 2 – SAWL(100% RT) ASME B 36.10				
Fittings (5)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11				ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																				
Flanges (1)		ASTM A105, CL.300 Lbs RF, SW				ASTM A105, WN, CL. 300 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE, BLIND FLANGES																				
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y				ASTM A216 GR WCB, TRIM 13% CR, CL.300 Lbs, FLANGED, RF, SERRATED API600, BB-BG-OS&Y				ASTM A216 GR.WCB, CL.300 Lbs, TRIM CRA(2), API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT				A216 WCB BODY TRIM:13%CR ,CL.300 Lbs BS 1873,FLANGED, OS&Y,BB																				
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT				ASTM A216 GR WCB, Trim13% CR, CL.300 Lbs, FLANGED, RF, SERRATED API600, SWING TYPE, BC (1)				ASTM A216 GR.WCB, CL.300 Lbs, TRIM CRA(2), API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																								
NOTES																										
(1) Flanges shall be in accordance with MSS SP 44.																										
(2) All materials shall comply with the NACE MR 01-75/ISO 15156 Standard.																										
(3) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50)																										
(4) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																										
(5) For diameter above 6” and unpiggable pipelines, the fitting shall be in accordance with ASTM A234.																										

Material: Killed Carbon Steel (2)							Rating: 600 Lbs RF										CLASS B6A0(N)									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)							Corrosion allowance: 0 mm																			
							Pressure / Temperature Limits																			
							Pressure(barg)					102					102					92.7				
							Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48				
	Schedule/ Thickness	80									According to relevant pipeline hydraulic gradient and wall thickness calculation (3)															
	Ends	PE					BE, AS PER ASME B 16.25																			
	Mat.Spec.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10										API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (4)										API 5 L, PSL 2 – SAWL(100% RT) ASME B 36.10				
Fittings (5)		ASTM A105, 3000 Lbs SW, AS PER ASME B16.11					ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																			
Flanges (1)		ASTM A105, CL.600 Lbs RF, SW					ASTM A105, WN, CL. 600 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE					ASTM A694 GR.F(GR.ACC TO LINE PIPE GRADE), WN, CL. 600 Lbs RF, SERRATED, HUB THICKNESS AS PER PIPE SCHEDULE														
Gate valves (1)		ASTM A105, CL. 800Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y					ASTM A216 GR WCB, TRIM 13% CR, CL.600 Lbs, FLANGED, RF, SERRATED API600, BB-BG-OS&Y					ASTM A216 GR.WCB, CL.600 Lbs, TRIM CRA(2), API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL														
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT					A216 WCB BODY TRIM:13%CR ,CL.600 Lbs BS 1873,FLANGED, OS&Y,BB																			
Check valves		ASTM A105, TRIM 13% CR, CL. 800 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT					ASTM A216 GR WCB, Trim13% CR, CL.600 Lbs, FLANGED, RF, SERRATED, API600, SWING TYPE, BC (1)					ASTM A216 GRWCB, CL.600 Lbs, TRIM CRA(2), API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL														
Gaskets		SPIRAL WOUND, GRAPHITE FILLER, 4.5 mm THICK 316L SS WINDING, 3.2 mm THICK INTERNAL AND EXTERNAL CENTERING RINGS PER ASME B 16.20																								
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																								
NOTES (1) Flanges shall be in accordance with MSS SP 44. (2) All materials shall comply with the NACE MR 01-75/ISO 15156 Standard. (3) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50) (4) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC. (5) For diameter above 6’’ and unpiggable pipelines, the fitting shall be in accordance with ASTM A860.																										

Material :Killed Carbon Steel (3)										Rating: 900 Lbs RTJ										CLASS B7A0(N)									
Services: HYDROCARBON WITHOUT H2 (CRUDE OIL, GAS CONDENSATE)										Corrosion allowance: 0 mm																			
										Pressure / Temperature Limits																			
										Pressure(barg)					153					153					139.1				
										Temperature(C)					-29					+ 37					+ 100				
PIPES	Diameter	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26				48							
	Schedule/ Thickness	80								According to relevant pipeline hydraulic gradient and wall thickness calculation (4)																			
	Ends	PE					BE, AS PER ASME B 16.25																						
	Mat.Spc.	API 5 L GR B, PSL 2, SEAMLESS-ASME B 36.10									API 5 L, PSL 2 – HFW / SAWL(100% RT) - ASME B 36.10 (5)										API 5 L, PSL 2 – SAWL(100% RT) ASME B 36.10								
Fittings (6)		ASTM A105, 6000 Lbs SW, AS PER ASME B16.11					ASTM A234 GR.WPB, AS PER PIPE SCHEDULE, BW, AS PER ASME B16.9																						
Flanges (1)(2)		ASTM A105, CL.900 Lbs RTJ, SW					ASTM A105, WN, CL. 900 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE					ASTM A694 GR.F(GR.ACC TO LINE PIPE GRADE), WN, CL. 900 Lbs RTJ, HUB THICKNESS AS PER PIPE SCHEDULE																	
Gate valves (1)		ASTM A105, CL.1500Lbs SW, API 602 , TRIM 13% CR ,BG - OS&Y					ASTM A216 GR WCB, TRIM 13% CR, CL.900 Lbs, FLANGED, RTJ, API600, BB-BG-OS&Y					ASTM A216 GR.WCB, CL.900 Lbs, TRIM CRA(3), API 6D, BB-BG-OS&Y, THROUGH CONDUIT, FLANGED OR BW BY NIOEC APPROVAL																	
Globe valves		ASTM A105, CL. 800LBS SW, ISO 15761,TRIM 13% CR ,BB - OS&Y- REMOVABLE SEAT					A216 WCB BODY TRIM:13%CR ,CL.900 Lbs BS 1873.FLANGED, OS&Y,BB																						
Check valves		ASTM A105, TRIM 13% CR, CL. 1500 Lbs SW, ISO 15761, ,BC, HORIZONTAL PISTON LIFT					ASTM A216 GR WCB, Trim13% CR, CL.900 Lbs, FLANGED, RJ, API600, SWING TYPE, BC (1)					ASTM A216 GRWCB, CL.900 Lbs, TRIM CRA(3), API 6D, BC, SWING TYPE, FULL BORE, FLANGED OR BW BY NIOEC APPROVAL																	
Gaskets		OCTOGONAL RING JOINT, PER ASME B 16.20 - 90 HB MAX, 900 Lbs RATING																											
Bolt & Nut		ASTM A193 GR.B7 STUD BOLT AS PER ASME B18.2.1 ASTM A194 GR.2H WITH 2 HEAVY HEX AS PER ASME B18.2.2																											
NOTES																													
(1) Flanges shall be in accordance with MSS SP 44.																													
(2) Ring joint facing																													
(3) All materials shall comply with the NACE MR 01-75/ISO 15156 Standard.																													
(4) The criteria of D/t shall be considered. (As per NIOEC – SP – 50 - 50)																													
(5) The line pipe manufacturing type (HFW or SAWL) shall be approved by NIOEC.																													
(6) For diameter above 6’’ and unpiggable pipelines, the fitting shall be in accordance with ASTM A860.																													