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Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

OIL AND GAS REGULATORY AUTHORITY

NOTIFICATION

Islamabad, the ---, 2009,

SRO No. --- (-)/2009:— In exercise of the powers conferred by Section 42 of the Oil and Gas Regulatory Authority Ordinance, 2002 (Ordinance No. XVII of 2002), the Authority is pleased to specify the following Standards namely: -

1. Short title and Commencement:

1.1. These Standards may be called as:

Part I: Standard Technical Specifications for Equipment and Material used in Natural Gas Transmission Network.

Part II: Standard Technical Specifications for Equipment and Material used in Natural Gas Distribution Network.

Part III: Standard Technical Specifications for Common Equipments and Materials used in Transmission/Distribution Networks.

1.2. They shall come into force at once.

2. Applicability: These Standard Specifications shall be applicable to all licensees undertaking any regulated activity in midstream and downstream of Natural Gas Sector.

3. Scope:

This document covers the Standard Specifications for the equipment and material used in undertaking any regulated activity in Natural Gas system, i.e. Transmission and Distribution Systems.

3.1. Transmission System:

The scope of the Standard Specifications of equipment and material falling under 'Transmission System' is limited to the segments of pipeline system starting from the delivery /custody transfer point at the gas field / processing plant to the outlet of the Sales Meter Station (SMS) i.e. before the distribution system or to the inlet of a large Industrial Customer's Meter Station where the customer is supplied Natural Gas directly from a transmission line. Pipelines from gas fields / processing plants downstream of delivery points to the outlets of Sales Meter Stations (SMS) shall be classified as Transmission Lines irrespective of their operating pressures. All installations on the transmission pipelines e.g. valve assemblies, mixing stations, compressor stations, pressure regulating and relieving stations and cathodic protection installations form part of the transmission system.

3.2. Distribution System:

The scope of the Standard Specifications of equipment and material falling under 'Distribution System' is limited to segments of pipeline system starting from the outlet of Sales Meter Station (SMS) to the outlet of the Customer's Meter Station but not including piping downstream of the customer's meter, including pressure regulating and cathodic protection installations on or along the pipeline network.

3.3. Miscellaneous Items:

The scope of the Standard Specifications of equipment and material falling under 'Miscellaneous Items / Common Equipments' involves those items commonly used in both Transmission and Distribution systems.

PART I

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENT AND MATERIAL USED IN NATURAL GAS TRANSMISSION NETWORK

A. TRANSMISSION EQUIPMENT:

1. Cleaning Pig
2. Foam Pig
3. Pig Signal Unit
4. Filter Separator
5. Gas Calorimeter
6. Hydrogen Sulfide and Total Sulfur Analyzer
7. Portable Btu Analyzer
8. Grease Gun (Heavy Duty)
9. Laser Sighting Thermometer
10. Meter Run With Single Chamber Orifice Fitting
11. Pressure and Flow Recorder
12. Pneumatic Differential Pressure Calibrator (Dead Weight Type)/ Dead Weight Tester (Digital Pressure Calibrator with Pump)
13. Pneumatic Differential Pressure Calibrator (Dial Type)
14. Portable Digital Differential Pressure Calibrator
15. Mechanical Pressure Gauge
16. Digital Electronic Pressure Gauge
17. Pressure Gauge (Liquid Filled)
18. Pressure and Temperature Recorder
19. Pressure Control Valve
20. Pressure Reducing Regulator
21. Safety Relief Valve
22. Odorizing Assembly / Odorizer

B. TRANSMISSION MATERIAL:

23. Line Pipe
24. Ball Valve
25. Plug Valve
26. Gate Valve
27. Needle Valve
28. Blind Flange
29. Anchor Flange
30. Welding End Flange
31. Welding -O-Let (Extra-Strong)
32. Thread -O- Let

33. Hot Tapping Conduit Barrel Split Tee
34. Butt – Welding End Pipe Fitting
35. Screwed Fitting
36. Stud Bolt
37. Pre-Fabricated Insulating Joint
38. Door Closure
39. CP-Set
40. Factory Bend
41. S.I. Oval Ring
42. Steel Grit
43. Welding Electrode

PART II

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENT AND MATERIAL USED IN NATURAL GAS DISTRIBUTION NETWORK

C. DISTRIBUTION EQUIPMENT:

44. Gas Meters
45. Swivel Assembly for Diaphragm Type Gas Displacement Meters
46. Filter
47. Regulator

D. DISTRIBUTION MATERIAL:

48. Malleable Cast Iron Threaded Fittings (Union, Elbow, Concentric Reducer, Bush, Cap, Tee, Socket and Hex Nipple)
49. Split Tee
50. Steel Butt Welding Fittings (Elbow, Equal / Reducing Tee, Concentric Reducer and Cap etc.)
51. Blind Flange
52. Welding Neck Flange
53. Steel Line Pipe
54. Galvanized Iron Pipe (G.I. Pipe)
55. Polyethylene Pipe (Medium Density)
56. Butterfly Valve
57. Ball Valve
58. Forged Carbon Steel Needle Valve
59. Plug Valve
60. Insulating Union Valve
61. Barrel Nipple
62. MDPE Fittings

PART III

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENTS AND MATERIALS COMMONLY USED IN NATURAL GAS TRANSMISSION AND DISTRIBUTION NETWORKS

E. MISCELLANEOUS ITEMS:

63. Carbon Dioxide Fire Extinguisher
64. Dry Chemical Powder Fire Extinguisher
65. AFFF (Aqueous Film Forming Foam) Fire Extinguisher
66. Halogenated Gas Fire Extinguisher
67. AFFF/ DCP/ CO₂ Wheeled Fire Extinguisher
68. Automatic Fire Extinguisher
69. Standard Fire Bucket
70. Dew Point Tester
71. Dial Type Thermometer For Dope-Kettle
72. Digital Thermometer with Probe
73. Digital Thermometer with Stem
74. Electric Cable
75. Electric Control Panel
76. Electric Drill Machine
77. External Line-Up Welding Clamp
78. Electrofusion Machine (Control Box)
79. Fiber Glass Wrap
80. Fire Blankets (Asbestos Type)
81. Gas Leak Detector
82. Leak Clamp
83. MDPE Socket Fusion Heating Mirror
84. Coal tar Enamel Grade 120/5
85. Coal tar Enamel Grade 105/8
86. Plug Valve Lubricant / Sealant
87. Primer and Tape
88. Gas Bag
89. Soil Resistivity Meter

PART I

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENT AND MATERIAL USED IN NATURAL GAS TRANSMISSION NETWORK

A. TRANSMISSION EQUIPMENT:

1. CLEANING PIG

- 1.1. Cleaning Pig equipped with stainless steel block brushes on wear compensating 'U' spring together with two easily replaceable Neoprene Driving Cups incorporating a Bypass facility according to current API 1117 or equivalent Standard.
- 1.2. Pig to be capable of negotiating pipeline bends of minimum radius 1½ times the pipe dia when driven by a liquid pressure (3D when driven by Air or Gas Pressure) and full size 90 degree branches.

2. FOAM PIG

- 2.1. The foam pig should be suitable for final drying of the lines by completely wiping it of water entrained after hydrostatic testing according to current API 1117 or equivalent Standard.
- 2.2. The foam pig should be manufactured from density 2-lbs/cft and high density 8 lbs/cft Polyurethane foam or equivalent material of high wear resistance and tensile strength. The nose of the pig should be cone shaped having bonded urethane driving area.
- 2.3. The pig should be capable to negotiate 1.5 dia pipe bends, full bore valves / fittings when driven by air or gas pressure.

3. PIG SIGNAL UNIT

- 3.1. Mechanical / visual manual reset pig signal unit, designed for mounting on a 1-1/2" diameter hole, drilled in the wall of pipe according to the current API 1117 or equivalent Standard.
- 3.2. Internal components of assembly should be corrosion resistant.
- 3.3. The pig signal unit should be capable of withstanding a 3000 Psig Pressure.

4. FILTER SEPARATOR

4.1. Scope:

This Specification covers the supply of 2-stage horizontal filter separator comprising of coalescing fiber glass filter elements and vane / wire mesh eliminator for sweet natural gas of 0.6 specific gravity (analysis of gas and site conditions). Filter separator shall comply ASME Section VIII of pressure vessel Code or ASME B31.8 Standard.

4.2. Filtration Requirement:

Filter separator shall be capable of removing 98% of 1 micron solid particles and liquid droplets from the gas stream with an overall removal efficiency of 99.5% by weight assuming normal distribution of particle sizes, when operated within 10% and 100% of its rated flow.

4.3. Operating Parameters:

Maximum operating pressure	1440 Psig
Maximum temperature	130 °F

4.4. Material Specifications:

Shell	ASTM A 106B
Head	ASTM 516-70/ASTM A-234 WPB
Plate	ASTM A 106 BD
Pipe	ASTM A 106 B
Flange / coupling	ASTM A 105
Vane / Vane boxing	
Riser	Carbon steel
Bolt	ASTM A 193 B 7
Wire mesh	316 stainless steel
Nut	ASTM A 194-2 H

5. GAS CALORIMETER

5.1. Scope:

Online gas calorimeter / recorder to measure and record calorific value of natural gas on continuous basis on a strip chart besides having digital display facility of showing calorific value in BTU/Scf.

5.2. Specifications:

Service media	Natural gas
Media pressure	1300 Psig (maximum)
Specific gravity	0.5 ~ 0.9
Calorific value units	BTU per Standard cubic feet (BTU/ Scf)
Chart drive	Mechanical drive
Accuracy	± 0.5 % or better
Repeatability	± 0.5 % or better
Display	Digital LCD
Gas calorific value range	800 to 1250 BTU/Scf
Minimum chart division	10 BTU or less
Operating temperature	0 – 150 ° F
Power supply	220V, 50 Hz single phase

The gas calorimeter should be capable to compensate for variation in specific gravity, ambient temperature and barometric pressure.

6. HYDROGEN SULFIDE AND TOTAL SULFUR ANALYZER

6.1. Scope:

It is required for the continuous online monitoring of total Sulfur contents (Hydrogen Sulfide, Mercaptans, Organic Sulfides, and Sulfur Dioxide) and Hydrogen Sulfide contents in natural gas stream.

6.2. Specifications:

Flowing medium	Natural gas
Gas specific gravity range	0.5 ~ 0.9
Flowing gas pressure range	500 ~1300 Psig
Flowing gas temperature range	-20 °F ~ +150 °F
Supply gas pressure range	15 ~ 20 Psig
Operating temperature range	-20 °F ~ +150 °F
Sensitivity:	Sensitivity of the equipment should be 0.005 Grains H ₂ S per 100 Standard cubic feet which is equivalent to 0.08 ppm.
Measuring ranges	Total Sulfur 0 – 500 ppm Hydrogen Sulfide 0 – 50 ppm
Accuracy	± 2% of range
Repeatability	± 2% or better
Power supply	Analyzer system to be operated on electrical supplies at 220 voltage, 50Hz (single phase)

7. PORTABLE BTU ANALYZER

7.1. Scope:

Portable field gas BTU analyzer with accessories is intended to measure instant BTU value of natural gas with digital display.

7.2. Specifications:

Flowing medium	Natural gas
Range	500 ~ 1500 BTU/Scf.
Repeatability	within ± 0.5 BTU/1000 BTU
Input (gas)	Sample 0.50 – 1300 Psig, Carrier 99.995% helium 150 Psig, Supply gas for valve switching 80 Psig (Helium)
Calibrating gas	Certified natural gas Standard in 14 liters bottle (240 Psig)
Environment	50 °F ~ 122 °F, non-condensing atmosphere.
Display	Digital and printed report in English metric units, compositional analysis in mole%, heating value BTU/Scf,
Supply voltage	220 V 50Hz
Inverter	To provide operating power from auto battery 12V DC to 220V AC
Connectors	Parallel printer: Laser jet or equivalent
Computer	Serial communication using a cable or modem,

MODBUS ASCII Standard.

Analog output

0 – 10 VDC signal for plotting chromatogram

8. **GREASE GUN (HEAVY DUTY)**

8.1. **Scope:**

Hydraulic grease gun to be employed for greasing high pressure valves (ANSI Class 600) on natural gas transmission network.

8.2. **Specifications:**

- Design pressure rating = 8,000 Psig - 10,000 Psig.
- Large fluid capacity to provide long periods of operation before charging.
- Powerful hydraulic floating piston for sealant injection.
- Hydraulic unit comprises piston cylinder arrangement with check valve.
- Minimum pumping effort required by hydraulic unit.
- Built in safety features such as internal relief valve to prevent excessive hydraulic pressure incase gun is depleted of sealant.
- Type of sealant as specified.
- Pressure gauge to indicate sufficient pressure inside the valve.
- Long life, tight sealed nylon piston cups.
- Maximum temperature of grease to be utilized by the gun is 480 °F.
- Giant button head coupler with flexible hose pipe compatible to different sizes of greasing nipples on valves ranging from 1" dia through 36" dia.

9. **LASER SIGHTING THERMOMETER**

9.1. **Scope:**

Portable, robust, fumes and shower proof, suitable for temperature measurements of molten coal tar / Asphalt enamel in dope kettles during heating operation.

9.2. **Specifications:**

Measurement range	32 °F to 932 °F (or equivalent in °C)
Accuracy of reading	± 1.0%
Resolution	1 °F
Response time	Instant
Display	Digital
Power source	Suitable dry battery
Laser sighting	1 mW
Emissivity	0.01 to 1.00 (adjustable)

10. METER RUN WITH SINGLE CHAMBER ORIFICE FITTINGS

10.1. Scope:

This scope covers meter run inclusive of meter tube and single chamber orifice fitting. Meter run shall be manufactured / fabricated in accordance with AGA Committee Report # 3, April 2000 or current edition; API/ANSI 2530 and API Chapter 14 Section 3 part 2 (14.3). End connections and pressure rating shall be in line with ANSI B 16.5 and B 31.8 Standard

10.2. Specifications for Orifice Plate:

Orifice plates shall be manufactured in accordance with para 2.4 of AGA Committee Report # 3, April 2000 edition. Orifice plate bore shall be in accordance with para 2.6.2.1 of AGA Committee report # 3, April 2000 edition.

10.3. Straightening Vanes:

Meter tube shall be provided with pin type straightening vanes. Construction of straightening vanes must be sturdily constructed and their construction conforms to para 2.5.5.1-3 of AGA Committee report # 3, April 2000 edition. Material used for the straightening vanes must conform to withstand specified design pressure recommended for meter tubes.

10.4. Material:

Material conforming to ASTM A 105 Grade 2 extra strong. RTJ/RF flange is ASA 16.5 ASTM 105 Grade I or II.

10.5. Type:

Orifice fittings should be "Flange end or Welding neck" type. Both up-stream and down-stream connections to the plate hold shall be flanged and aligned with the orifice fitting with dowel pins.

11. PRESSURE AND FLOW RECORDER

11.1. Scope:

Mechanical type recorders for registering static pressure and differential pressure (across an orifice plate) of gas flowing through an orifice meter run.

11.2. Static Pressure Sensing: 0 - 300 Psig for SMS
0 - 1300 Psig for Main line

Bourdon tube material should be stainless steel 316 or copper based material.

11.3. Differential Pressure Range: Max. 200 inches of water column

For differential pressure measurement, dual rupture proof bellows shall be integrated with internal temperature compensation and pulsation dampener.

11.4. Recorder Pens: Ink re-fill able type suitable for
temperature range 14 °F to 140 °F.

11.5. Service Medium: Natural gas (specific gravity 0.5 – 0.9)

11.6. Standard Conformance:

Recorders should conform to NACE requirements, AGA recommendation, where applicable Recorder should be compatible to incorporate 12" dia charts conforming to ITT Barton Chart No. M-100-S or equivalent.

12. DIGITAL PRESSURE CALIBRATOR

12.1. Scope:

To be used for the field calibration of differential pressure / flow recorders and gauges relating to mechanical bellows / mercury manometers.

12.2. Specifications:

Calibrator range	0-400 inches water column / as specified.
Engineering units (built-in)	User selectable 17 units (psi, "H ₂ O @ 4°C, "H ₂ O@20°C, "H ₂ O@ 60°F, "Hg@0°C, ft H ₂ O @4°C, ft H ₂ O@ 20°C, ft H ₂ O@ 60°F, bar, mbar, kPa, kg/cm ² , cm H ₂ O @ 4°C, cm H ₂ O @ 20° C, cmH ₂ O @ 4°C, cmH ₂ O@ 20°C, mmHg)
Pressure accuracy	Pressure: ±0.04% RDJ : ±0.01% F.S.
Measure and display applied	mA output signal, automatic, switch test, pressure plus
Operating temperature	32 ~ 140 °F. The calibrator should maintain its accuracy over temperature range of 0 °F ~ 140 °F.
Mounting	Portable, foot, panel
Minimum increment	5 inches water column
Accuracy (full scale)	0.025% or better

13. PNEUMATIC DIFFERENTIAL PRESSURE CALIBRATOR (DIAL TYPE)

13.1. Scope:

To be used for the field calibration of differential pressure / flow recorders and gauges relating to mechanical bellows / mercury manometers / coils / bourdon tubes.

13.2. Specifications:

Flowing media	Natural gas
Calibrator range	0-400 inches water column
Accuracy (full scale)	0.1% or better
Operating media	Air or gas
Operating media range	0-50 Psig
Mounting	Portable, foot, panel

14. PORTABLE DIGITAL DIFFERENTIAL PRESSURE CALIBRATOR / PRESSURE CALIBRATOR

14.1. Scope:

Portable digital different pressure calibrator is required for the field calibration of Natural gas differential pressure / flow recorder (mechanical bellows / mercury monometer / coils / bourdon tubes type differential pressure recorders and flow transmitters).

14.2. Specifications:

Differential pressure range	0 ~ 400 inches of water column / as specified
Accuracy	0.05% full scale
Display	Digital display in Inches of water column engineering Units.
Operating temperature	14 °F ~ 122 °F.

15. MECHANICAL PRESSURE GAUGE

15.1. Scope:

Mechanical pressure gauge is used to measure gas pressure.

15.2. Specifications:

Pressure range	As specified
Type	Vertical
Dial size	2", 4", 6" or as specified
Material	Stainless steel / fiber glass reinforced thermoplastic
Minimum graduation	As specified
Accuracy	±1% of span
Scale	Dual Psi / Bar
Sensing element	Bourdon tube
Wetted parts	SS-316 L
Front	Safety glass front

16. DIGITAL ELECTRONIC PRESSURE GAUGE

16.1. Scope:

Digital electric pressure gauge is used to measure gas pressure.

16.2. Specifications:

Pressure range	As Specified
Measuring unit	User selectable units; Psi, Bar, Pascal, Kilo Pascal, inches of WC, inches of Hg etc.
Accuracy	±0.1% of reading
Resolution (Min. Div.)	As specified
Total worst error @25°C	±0.0.095% of full scale (max.)
Display update rate	0.33 seconds (max.)
Time to stable reading	10 to 20 seconds
Thermal span shift	±0.002 to ± 5.0 % IP /0°C,
Zero adjustment	±1.0 to ± 5.0 % of full scale / externally adjustable
Connection size	As specified

Dial size	2", 4", 6" or as specified
Operating temperature	0 to 60 °C,
Proof pressure range	150% of full scale
Burst pressure range	200% of full scale
Power supply mode	DC battery of 1.5 volt size 'AA' or 'D'
Standard	Class 1- IP66/CSA classified for Class I Div. II area or equivalent
Construction	Robust and rugged, suitable for field use

17. PRESSURE GAUGES (LIQUID FILLED)

17.1. Scope:

Pressure gauge (liquid filled) is used to measure gas pressure.

17.2. Specifications:

Pressure range	As specified
Dial size	2 ~ 6 inch
Connection	Standard bottom connection with ½ NPT threads.
Case and Bezel	Grey glass reinforced polyester made, should be solid front type. Stable upto 320 °F and bezel screwed to the case.
Back	Type 302 stainless steel 0.2 mm/0.008" thick. Back sealed to the case by neoprene ring.
Window	Laminated safety glass (acrylic)
Pointer	Type 304 stainless steel.
Mounting	Direct.
Dial	Aluminum, anodized painted and stored white, marked in black.
Wetted materials	15- 5 pH, 304 SS and 316 SS
Movement and material	upto 90° and Austenitic stainless steel
Tube	Solid drawn type 316. Stainless steel with inert gas welded at tip.

18. PRESSURE AND TEMPERATURE RECORDER

18.1. Scope:

Mechanical type recorder for registering static pressure and temperature of the gas flowing through measuring facility

18.2. Specifications:

Bourdon tube range	0 ~ 500 Psig (for SMS)
	0 ~ 1500 Psig (for mainline)

Temperature range	32 °F ~ 220 °F
Material	316 SS helical (for static element) as per AGA recommendation (for temperature element)
Recorder pens	Ink re-fill-able, suitable for ambient temperature 14 °F~140 °F
Flowing medium	Natural gas
Standard conformance	As per AGA recommendations, corrosion resistant case and door shall be provided. Recorder shall be compatible to incorporate 12" dia (edge to edge measurement) charts conforming to ITT Barton Chart No. M-100-S or equivalent

19. PRESSURE CONTROL VALVE

19.1 Scope:

Gas pressure reduction through control valve throttling with occasional shut-off requirements at reduced gas loads during off load / shut-off.

19.2 Specifications:

Type / Rating:	Globe / ANSI Class 600
Maximum inlet pressure	1300 Psig
Outlet pressure	As specified (per requirement)
Fluid temperature	As specified (per requirement)
Flow characteristics	Equal percentage
Gas flow direction	Down to up in control Valve:
End connections:	Control valve end connections to be ANSI CI: 600 Flanged RTJ / RF conforming to ASME B 16.5.
Inlet and outlet line size	(As per design requirement)
Trim material:	416 SST/17-4 pH or equivalent (for valve plug) 416 SST/17-4 pH or equivalent (for seat ring) 17- 4 pH or equivalent (for bushing / retainer)
Noise level	Less than 100 db

20. PRESSURE REDUCING REGULATOR

20.1. Scope:

Pressure reducing regulator shall be capable of installations in any position (horizontal / vertical).

20.2. Specifications:

Maximum inlet pressure	1300 Psig
Flow capacity	As specified
Natural gas specific gravity	0.5-0.9
Temperature range	-20 °F ~ +130 °F

Shut-off classification	ANSI Class IV (O-ring seats)
Body size and end connection	As specified
Construction material	ASTM A216 WCB / WCC Carbon steel for valve Body 316 SS for valve plug and seat ring 17- 4 pH for guide bushing

21. SAFETY RELIEF VALVE

21.1. Scope:

Safety relief valve shall be in accordance with current ASME Pressure Vessel Code, Section VIII for gas installation as a safety device for relieving excess pressure in the line.

21.2. Specifications:

Discharge	Angled
Bonnet	Bolted
Back pressure	Atmospheric
Body and bonnet	Carbon steel, SA 216 Gr. WCC
Cap	A 105C 1010
Nozzle	AISI 316 stainless steel
Nozzle ring	AISI 304 stainless steel
Guide	AISI 304 stainless steel
Disc	AISI 304 stainless steel
Stem	AISI 410 stainless steel
Spring	Alloy steel, Cadmium plated or Aluminized
Spindle	AISI 304 stainless steel
Adjusting screw	AISI 410 stainless steel
Adjusting screw nut	AISI 410 stainless steel
Disc retainer	stainless steel
Guide support	AISI C1010 carbon steel
Set screw	AISI 410 stainless steel
Body/Bonnet gasket	Soft iron or stainless steel
Body/Bonnet gasket	Soft iron or stainless steel
Gaskets	Asbestos

22. ODORIZING ASSEMBLY / ODORIZER:

22.1. Scope:

By-pass type odorizing assembly / odorizer, suitable for appropriate pressure. To be used with appropriate orifice flange, according to the current edition of the ASME Pressure Vessel Code Section VIII.

22.2. Specifications:

Material of construction	Carbon steel
Capacity	As per schedule of requirement
Gas flow rate	As specified
Pressure rating	As per schedule of requirement
Operating temperature range	-20 °F ~140 °F

B. TRANSMISSION MATERIAL

23. LINEPIPE

23.1. Scope:

The purpose of these Specifications is to provide Standards for pipe suitable for use in natural gas industry and cover seamless and welded steel line pipe. It includes plain-end, threaded-end, and beveled-end pipe. This Specifications establishes requirements for two product Specifications levels (PSL 1 and PSL 2). These two PSL designations define different levels of Standard technical requirements mentioned under API 5L current edition.

23.2. Grades:

The grades covered by this Specifications are the Standard Grades A25, A, B, X42, X46, X52, X56, X60, X65, X70 and X80; and any intermediate grades.

23.3. Material Requirements:

23.3.1. Chemical Composition:

The composition of steel used for the manufacture of pipe shall conform to the chemical requirements given in table 2A and 2B of API 5 L 42nd edition.

23.3.2. Mechanical Properties:

Tensile properties shall conform to requirements specified in table 3A and 3B for PSL1 and PLS2 of API 5L 42nd edition.

23.3.3. Design and Specifications:

Each length of pipe shall be measured for conformance to the specified wall thickness requirements as given in table 9 (tolerances for wall thickness) of API 5L 42nd edition. Pipe shall be supplied in nominal lengths of 40 ft, (12.2 meters), maximum length 43 ft, (13.1 meters), minimum length 26.25 ft, (8.0 meters) and an average length 36 ft (11 meters), with not more than 10% of pipe falling below length of 36 ft (11 meters) or as specified. Para 7.5 of API Spec 5L 42nd Edition shall apply for length measurement. Pipe ends shall be beveled for welding as per para 7.9.3 API Spec 5L requirement i.e. beveled to an angle of 30 degree +5 degree -0 degree, measured from a line drawn perpendicular to the axis of pipe and with a root face of 1/16" plus/minus 1/32".

24. BALL VALVES

24.1. Scope:

This Specifications covers the supply of welded / bolted body, (full bore / full opening). Ball valves (size as specified) with pressure classification of ANSI Class 600 or 300 as specified generally conforming to API Specifications 6D current edition. These valves are required for service on high pressure natural gas pipelines. Valves are to be capable to tight shut-off under all pressure differentials and fully fire-safe to API 6FA, API 607 and BS6755 Part 2

Standards. Valves shall be supplied complete with wrench and hand wheel operation through a gear system except where specified otherwise.

24.2. Specifications:

Valve body (shell)	Cast / forged steel material conforming to ASTM A 350 Gr. LF2 (M) or ASTM A516 Gr. 70 or ASTM A 216 Gr. WCC or ASTM A105. Forged steel shall be preferred.
Ball (sphere) plug	Forged steel material conforming to ASTM A 350 Gr. LF2 (M) or ASTM A395 or AISI 4130, or ASTM A 48 CI 50B, Ball to be Nickel plated, (ENP), Chrome plated or PTFE coated. Minimum thickness of ENP or Chrome plating shall be 0.075 mm (75 micron).
Seat rings	Material conforming to AISI 4130 or AISI 4140 or ASTM A350 Gr. LF2 or ASTM A668 Gr. 4140 or ASTM A 633.
Seat ring insert	Material conforming to PTFE, PCTFE or Nylon
Stem	material conforming to AISI 4140, ASTM A322 Gr. 4140, or ASTM A633 Gr.C. Stem to be Nickel plated or Chrome plated.
Stem seals	PTFE
Lip seals	PTFE
O-rings	Viton
Trunnion / Pivot	Material conforming to ASTM A 350 Gr. LF2 (M) or ASTM A516 Gr. 70. Suitably coated for low torque and wear resistant.
Gears / Drive	Cast or forged steel of most suitable material.
Wrenches	Cast or forged steel of most suitable material

24.3. Valve End Connections and Configuration:

24.3.1. Welding Ends:

Welding ends of valves shall be suitable for field welding on to the pipe / fitting as mentioned in ANSI B16.5 and ANSI B31.8 for wall thickness ratio. The ball valve ends shall have weldability to the API 5L Grade pipe material specified in schedule of requirement. Bevel ends shall conform to the matching pipe / fitting size specified in the schedule of requirements.

24.3.2. End Flanges:

Weld flanges shall be furnished with raised face or ring type joint as specified in the schedule of requirement.

Dimension and tolerances, including drilling templates, flange facing spot facing and back facing shall conform to ANSI B 16.5 Standard for size upto 24" and MSS-SP44 for size exceeding 24" dia. The end flanges shall be fully machine furnished on the joint side. Gasket contact surface for all the raised face shall have a serrated finish conforming to MSS SP-6.

25. PLUG VALVES

25.1. Scope:

This Specifications covers the supply of pressure balanced, inverted type, fire safe lubricated plug valves (size as specified) with ANSI Class 600 or 300 as specified generally conforming to API Specifications 6D current edition. These valves are required for service on natural gas pipelines. Valves shall be suitable for being operated and be complete with wrench or hand wheel working through a worm gear (reduction unit) for low torque requirements.

25.2. Specifications:

Cast / carbon steel conforming to ASTM A 216 Grade WCB/WCC or ASTM A105 or ASTM A352 GR. LCB/LCC or ASTM A350 GR IF2 or equivalent grade.

25.2.1. Plugs:

Class ANSI 150 semi steel ASTM A126, grade B or equivalent grade.

Class ANSI 600 Cast / forged steel ASTM 216, Grade WCB/WCC or ASTM A352 GR. LCB/LCC or equivalent grade.

Plugs shall be case-hardened and lapped with valve body seat after ground finish. Plug surface shall be impregnated with anti-friction PTFE or other approved coating to ensure consistent operating torque.

25.2.2. Cover Bolting:

Cover	ASTM A105 or ASTM A516 GR. 70
Bolts	ASTM A193 Grade. B7
Bolts	ASTM A194 Grade 2H
Gasket	PTFE or filled PTFE
Stem	ANSI 4140 Nickel plated.
Other parts	Metal parts such as gearing, motor drive attachment, hand wheel, etc. Shall be cast or forged steel of material suitable for the service.
Wrenches	Cast, forged steel or of malleable Iron.
Gear Box	Sturdy

25.3. Valve End Connections and Configuration:

25.3.1. Welding Ends:

Welding ends of valves shall be suitable for field welding on to the pipe/fitting as mentioned in ANSI B16.5 and ANSI B31.8 for wall thickness ratio. The plug valve ends shall have weldability to the API 5L Grade pipe material specified in schedule of requirement. Bevel ends shall conform to the matching pipe/fitting size specified in the schedule of requirements.

25.3.2. End Flanges:

Weld flanges shall be furnished with raised face or ring type joint as specified in the schedule of requirement.

Dimension and tolerances, including drilling templates, flange facing spot facing and back facing shall conform to ANSI B 16.5 for size upto 24" and MSS-SP44 for size exceeding 24" dia. The end flanges shall be fully machine furnished on the joint side. Gasket contact surface for all the raised face shall have a serrated finish conforming to MSS SP-6.

26. GATE VALVES

26.1. Scope:

These valves will conform to the API Specifications 6D (current edition) as modified by these Specifications or other recognized authoritative Standards ensuring equal or higher quality. These valves are required for service on low / high pressure gas pipeline. Valve shall be arranged for and be complete with hand wheel operation through bevel gears.

This Specifications covers gate valves of the following types

Regular double disc.	Rising stem
Through conduit	Rising stem
Through conduit	Non-rising stem
Double disc	Non-rising stem

26.2. Specifications:

Valve components shall be fabricated of the cast or forged steel conforming to ASTM A 216 Grade WCB or ASTM A 105 Grade II.

Body	Cast or forged steel conforming to ASTM A216 Grade WCC or ASTM A217 Grade WCB.
Gate	Alloy steel hard chrome plated.
Seats	Nickel alloy or similar abrasion resistant steel.
Stem	Stainless steel coated with Molybdenum Disulfide.
Bonnet bolting	The bolts shall be of quality and strength equal to ASTM A193 Grade B7 and nuts to ASTM A194 Grade 2H.
Other parts:	Metal parts such as gears, yoke, gland bushings, and hand wheels.

26.3. Valve End Connections and Configuration:

26.3.1. Welding Ends:

Welding ends of valves shall be suitable for field welding on to the pipe / fitting as mentioned in ANSI B16.5 and ANSI B31.8 for wall thickness ratio. The gate valve ends shall have weldability to the API 5L Grade pipe material specified in schedule of requirement. Bevel ends shall conform to the matching pipe/fitting size specified in the schedule of requirements.

26.3.2. End Flanges:

Weld flanges shall be furnished with raised face or ring type joint as specified in the schedule of requirement.

Dimension and tolerances, including drilling templates, flange facing spot facing and back facing shall conform to ANSI B 16.5 for size upto 24" and MSS-SP44 for size exceeding 24" dia. The end flanges shall be fully machine furnished on the joint side. Gasket contact surface for all the raised face shall have a serrated finish conforming to MSS SP-6.

27. NEEDLE VALVES

27.1. Scope:

Needle valve, screwed end in accordance with ANSI Class 600, having integrated seat with non-reversible hand wheel directly attached with spindle for clock-wise closing.

27.2. Material: Steel conforming to ASTM A105 Grade II

27.3. Threads: API line pipe conforming to ASA B 2.1

27.4. Design Specifications:

Operating pressure,	1300 Psig maximum
Operating temperature,	250 °F maximum
Media to be handled,	Natural gas
Fire safe design	API RP 6

28. BLIND FLANGES

28.1. Scope:

Blind flanges shall conform to the requirement of current edition of ASME B 16.5 raised face or RTJ, ASTM A 105 Grade II.

28.2. Material:

Forged from material ASTM A 105/ SA 105N/ C21 with additional NACE MR-01-75 or ASTM A350/SA 350 LF2 Class 1, normalized.

28.3. Marking:

Each fitting shall be marked with size and thickness in line with Section 813 of ASME B31.8.

29. ANCHOR FLANGES

29.1. Scope:

Fittings shall conform to the requirement of current edition of BS-1503 24-28A.

29.2. Material:

Fittings shall be forged carbon steel conforming to the requirements of current edition of BS-1503 24-28A Specifications 28A with the following maximum limits of material constituents.

Carbon	0.25%
Manganese	1.40%
Phosphorus	0.04%

29.3. Design Specifications:

Beveled end in accordance with ANSI B 16.5 suitable for 250 °F temperature and upto 1300 Psig pressure or as specified.

29.4. Marking:

Each fitting shall be marked with size and thickness in line with Section 813 of ASME B31.8.

30. WELDING END FLANGES (RF/RTJ)

30.1. Scope:

Welding end flanges of ANSI pressure rating 600 shall be as per schedule of requirement. Working pressure and temperature rating of the flanges shall be in accordance with MSS SP 44 current edition or as specified.

30.2. Material:

The forged steel used for flanges shall be from steel conforming to ASTM 105 Grade 2, ASTM A 350 LF2, ASTM 694 F52.

30.3. Design Specifications:

The design and dimensions for welding end flanges shall conform to ASME B 16.5 Standard.

30.4. Marking:

Each fitting shall be marked with size and thickness in line with Section 813 of ASME B31.8.

31. WELD-O-LETS (EXTRA-STRONG)

31.1. Scope:

Weld-O-let shall conform to the requirement of current edition of ASTM A105 Grade II.

31.2. Material:

Fittings shall be forged carbon steel conforming to the requirements of current edition of ASTM A105 Grade II. The steel used shall have a maximum carbon equivalent (CE) not exceeding the limits mentioned hereunder:

$$CE = 0.45\%$$

31.3. Fitting Ends:

Ends of each fitting should be beveled for welding.

32. THREAD - O - LETS

32.1. Scope:

Thread-O-let shall conform to the requirement of current edition of ASTM A105 Grade II.

32.2. Material:

Fittings shall be forged carbon steel conforming to the requirements of current edition of ASTM A105 Grade II and screw shall conform to ASA B 2.1 Standard.

33. HOT TAPPING CONDUIT BARREL SPLIT TEE

33.1. Scope:

Full encirclement barrel split tee is to be used for hot tapping operation and shall be equipped with flanges of ANSI Class 600, RF / RTJ flanges conforming to ANSI B16.5 Standard. The flanges shall be suitable for installation of plug valve having a locking

provision for retaining the plug and to provide a pressure tight seal over the tapped hole and to permit the recovery of tapping valves where required.

33.2. Specifications:

Barrel split tee design conforming to code ANSI B 31.8. Tee to be welded on API 5LX natural gas transmission line with a maximum allowable working pressure of 1300 Psig and a maximum temperature of 167 °F. Tee to be 100% radio graphed in accordance with API-1104.

34. BUTT – WELDING PIPE FITTINGS

(Equal tee / Reducing tee / Concentric reducer / Welding end cap / Long radius elbow, etc.)

34.1. Scope:

All welding fittings shall be forged carbon steel butt – welding end pipe fittings conforming to material grades WPHY 42 to 70 as specified in the schedule of requirement. Welding fittings shall be in accordance with MSS SP-75 current edition for sizes greater than 24 inch and smaller shall be according to ASME B 16.9 Standard.

34.2. Material:

Welding fittings shall be of forged carbon steel of material grade ASTM A 105 Grade II, ASTM A 234/ ASME SA 234 Grade WPB or equivalent.

34.3. Carbon Equivalent:

The steel used shall have homogeneous structure and carbon should be evenly distributed throughout the steel. The steel shall have a maximum carbon equivalent (CE), at any location not exceeding the limits mentioned hereunder:

$$CE (IIW) = 0.45\%$$

Carbon equivalent lesser than 0.45% shall be preferred.

34.4. Tensile Properties:

Tensile properties of the fittings shall meet the requirements as specified in table 2 of MSS SP -75-current edition. Tensile properties shall be determined in accordance with ASTM A-370.

34.5. Pressure Ratings:

Maximum allowable working pressure rating for the pipe fittings shall be calculated as per Section 2 of MSS SP-75 current edition or as specified.

34.6. Tolerances:

Tolerances for sizes shall be inline with Standards ASME B 16.9 and MSS SP-75 current edition.

35. SCREWED FITTING:

35.1. Scope:

All screwed fitting under these Specifications shall be made from forged carbon steel sizes ranging from ¼ to 4 inch diameter conforming to ASME 3000 lbs / 6000 lbs.

35.2. Material:

Close grain, non-porous, forged carbon steel, conforming to ASTM A 105 Grade 2 or SA 105N.

35.3. Threads:

API pipe thread conforming to ASA B 2.1.

35.4. Design Specifications:

All screwed fittings shall be made to the dimensions conforming to Standards ASME B16.11, BS 3799, MSS SP-79 and 83.

36. STUD BOLTS

36.1. Scope:

Stud bolt for high temperature and high / low pressure gas (ANSI Class 300 / 600) lines. Full length threaded stud-bolt shall conform to ASTM A 193 Gr B7, nuts and washer shall comply to ASTM A 194 Gr 2H.

36.2. Specifications:

The stud bolts shall be made to dimensions conforming to requirements of ANSI B 16.5. Threads shall be in accordance with ANSI B1.1 unified coarse thread series Class 2A for diameter 1 inch and smaller and 8 thread series Class 2A for diameter 1-1/8" inch and larger.

37. PRE-FABRICATED INSULATING JOINTS

37.1. Scope:

Cathodic protection prefabricated insulating joint assembly ANSI Class 600, complete for installation in natural gas transmission lines of following Specifications:

Design Codes	ASME VIII Div-II App.2
Electrical resistance in dry air	6.0 m Ohm
Breakdown voltage in dry air :	3500 volts at 50 Hz
Max operating temperature range	32 °F ~ 176 °F
Beveled welding ends	API 5L Specifications
Maximum working pressure	1300 Psig

37.2. Material:

Steel parts	API 5L Grade.
Gasket	Aerylonthriole / Butadiene elastomer according to ASTM D2000.
Insulating material	Laminated epoxy resin reinforced with glass fabric according to ASTM D 709 type 4 Group G11.
Filling	Epoxy cold curing resin.
Internal	Epoxy powder resin DFT 200 micron
External	Epoxy powder resin DFT 200 micron

38. DOOR CLOSURE

38.1. Scope:

Door closure shall be self aligning and double pivoted with full articulation. Closure shall be designed for low wear and tear with inherent safety for operator.

Closure type	Band lock, yoke double bolt or clamp ring
Closure installation	Horizontal
Design rating	ANSI Class 600
Design temperature	-4 ~ 176 °F
Design Standard / Code	ASME Section VIII, Div 1, or Div 2 or BS 5500

38.2. Specifications:

Hub	Forged carbon steel ASTM A 105 or BS 1503-224-490
Head	ASTM A 515 Gr. 70 or ASTM A516 Gr.70
Yoke	ASTM A 515
Bolts	ASTM A1930 Gr B7
Structural components	ASTM A36 or equivalent material
O-Ring / Gasket	Buna N
Seal	Nitrile

The closure shall be capable of withstanding normal working pressure of 1300 Psig. The welding neck of the closure shall be beveled to 30 degree \pm 5 degree with a root face of 1/16" suitable for welding to API Specifications 5L Grades, diameter and wall thickness shall be mentioned in scheduled requirement.

39. CP-SET

39.1. Scope:

CP flange shall be of type D RTJ set comprising of phenolic gaskets flange insulating kits for ANSI Class 600 pressure rating.

39.2. Specifications:

Sleeve	Polyethylene
Washer	Phenolic
Sleeve	Minion

40. FACTORY BENDS

40.1. Scope:

Factory bends shall be formed by cold or hot (induction) bending process, minimum wall thickness of product (bent pipe) shall not be less than:

0.307" for 10" dia

0.500" for 30" dia

0.562" for 36" dia

Finished bends shall have a minimum of 1 feet straight / tangent portion on either end of bends. Beveled ends shall conform to ANSI B 16.9 and ANSI B31.8 Standard.

40.2. Material:

High yield strength carbon steel pipe conforming to API 5L Grade:

X46 for 10" dia

X60 for 30" dia

X70 for 36" dia

With weld seam factor of 1.0 base material shall be 100% on-line-ultrasonically tested by the pipe manufacturer.

41. S.I.OVAL RING CLASS 600 RTJ

Soft iron oval rings shall be in accordance with Series R manufactured to the Standard ANSI B16.20 – API Standard and API Standard 6A/6D, BS 7076 part 2.

42. STEEL GRIT (G-25)

42.1. Scope:

Steel grit for blast cleaning of external steel line pipe to produce surface profile of 50-120 micron and Swedish Standard SA 2 ½. Grit according to ASTM E 11-70, SAE J-444, SFSA J-444, SFSA 20/66 and SAE J-827 or equivalent ISO/DIN Standards.

42.2. Chemical Composition:

Carbon	0.85% (Minimum)
Phosphorus	0.05% (Maximum)
Sulphur	0.05% (Maximum)
Manganese	1.25% (Maximum)
Silicon	0.2 – 1 % (Maximum)

42.3. Nominal Size of Grit Pallet:

0%	More than 1.20 mm
70%	1.20 – 0.71 mm
10%	0.71 – 0.42 mm
20%	0.42 – 0.35 mm

43. WELDING ELECTRODE

43.1. Scope:

This Specifications covers all position Shield Metal Arc Welding (SMAW) electrodes for the Classes equivalent to AWS Standards.

43.2. Specifications:

43.2.1. E-6010, E-7010P1, E-8010G, E-8010P1, E-9010P1, E-9010G, E-8018G

43.2.2. AWS A5.1 (for E-6010 electrodes only), AMSE SFA 5.1, CSA W 48.01, EN 499 AWS A5.5, ASME SFA-5.5.

PART II

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENT AND MATERIAL USED IN NATURAL GAS DISTRIBUTION NETWORK

C. DISTRIBUTION EQUIPMENT

44. GAS METERS

44.1. DIAPHRAGM TYPE GAS DISPLACEMENT METER

44.1.1. Scope:

Diaphragm meter is positive displacement type gas meter used to measure the volume of gas in residential, commercial and industrial units.

44.1.2. Design Specifications:

Gas meter shall be in accordance with ANSI B 109.1-1973 addenda B109.1-1973 and addenda B 109 1a / O.I.M.L for diaphragm type gas positive displacement meters.

Fluid in line	Natural gas
Specific gravity	0.5 to 0.7
Flow measurement accuracy	± 2.0%
Installation:	Top mounted connections with flow direction left to right.
Base pressure	14.65 Psia
Base temperature	60 Ƒ

Operating temperature range	-30 Ƒ to 122 Ƒ
Reading indication	Direct reading front counter with suitable flow proving provisions.
Diaphragm	Synthetic rubber, long life, temperature resistant.
Housing	Pressure die-cast aluminum with separate inserted steel ferrule threads NPT male or corrosion resistant steel casing with powdered coating and with re-enforced steel ferrules threaded NPT male. The index glass should be unbreakable

44.1.3. Capacity:

Capacities in SCFH of natural gas at 0.5" W.C. differential and 0.6 specific gravity of gas delivered at 14.65 Psia and 60 Ƒ.

44.1.4. Meter Coupling:

Class 170	Top mounted 3/4" NPT male threaded / matching straight swivel should be supplied with the meter.
Class 50	Straight swivel 7/8" NPT female threads (Standard)

44.2. TURBINE TYPE GAS METER

44.2.1. Scope:

Turbine gas meter infer gas volume by determining the speed of the gas moving through the meter through a small internal turbine, which is transmitted mechanically to a mechanical or electronic counter.

44.2.2. Design Specifications:

Turbine meter shall meet manufacturing standards as specified in ANSI/ASME MFC - 4M – 1986. The meter body shall be of cast Aluminum, cast steel or steel depending on pressure rating.

Fluid in line	Natural gas
Specific gravity	0.5 to 0.7
Flow measurement accuracy	+ 1.0%
Base pressure	14.65 Psia
Base temperature	60 Ƒ
Operating temperature range	-40 to 140 Ƒ
Pressure rating	Class 125/300
Reading indication	Direct reading front mechanical counter with suitable proving provisions.

Lubrication Oil lubrication system for the turbine wheel shaft bearings.

44.2.3. Capacity:

Capacities in SCFH of natural gas at 0.5" W.C. differential and 0.6 specific gravity of gas delivered at 14.65 Psia and 60 °F.

44.3. ROTARY METER

44.3.1. Scope:

Rotary meter is highly machined precision instrument capable of handling higher volumes.

44.3.2. Design Specifications:

Rotary meter is positive type displacement meter and shall conform to ANSI B109.3 Specifications or equivalent.

Fluid in line	Natural gas
Specific gravity	0.5 to 0.7
Flow measurement accuracy	+ 1.0%
Base pressure	14.65 Psia
Base temperature	60 °F
Operating temperature range	-40 to 122 °F
Pressure rating	Class 125 / 300
Body and covers	Cast Aluminum
Impellers	Extruded Aluminum
Impeller shafts	High grade alloyed steel
Installation	Shall have the provision to be installed on vertical and horizontal lines
Reading indication	Direct reading front mechanical counter with suitable proving provisions.

44.3.3. Capacity:

Capacities in SCFH of natural gas at 0.5" W.C. differential and 0.6 specific gravity of gas delivered at 14.65 Psia and 60 °F.

44.4. SONIC METER:

44.4.1. Scope:

Ultrasonic meter measures the speed of gas movement by measuring the speed at which sound travels in gaseous medium within the pipe, which translates into volume.

44.4.2. Design Specifications:

Sonic meter shall comply with AGA Report 9 and ISO standard CD17089 or equivalent.

Fluid in line	Natural gas
Specific gravity	0.5 to 0.7
Flow measurement accuracy	+ 1.0%
Base pressure	14.65 Psia

Base temperature 60 °F

44.4.3. Capacity:

Capacities in SCFH of natural gas at 0.5" W.C. differential and 0.6 specific gravity of gas delivered at 14.65 Psia and 60 °F.

44.5. VOLUME CORRECTORS

44.5.1. Scope:

Some meters mentioned above have the provision for the installation of volume corrector which further enhances the capacity of the meter. The volume corrector on the meter senses /records instantaneous line pressure and flowing temperature and applies corresponding conversion factor to compute standard volume at the base conditions. The volume correctors include 'Emcorrectors', 'Temcorrectors' and 'Electronic Volume Correctors (EVC)'.

44.5.2. Design Specifications:

Fluid in line	Natural gas
Specific gravity	0.5 to 0.7
Flow measurement accuracy	± 1.0%
Base pressure	14.65 Psia
Base temperature	60 °F
Operating temperature range	-20 to 142 °F
Pressure rating	As specified
Installation	The correctors shall be designed to be intrinsically safe and can be located in either the hazardous area or safe area.
Battery (For EVC)	Long life (5 to 10 years)

45. SWIVEL ASSEMBLY FOR DIAPHRAGM TYPE GAS DISPLACEMENT METERS:

45.1. Scope:

Offset swivel with nominal pipe male threads at one end fitted with an octagonal nut and rubber washer at the other end.

Temperature range: -20 °F to 150 °F

Maximum inlet pressure: 3 Psig

45.2. Material:

The offset swivel shall be made from brass conforming to ASTM B-584 or equivalent. On the swivel pipe, threads shall conform to British Standard BS-21. The octagonal nut shall be made from brass conforming to ASTM B-584.

46. FILTER

46.1. **Scope:**

All portions of the dry gas filter including filtering element which are exposed to the flow of gas shall not be affected by any constituent of natural gas and any additives normally used in operation such as odorants.

Temperature range: -20 °F to 150 °F

Pressure range: Conforming to ANSI Class 150 / 300 lbs

46.2. **Material:**

The filter body shall be designed as per ASME Pressure Vessel Code Section VIII, Division I and meet the requirement of ANSI B 16.34. The filter shall have nominal diameter, flanged end / raised face conforming to the requirement of ANSI Class 150 / 300 lbs and dimensions to ANSI B 16.5. All screwed connections pertaining to threads for drainage, pressure gauge and differential pressure gauge shall conform to BS-21.

46.3. **Capacity:**

Connection Size		
(2" x 2")	(4" x 4")	(6" x 6")
25,000 to 35,000 Scf at 10" of water column differential and 60 Psig inlet pressure.	50,000 to 60,000 Scf at 10" of water column differential and 60 Psig inlet pressure.	80,000 to 110,000 Scf at 10" of water column differential and 60 Psig inlet pressure.

47. REGULATOR

47.1. AXIAL FLOW VALVE TYPE REGULATOR

47.1.1. **Scope:**

All portions of the regulator case and all parts of the regulator assembly which are exposed to the flow of gas shall not be affected by any constituents of natural gas and any additives normally used in the operation such as odorant. For all the specific requirements the regulator shall operate over a temperature range of -20 °F to 150 °F.

47.1.2. **Material:**

Body material shall be of carbon steel and Ductile Iron and conform to ANSI B-31.8 Standard. Screws, bolts and nuts shall conform to latest edition of ANSI B 1.1 Standard.

47.1.3. **Pressure Rating:**

ANSI Class 150 / 300 lb.

47.1.4. **Connection:**

Wafer type design to be inserted between ANSI 150 / 300 flanges conforming to B16.5.

47.1.5. Capacity:

Axial flow valve regulator shall have capacity to deliver natural gas of 0.58 to 0.72 specific gravity (air=1) at 60 °F and 14.65 Psia.

Size of Axial Flow Valve Type Regulator (Inch)	Inlet Pressure (Psig)	Outlet Pressure (Psig)	Capacity (Scfh)
2	60	20	120,000
	150	50	250,000
4	60	20	275,000
	150	50	600,000

47.2. PILOT OPERATED (LOW DIFFERENTIAL)

47.2.1. Scope:

All portions of the regulator case and all parts of the regulator assembly which are exposed to the flow of gas shall not be affected by any constituents of natural gas and any additives normally used in the operation such as odorant. For all the specific requirements, the regulator shall operate over a temperature range of -20 °F to 150 °F.

47.2.2. Material:

Body material shall be of carbon steel and Ductile Iron and conform to ANSI B-31.8 Standard. Screws, bolts and nuts shall conform to latest edition of ANSI B 1.1 Standard.

47.2.3. Pressure Rating:

ANSI Class 125.

47.2.4. Capacity:

Regulator shall have capacity to deliver natural gas of 0.58 to 0.72 specific gravity (air=1) at 60 °F and 14.65 Psia.

Size (inch)	Inlet Pressure (Psig)	Outlet Pressure (Psig)	Capacity (Scfh)
2	15	8	55,000
4	15	8	190,000

47.3. PILOT OPERATED (LARGE CAPACITY)

47.3.1. Scope:

All portions of the regulator case and all parts of the regulator assembly which are exposed to the flow of gas shall not be affected by any constituents of natural gas and any additives normally used in the operation such as odorant. For all the specific requirements the regulator shall operate over a temperature range of -20 °F to 150 °F.

47.3.2. Material:

Body material shall be of carbon steel and Ductile Iron and conform to ANSI B-31.8 Standard. Screws, bolts and nuts shall conform to latest edition of ANSI B-1.1 Standard.

47.3.3. Pressure Rating:

ANSI Class 300

47.3.4. Capacity:

Regulator shall have capacity to deliver natural gas of 0.58 to 0.72 specific gravity (air=1) at 60 °F temperature and 14.65 Psig.

Size (Inch)	Inlet Pressure (Psig)	Outlet Pressure (Psig)	Capacity (Scfh)
2	60	20	92,000
	150	50	173,000
4	60	20	350,000
	150	50	650,000
6	60	20	800,000 to 955,000
	150	50	2,295,000 to 2,300,000

47.4. GAS REGULATOR (SELF OPERATED)

47.4.1. Scope:

All portions of the regulator case and all parts of the regulator assembly which are exposed to the flow of gas shall not be affected by any constituents of natural gas and any additives normally used in the operation such as odorant. For all the specific requirements the regulator shall operate over a temperature range of -20 °F to 150 °F.

47.4.2. Material:

Body material shall be of carbon steel and Ductile Iron and conform to ANSI B-31.8 Standard. Screws, bolts and nuts shall conform to latest edition of ANSI B-1.1 Standard.

47.4.3. Diaphragm Casing Assembly:

Top cover of the diaphragm case shall have a Female Nominal Pipe Thread vent connection marked "VENT" conforming to the latest edition of ANSI B-21. Screws, bolts and nuts shall conform to latest edition of ANSI B-1.1.

47.4.4. Pressure Rating:

ANSI Class 125 / 250.

47.4.5. Capacity:

Regulator shall have capacity to deliver natural gas of 0.58 to 0.72 specific gravity (air=1) at 60 °F and 14.65 Psia.

Size (Inch)	Inlet Pressure (Psig)	Outlet Pressure (Psig)	Capacity (Scfh)
$\frac{3}{4}$	8	8 (inch W.C.)	500 - 600
	40	8 (inch W.C.)	700 - 800
1	8	8 (inch W.C.)	900 to 1600
	15	8	4,000 to 5,000
2	25	8	35,000-40,000
	25	8	70,000
	25	8	8,000 - 9,000
	15	8	55,000
	60	20	120,000
	150	50	250,000
4	15	8	110,000 to 115,000
	60	20	201,000 to 660,000
	150	50	444,000 to 1454,000
6	60	20	330,000 to 686,000
	150	50	728,000 to 2706,000

47.5. DOMESTIC GAS REGULATOR (SELF OPERATED)

47.5.1. Scope:

All the parts of regulator assembly which are exposed to the flow of gas shall not be affected by any constituents of natural gas and any additives normally used in the operation such as gas odorant. For all the specific requirements the regulator shall operate over a temperature range of -20 °F to 150 °F.

47.5.2. Material:

Regulator body shall be of die-cast Aluminum alloy (LM-6) / shall conform to the requirements of the latest edition of the ANSI Standard B16.4.

47.5.3. Diaphragm Casing:

Diaphragm casing shall be of die-cast Aluminum alloy (LM-6) or of equivalent material. Screws or bolts and nuts shall conform to latest edition of ANSI B1.1 Standard.

47.5.4. Pressure Rating:

ANSI Class 125.

47.5.5. Capacity:

Regulator shall have capacity to deliver natural gas of 0.6 specific gravity (air=1) at 60 °F and 14.65 Psia at inlet pressures mentioned below.

Size (Inch)	Inlet Pressure (Psig)	Outlet Pressure (Inch W.C)	Capacity (Scfh)
¾ (Low Capacity)	10	8	30-60
	20	8	30-60
	40	8	40-90
	60	8	40-120
¾ (High Capacity)	10	8	100-150
	60	8	200-250

D. DISTRIBUTION MATERIAL

48. MALLEABLE CAST IRON THREADED FITTINGS

(Union, Elbow, Concentric Reducer, Bush, Cap, Tee, Socket and Hex Nipple etc.)

48.1. Scope:

All screwed fittings under this Specifications shall be made from forged carbon steel sizes ranging from ¼ to 4 inch diameter conforming to British Standard Specifications BS-143.

48.2. Pressure and Temperature Ratings:

Fittings shall be capable to hold a gas pressure of 300 Psig or specified and suitable for use in an environment with a temperature variance between -20 °F to 150°F.

48.3. Material:

Forged carbon steel conforming to ASTM A-105 Gr 2 or SA 105 -N or equivalent. Pipe threads shall conform to the requirements for taper pipe threads in the current edition of the British Standards taper pipe threads (except dry seal) BS-21.

48.4. Specifications:

All screwed fittings shall be made to the dimensions conforming to Standards ASME B16.11, BS 3799, MSS SP-79 and SP- 83.

49. SPLIT TEE

49.1. Scope:

Hot tapping conduit barrel split tee Class 150 / 300 required to carryout hot tapping operation for making off-take connection required on API 5LX pipe.

49.2. Specifications:

Dimensions and size of split tee shall conform to ANSI B16.5 Standard.

50. STEEL BUTT WELD FITTINGS

(Elbow, Equal / Reducing Tee, Concentric, Reducer and Cap, etc.)

50.1. Scope:

Fittings shall conform to the requirement of current edition of ANSI Class 150 / 300 and Standard "Wrought Steel Butt Welding Fittings" ANSI B16.9 factory made.

50.2. Material:

Fittings shall be of forged carbon steel grade WPB / WPC conforming to the requirements of the current edition of ANSI Specifications or ASTM A 234 / ASME SA 234 Grade WPB / WPC.

50.3. Specifications:

It shall conform to the requirements of latest edition of Standard ASME B 16.9 Standard Specifications dimension, tolerance and weight of the welding fittings or Schedule 40 Standard Specifications.

50.4. Fitting End:

End of each fitting should be suitable for welding with API 5L Grade B or schedule 40 Standard weight thickness line pipes and fittings and shall be prepared in accordance with latest edition of ANSI B 16.5.

51. BLIND FLANGE

51.1. Scope:

Steel blind flange ANSI Class 150 / 300 lbs shall conform to the requirements of current edition of ANSI B16.5 (Gr WPB / Schedule-40). This scope will cover nominal sized diameter 1/2 inch to 24 inch.

51.2. Pressure Rating:

ANSI Class 150 / 300 lbs.

51.3. Material:

The blind flanges shall conform to ASTM A-105/ SA-105 / C 21 or equivalent.

51.4. Specifications:

It shall conform to the requirements of latest edition of Standard ASME B 16.5 Standard for Specifications, dimension, tolerance and weight of the welding fittings.

52. WELDING NECK FLANGES

52.1. Scope:

Steel flanges shall conform to the requirement of current edition of ANSI B 16.5, suitable for welding with API 5L Grade B line pipe and Schedule 40 Standard weight thickness weld fittings. This scope will cover nominal sized diameter from ½ inch to 24 inch.

52.2. Pressure Rating:

ANSI Class 150 / 300 lb

52.3. Material:

The flange shall be of weld neck with 1/16" raised face, free of cuts and dents, with ANSI Class 150 / 300 lbs. The flanges shall be forged from carbon steel ASTM A-105-II or equivalent.

52.4. Specifications:

It shall conform to the requirements of latest edition of Standard ASME B 16.9 Standard for Specifications, dimension, tolerance and weight of the welding fittings.

53. STEEL LINE PIPE

53.1. Scope:

Steel line pipe 1/2 inch to 24 inch nominal diameter shall be seamless, Electric Resistance Weld (ERW), High Frequency Electric Induction Welded (HFEIW) line pipe in accordance with the requirements of API 5L (Gr B) Standard 42nd edition.

53.2. Material:

The composition of pipe furnished to this Specifications as determined by heat analysis shall conform to the chemical requirements given in table 2A and 2B of API 5L 42nd edition.

53.3. Specifications:

Each length of pipe shall be measured for conformance to the specified wall thickness requirements as given in Table 9 (tolerance for wall thickness of API 5L 42nd edition).

54. G.I. PIPE (Galvanized Iron Pipe)

54.1. Scope:

Galvanized pipe 1/2 inch diameter to 2 inch diameter shall be formed in accordance with the requirements of BS 1387 medium grade (latest edition). Pipe end shall be supplied with threaded end conforming to BS-21 taper pipe thread.

54.2. Material:

The composition of pipe furnished to this Specifications as determined by heat analysis shall conform to the percentage chemical composition given below:

Carbon (C) (Max.)	Manganese (Mn) (Max.)	Phosphorus (P) (Max.)	Sulphur (S) (Max.)
0.20	1.20	0.045	0.045

Pipe furnished to this Specifications shall conform to Table-1 Specifications BS 1387 (medium grade).

54.3. Specifications:

Nominal Dia.	Outside Dia.		Wall thickness Tolerances (%)
	Maximum	Minimum	
½ inch	0.856 inch	0.831 inch	±10
¾ inch	1.072 inch	1.047 inch	±10
1 inch	1.346 inch	1.316 inch	±10
2 inch	2.394 inch	0.144 inch	±10

55. POLYETHYLENE PIPE (MEDIUM DENSITY)

55.1. Scope:

Polyethylene pipe shall conform to the Standard Specifications for thermoplastic gas pressure pipe ISO-161 and ISO-1872 and ISO-4437.

55.2. Specifications:

The plastic used to make pipe under this Specifications shall be from polyethylene (PE-80) MDPE in accordance with ISO-161-1 and ISO-1872 and DVGW-G-477 / ISO-4437. The pipe shall be homogeneous through out and uniform in color. The color of pipe should be yellow and should have following properties:

Density (Compounded / Annealed base)	0.940 to 0.944 gm/cm ³ , ISO-1183-D and ISO-1872/2, Method-B.
Melt Flow Rate (MFR)	190 °C / 5 Kg., 0.2 to 1.3 gm/ 10 min, ISO-1133, Condi-4.
Yield strength	19 N/mm ² , ISO 6259
Ultimate tensile strength	27 N/mm ² , ASTM D 638
P.E raw material sources	BP / Solvay and Fina

55.3. Specifications:

Measurements shall be in accordance with ISO-3607, ISO-S-5, PN-10, SDR-9 (for 20mm pipe only) and SDR-11 for all other diameters.

Thickness of P.E pipes should be as per detail given below:

<u>Dia of Pipe (mm)</u>	<u>Thickness in (mm)</u>
20	2.2 to 2.6
32	3 to 3.4

40	3.7 to 4.1
63	5.8 to 6.5
125	11.4 to 12.6
180	16.4 to 18.2

56. **BUTTERFLY VALVE**

56.1. **Scope:**

Butterfly valves for natural gas service to be mounted between flanges of ANSI Class 150 / 300 according to ANSI B16.5 Standard.

56.2. **Material:**

Body	Forged steel ASTM A-105 or equivalent.
Butterfly	Forged Steel ASTM A-105 or equivalent.
Sealing rings	Steel reinforced nitrile rubber.
Stem	Stainless steel AISI-410.

56.3. **Pressure:** ANSI Class 150 / 300.

57. **BALL VALVE**

57.1. **FLANGED END BALL VALVE**

57.1.1. **Scope:**

Ball valve shall conform to the requirement of current edition of API 6D for pipeline valves and Specifications conform to ANSI Class 150 / 300 lbs. Valve shall be turnnion mounted or pivot supported only, full bore, all welded body. Flanged end, ANSI Class 150.

57.1.2. **Material:**

Body shall conform to suitable grade of forged steel / cast steel WPB / WPC.

57.1.3. **Valve Ends:**

Flanged, raised face suitable to match ANSI B16.5 Class 150 / 300 rating.

57.1.4. **Thickness:**

Minimum wall thickness shall not be less than minimum requirement of ASME B 16.34.

57.2. **MDPE BALL VALVE**

57.2.1. **Scope:**

The material for the valve shall conform the Specifications of PE-80 or PE-100 and in accordance with DIN-3543 and 3544, yellow in color having polypropylene ball with gas resistant nitrile rubber seal or equivalent according to ISO-6447.

57.2.2. **Specifications:**

Density 0.940 gm/cc, according to ISO-1183.

Melt flow index 190 °C / 50 N, 0.2-1.3 gm/10min., a cording to ISO-4440.

58. FORGED CARBON STEEL NEEDLE VALVE

58.1. Scope:

Needle valves shall conform to the requirements of the current edition of the American Petroleum Institute Specifications for the needle valves.

58.2. Pressure Rating:

ANSI Class 150 / 300.

58.3. Material:

Body shall conform to suitable grade cast steel WPB / WPC conforming to ASTM A105 Grade II.

58.4. Ends:

Screwed ends, taper female threads conforming to BS-21 Standard.

59. PLUG VALVE

59.1. CARBON STEEL LUBRICATED TAPERED PLUG VALVES

59.1.1. Scope:

The valves shall conform to the requirements of current edition of API -6D Standards for ANSI Class150 / 300 lbs.

59.1.2. Pressure Rating:

ANSI Class 150 / 300.

59.1.3. Material:

Body and plug of cast carbon steel shall conform to ASTM A-216, Grade WCB / WCC and according to ASME B 16.34 or equivalent.

59.1.4. Valve Ends:

Flange end raised face or ring type joint shall conform to ANSI B16.5 Standard.

59.2. PLUG VALVE SCREWED ENDS

59.2.1. Scope:

Forged carbon steel tapered plug valves conforms to API 6D Class 150 / 300.

59.2.2. Lubricants:

Plug valve shall be furnished / lubricated with the manufacturer lubricant.

59.2.3. Pressure Rating:

Pressure in accordance with ANSI Class 150 / 300.

59.2.4. Material:

Cast carbon steel as per ASTM A-216 grade WCB.

59.2.5. Valve Ends:

Ends shall be screwed to British Standard pipe taper threads to BS-21 (female threads).

59.2.6. Dimensions:

Face to face and other dimension shall conform to the requirements of API 6D.

60. INSULATING UNION VALVE

60.1. **Scope:**

For all specific requirements, the valve shall operate over a temperature range of –20 °F to 150 °F and a maximum inlet pressure conforming to A NSI Class 150 / 300 rating.

60.2. **Material:**

The valve body shall be cast from cast iron ASTM Class A-126 Grade B.

60.3. **Plug:**

Tapered plug shall be made from special high copper brass alloy ASTM B-584.

60.4. **Union Nut:**

It shall be made from Malleable Iron (ASTM A-47) / Spheroidal Graphite Iron (ASTM A-536).

60.5. **Inlet and Outlet Connection:**

Inlet shall have 3/4 inch nominal diameter tapered female pipe threads conforming to BS-21 Standard. Outlet shall have 1/2 inch female taper pipe threads in accordance with the requirement of BS-21 Standard.

61. BARREL NIPPLE

61.1. **Specifications:**

Thickness of the barrel nipple must comply with BS-1387 and made from medium Grade G.I. pipe or MS pipe of schedule 40 Nickel plated.

Pipe nipples required are of following diameter and thickness.

<u>Nominal Diameter</u>	<u>Thickness</u>
1/2 inch	0.104 inch
3/4 inch	0.104 inch
1 inch	0.128 inch
2 inch	0.144 inch

61.2. **Threaded Ends:**

Pipe nipple shall have both ends threaded and shall conform to BS 21 Standard.

62. MDPE FITTING

62.1. **Scope:**

MDPE fittings shall conform to the Standard Specifications for thermoplastic gas pressure pipe, tubing and fittings. Fitting shall include but not limited to coupling, tee, cap, bends, elbow, reducer, tapping saddles and electrofusion type.

62.2. **Specifications:**

Standard Specifications of polyethylene fittings for SDR-11, polyethylene pipe.

ISO-1872/1 polyethylene thermoplastic materials designation.

ISO-3607 – 1977	polyethylene pipe tolerances on outside diameters and wall thickness.
ISO-4437	P.E. pipes for the supply of gaseous fuels Specifications.
ISO-6447	Rubber seals – joint rings used for gas supply pipes and fittings – Specifications for material.
ISO-4440	Melt flow index.
ISO-1183	Density

PART III

STANDARD TECHNICAL SPECIFICATIONS FOR EQUIPMENTS AND MATERIALS COMMONLY USED IN NATURAL GAS TRANSMISSION AND DISTRIBUTION NETWORKS

E. MISCELLANEOUS ITEMS

63. CARBON DIOXIDE FIRE EXTINGUISHER

63.1. Scope:

CO₂ fire extinguisher shall conform to the Standard BS EN3 for all types of fire required for Class B, C and E fires.

63.2. Specifications:

Capacity	25 Kg. of Carbon Dioxide (CO ₂) by weight
Necessary parts	Discharge valve with handle, discharge hose, nozzle, flexible hose joint with directional funnel
Mounting	Trolley

63.3. Operating Parameters:

- Rechargeable
- Deep drawn seamless body / cylinder of carbon steel of thickness of minimum 8 mm.
- Controllable operating valve
- Locking pin to control accidental discharge
- Stored pressure type
- Delivery hose of length at least six feet and discharge nozzle.
- Carbon dioxide as extinguishing medium.

64. DRY CHEMICAL POWDER (DCP) FIRE EXTINGUISHER

64.1. Scope:

DCP fire extinguisher shall conform to the Standard BS EN3 for all types of fire required for Class A, B, C and E fires.

64.2. Specifications:

Capacity	10 Kg dry chemical pressurized to 12 bar by CO ₂ gas.
Discharge time	8 to 25 Seconds
Pressure gauge	to allow visual capacity check

Effective range 5 to 20 feet

64.3. Operating Parameters:

- Rechargeable
- Cylinder of carbon steel of gauge 18
- Semi deep drawn centrally welded body
- Stored pressure type
- Controllable operating valve
- Locking pin to control accidental discharge
- Pressure gauge
- Delivery hose and discharge nozzle
- Mono Ammonium Phosphate as extinguishing agent

65. AFFF (AQUEOUS FILM FORMING FOAM) FIRE EXTINGUISHER

65.1. Scope:

AFFF fire extinguisher shall conform to the Standard BS EN3.

65.2. Operating Parameters:

- Rechargeable
- Cylinder of carbon steels of gauge 18
- Semi deep drawn centrally welded body, controllable operating valve
- Locking pin to control accidental discharge
- Pressure gauge
- Delivery hose and discharge nozzle

66. HALOGENATED GAS FIRE EXTINGUISHER

66.1. Scope:

Halogenated fire extinguisher shall conform to the Standard BS EN3.

66.2. Operating Parameters:

- Rechargeable
- Cylinder of carbon steel of gauge 18
- Semi deep drawn centrally welded body
- Stored pressure type
- Controllable operating valve
- Locking pin to control accidental discharge
- Pressure gauge
- Delivery hose and discharge nozzle
- Blended gases preferably Halotron to be used.

67. AFFF / DCP / CO₂ WHEELED FIRE EXTINGUISHERS

67.1. Scope:

Wheeled (AFFF / DCP / CO₂ fire extinguisher shall conform to the Standard BS EN3.

67.2. Operating Parameters:

- Rechargeable
- Cylinder of carbon steel of gauge 10
- Stored pressure type
- Controllable operating valve
- Locking pin to control accidental discharge
- Pressure gauge for AFFF and DCP only
- Delivery hose and discharge nozzle
- One of the following fire extinguishing agent is to be used
 - i) Carbon dioxide.
 - ii) AFFF foam
 - iii) Dry chemical powder (Mono Ammonium Phosphate)

68. AUTOMATIC FIRE EXTINGUISHER

68.1. Scope:

Automatic fire extinguisher shall conform to the Standard BS EN3.

68.2. Operating Parameters:

- Rechargeable
- Cylinder of carbon steel of gauge 18
- Stored pressure type
- Discharges automatically when temperature reaches 68 °C
- Roof hanging type
- Extinguishing agent is either dry chemical powder (Mono Ammonium Phosphate) or Halotron gas.

69. STANDARD FIRE BUCKET

69.1. Scope:

The Standard fire bucket shall conform to the Standard BS EN3.

69.2. Operating Parameters:

- Made of galvanized steel of gauge 24
- Rounded bottoms welded in place or suitably reinforced
- Stamped ears welded in place
- Strong wire bail for holding

- Loose fitting metal covers to exclude debris and retard evaporation

70. DEW POINT TESTER

70.1. Scope:

A portable chilled mirror type dew point tester is required to measure the dew point temperature of hydrocarbon condensate contents in high-pressure natural gas stream.

70.2. Operating Parameters:

Type	Portable
Method	Chilled mirror
Range	-90 ° F ~ +100 ° F
Accuracy	±0.5 °F or less
Display	Selectable digital display in °F and lbs / MMCF
Ambient temperature	32 ° F– 122 ° F
Medium (gas flowing conditions)	High pressure natural gas having specific gravity 0.6 ~ 0.7, pressure 10 ~ 1300 Psig and temperature 50 ~ 122 °F.
Power supply	220 V AC (single phase, 50 Hz)

71. DIAL TYPE THERMOMETER FOR DOPE-KETTLE

71.1. Scope:

Portable robust, fumes and shower proof suitable for temperature measurement of molten coal tar / asphalt enamel.

71.2. Operating Parameters:

Measurement range	0 ° F– 800 ° F
Accuracy of reading	± 0.5%
Resolution	10 °F
Display	Dial type, analogue
Stem	½" dia. x 30" long
Dial size	4"dia. vertical (facing towards operator, dial at right angle with respect to stem.)

72. DIGITAL THERMOMETER WITH PROBE

72.1. Scope:

Portable, robust, fumes and shower proof, suitable for temperature measurements of molten coal tar / Asphalt enamel in dope kettles during heating operation.

72.2. Operating Parameters:

Temperature scale	Celsius and Fahrenheit
Measurement range	32 - 932 °C minimum
Accuracy of reading	± 1.0 %.
Resolution	1 °F

Response time	Instant
Display	Digital
Probe	30 inches type "K" thermocouple
Lead	3.0 meters (minimum)
Power source	Suitable dry battery

73. DIGITAL THERMOMETER WITH STEM

73.1. Scope:

Digital thermometer with stem is suitable for temperature measurements ranging from -148 to +392 °F, 0.1 deg resolution

73.2. Operating Parameters:

Sensor:	Platinum RTD or thermocouple (Type K class 1 as Standard)
Measurement ranges:	T/C: -148 ° F to +392 °F, 0.1 deg resolution
Accuracy:	T/C: ± 32 ° F, ± 1 digit RTD: ± 32.36 °F, ± 1 digit
Stability	T/C: Zero: ± 0.05 ° C ambient change Span: $\pm 0.01\%$ of span per ° C ambient change RTD: Zero: ± 0.005 °C per °C ambient change Span: $\pm 0.003\%$ of span per °C ambient change (figures for T/C variant include CJ compensator)
Sensor linearization:	Automatic, via software.
Cold junction compensator	Automatic (T/C only).
Display	4 digit, LCD with 12.7 mm (1/2") high characters. °C or °F selectable by internal jumper
Update interval:	0.6 seconds approximately
Power sources:	3 V battery, 2 x 1.5 V "AA" alkaline cells.
Low battery warning:	Display will alternate between temperature reading and BATT
Electromagnetic	BN EN 50081-1: 1992
Compatibility (EMC)	BN EN 50082-2: 1995

74. ELECTRIC CABLES

The cables shall be in accordance with the Standard of International Electro-technical Commission (IEC) 502 or equivalent. The conductors are made from high conductivity

Copper or Aluminum to meet the requirement of BS 6360 Standard. The sheath in the outer most surface of the cable shall consist of block extruded PVC complying with BS 6746 Standard.

75. ELECTRIC CONTROL PANEL

Electronic control panel shall comply with latest NEMA / British / NEC or equivalent Standards and shall be able to operate at 55 °C and ambient relative humidity of 35 - 95%. Control panel shall be free standing floor mounted with hinged lockable doors with electrical / electronic controls and provision for auto or manual start option with air type SF6 circuit breaker.

76. ELECTRIC DRILL MACHINE

Electric drill should have a drilling ability for concrete, steel and wood. It should have electric control with speed pre selection. It may operate in reversible rotation and should be accompanied with safety clutch to stop quickly, power rating of 600 - 1000 watts.

77. EXTERNAL LINE-UP PIPE CLAMP

77.1. Scope:

External line-up pipe clamp suitable for holding the two ends of the pipe together while welding.

77.2. Material:

The clamps shall be made of forged iron or other suitable material for use in rugged environment without bending and breakage.

77.3. Hydraulic Jack:

External line-up clamp size 14 inch and above shall have hydraulic jack attached to it. These shall be all position hydraulic with the jack which shall be self retracting. External line-up clamp size 4-12 inches shall have a lever to tighten the clamp. Cross bars shall be attached to the clamp for aligning the pipes.

78. ELECTROFUSION MACHINE (CONTROL BOX)

78.1. Scope:

Electrofusion machine (control box) is required for electrofusion of various types of fittings and sizes from 20mm to 180mm diameter with MDPE pipes of same outside diameter of SDR-11 and SDR-9 type.

78.2. Specifications:

The control box shall be able to electro fuse bar-coded electrofusion fittings with MDPE pipes from different manufacturers and shall have following general Specifications:

- The machine shall be rugged for use under field condition, be suitable for operating in outdoor condition within the temperature range of -10 °C to +50 °C. The box shall have double electrical insulation with protection Class I-54 /I-65 preferably.
- The unit to be operated at an input supply voltage of 220 Volts with a variance of $\pm 10\%$ and 50 cycles.
- The control box shall be capable of delivering variable output fusion voltage of 8 volts to 48 volts.

79. FIBER GLASS WRAP

79.1. Scope:

This Specifications covers the Standard of reinforced glass fiber wrap to be used as part of protective coating of buried pipeline. This material is required to be incorporated in the corrosion protection coating on the exterior of a buried natural gas pipeline.

79.2. Specifications:

79.2.1. The glass fiber wrap shall consist of a thin flexible uniform material, generally defined by ASTM definition C162-80 chemically resistant Boro-silicate glass containing not less than 5% of B₂O₃.

79.2.2. The glass fiber mono-filaments shall be reinforced by parallel longitudinal yarns of continuous filament glass fiber embedded in the material and spaced at regular intervals. The whole shall be bonded with an inert phenolic type resin, which shall be compatible with hot coal tar / Asphalt enamel.

79.2.3. The material shall be sufficiently porous, so that, it can be drawn into the hot coal tar / Asphalt enamel coating as it is applied to the exterior of the pipe by a line traveling machine or hand application, but shall not pull right through the coating on to the pipe under normal tension. In this application the enamel will be to BS 4164 – 80 or BS 4147 – 87.

79.3. Physical Characteristics:

Thickness	Not less than 0.30mm / 13 mils (ASTM D 146 as modified)
Weight	Not less than 41g/m ² (0.84 lb / 100ft ²) (ASTM D 146 as modified)
Breaking strength longitudinal	13 ft. 1bs / in (700N/m) minimum. ASTM D 146 as modified.
transverse	04 ft. 1bs/ n (700 N/m) minimum. ASTM D 146 as modified.
Porosity	Not less than 0.6 mm (0.22") and not more than 1.9 mm (0.76") of water at an average air velocity of 200ft. /minute (ASTMS D 737, as modified).
Phenolic or Urea binder content	12% ($\pm 2\%$)
Pliability	No cracking when bent over 1/8" / 3 mm at 73 °F ± 2 °F for 10 - 15 minutes (ASTMD 737, modified).
Reinforcement type	Continuous filament glass fiber yarn.

80. FIRE BLANKETS (ASBESTOS TYPE)

Fire blankets manufactured from woven glass fabric coated on both sides with white silicon rubber fully tested in accordance with BS 6575 Standard.

81. GAS LEAK DETECTOR

81.1. Scope:

Portable gas leak detector shall be designed for natural gas detection on both ranges i.e. percentage LEL (lower explosive limit) and percentage volume to greater degree of accuracy.

81.2. Specifications:

The instrument shall be housed in a tough, impact resistant light weight box. The display shall be protected by toughened glass to prevent any damage. The box shall also be protected against dust and water and shall be corrosion resistant.

Measuring Entities	% gas and % LEL
Resolution	0 to 100% LEL (resolving to 0.5% under 10% LEL and 1% between 11% to 100% LEL) 0 to 100% Gas (resolving to 0.5% under 10% Gas and 1% between 10% and 100% Gas)
Calibration	Calibrated for detection of natural gas (80% to 96% Methane)
Temperature range	-20 deg C to +50 deg C (preferably upto 55 deg C)
% Volume gas	± 2% LEL for % LEL scale
% LEL	± 2% gas for % gas scale
Display	Digital liquid and crystal display.
Pressure	± 950 to 1100 mbar.
Suction pump	Built-in suction pump for sampling with long probe attached with flexible rubber probe with filter / water trap bulb for collecting sample from underground bar hole.
Battery	D size alkaline battery operated, maximum volts requirement shall not be more than 6 volts, and shall have built-in low battery alarm.

82. LEAK CLAMP

82.1. Scope:

Pipeline leakage repair clamps, suitable for fixing on leaking gas pipelines, shall be capable of stopping gas leaks which may occur due to pin holes, puncture or damage without disturbing the continuity of gas flow. Leak clamps shall be precisely engineered to a balanced design and accurately manufactured to produce a clamp with high performance characteristics.

82.2. Specifications:

Pipe leak clamp shall be constructed of a single stainless steel band, having ductile cast iron lugs at the end to equalize the clamping pressure on the pipeline. A gasket sheet is to be

fitted inside the surface of the band. A specially designed bolt with heavy shoulder fixed in slots of lugs for circumferential tightening of clamp on the pipe.

82.3. Material:

Band	Band shall be made from the corrosion resistant 18 Cr – 8 Ni stainless steel sheet (type 304) 0.80mm (22 gauge) thick.
Bolts and nuts	Bolt and nut shall be made from stainless steel type 304.
Lugs	Lugs shall be epoxy coated and made from S.G iron ASTM A-536
Gasket	Gasket 0.225 inch (\pm 0.0225) inch thickness shall be made from neoprene / nitrile rubber. Gasket shall be suitable for a temperature range of -20 ° F to 212 °F.
Pressure	Leak clamps (size 2" to 6") to be suitable for operation at 100 Psig. Leak clamps (size 8" to 30") to be suitable for operation at 150 Psig.

82.4. Dimensions:

The leak clamps shall match following dimensions.

N.D of pipe (inches)	Band Width 3" no. of bolts	Band Width 6" no. of bolts	Band Width 9" no. of bolts	Band Width 12" no. of bolts	Band Width 15" no. of bolts	Band Width 20" no. of bolts	Bolt size
3/4	1	2	3	4	-	-	1/2" x 5-1/2"
1	1	2	3	4	-	-	1/2" x 5-1/2"
2	1	2	3	4	-	-	1/2" x 6"
4	-	2	3	4	-	-	1/2" x 6"
6	-	2	3	4	-	-	5/8" x 7"
8	-	2	3	4	-	-	5/8" x 7"
10	-	2	3	4	-	-	5/8" x 7"
12	-	2	3	4	-	-	5/8" x 7-1/2"
16	-	-	-	-	5	6	5/8" x 7-1/2"
20	-	-	-	-	5	6	5/8" x 7-1/2"

24	-	-	-	-	5	6	5/8" x 7-1/2"
30	-	-	-	-	5	6	5/8" x 7-1/2"

83. MDPE SOCKET FUSION HEATING MIRROR

Manual fusion / heating mirror (jointing tool) for socket fusion of MDPE pipes and fittings of sizes 20mm, 32mm, 40mm and 63mm dia complete comprising Aluminum heating bushes and spigots of diameter 20mm, 32mm, 40mm and 63mm dia, The heating mirror shall be fitted with a thermo switch or dial thermometer to allow the operator to monitor the heating mirror. The heating mirror / element should be of 1400 watt for heating pipes and fittings of above stated sizes in SDR-11 thickness.

The heating mirror shall be capable of being operated at 220 volts and 50 cycles with a variance of $\pm 10\%$.

84. COALTAR ENAMEL GRADE 120/5

84.1. Scope:

The enamel shall generally conform to specs of BS: 4164 Standard or equivalent.

84.2. Specifications:

The enamel should be a uniform mixture of coal tar based enamel and inert non-fibrous filler and shall conform to the Specifications as per table below:

Characteristic	Grade 120/5
Filler content by ignition, % by mass.	25 to 35
Filler fineness	Article 9, Section III
Density at 77 °C, g/cm ³	1.4 to 1.6
Softening point (ring and ball), °F	248 to 266
Penetration, 10 ⁻¹ mm 77 °C, 100 g 113 °C, 50 g	1 to 9 3 to 16
Viscosity (kg / m / sec), 446 °F 464 °F	9 to 24 9 to 24
Sag, (mm) 176 °F, 24 h	1.5
Low temperature cracking and disbanding (-) 68 °F.	None
Cathodic dis-bonding in 28 days max, mm	5
Operating temperature	176 °C

84.3. Filler:

Does not react with the environment in which it will be used. The fineness of the filler shall be according to BS 1796 Standard, not less than 93% passing 90 µm test sieve and not less than 99% passing 250 µm test sieve (BS 410 Standard).

85. COALTAR ENAMEL GRADE 105/8

85.1. Scope:

The enamel shall generally conform to Specifications of BS 4164 Standard or equivalent.

85.2. Specifications:

The enamel shall be a uniform mixture of Coal tar based enamel and inert non fibrous filler and shall conform to the Specifications as per table below:

Characteristic	Grade 105/8
Filler content by ignition, % by mass.	25 to 35
Filler fineness	Article 9, Section III
Density at 77 °F, g/cm ³	1.4 to 1.6
Softening point (ring and ball), °C	221 to 241
Penetration, 10 ⁻¹ mm 77 °C, 100 g 113 °C, 50 g	5 to 12 8 to 30
Viscosity (kg / m / sec), 446 °F 464 °F	9 to 16 9 to 16
Low temperature cracking and disbanding (-) 20 °C.	None
Cathodic dis-bonding in 28 days max, mm	5
Operating temperature	149 °F
Application temperature	446 °F - 482 °F

85.3. Filler:

The inert filler shall be inorganic material which is not hygroscopic. The fineness of the filler shall be according to BS 1796 Standard, not less than 93% passing 90 µm test sieve and not less than 99% passing 250 µm test sieve (BS 410 Standard).

86. PLUG VALVE LUBRICANTS / SEALANTS

86.1. Scope:

This is required to be used in stick form as lubricants and sealant for high pressure plug valves in natural gas services.

86.2. Specifications:

The required grease must fulfill the following Specifications

- i.) Base oil (synthetic / vegetable)
- ii.) Thickening agent {(synthetic / inorganic (Lithium only))}
- iii.) Worked cone penetration (175 -205) @ 77 °F (ASTM-D217)

Special additives may also be used to give certain characteristics like chemical resistance to hydrocarbons, water and oxidative degradation, high dropping point, anti corrosiveness, anti rusting property.

87. PRIMER AND TAPES

87.1. Scope:

These are required for underground pipeline for prevention against corrosion. The primer and tapes shall conform to Standard EN 12088.

87.2. Specifications:

These Specifications shall be applied to cold tapes and their related primer. The tape and primer system is used to form an effective coating system. Tapes will be utilized to coat pipe, fittings and other exposed metal surface to protect them from corrosion in conjunction with cathodic protection.

87.3. Primer:

The primer shall be suitable for manual brush / roller application at pipeline temperature of 50 °F to 140 °F. The service temperature of primer shall also be 50 °F to 140 °F.

87.4. Hand Applied Primer:

Application temperature	14 °F to +167 °F.
Operating temperature	-76 °F to +122 °F.

87.5. Machine Applied Primer: (also for hand application)

Application temperature	-40 °F to +167 °F.
Operating temperature	-76 °F to +122 °F.

Primer must comply with: EN-12068 Class C-50 and DVGW Standards.

87.6. Tape (3 Ply Inner Wrap):

It consists of high density stabilized polyethylene film having butyl rubber on one side, compatible with the properties of above 3 ply inner tape. The polyethylene film thickness shall be 0.30 mm (minimum) and the butyl rubber thickness 0.30 mm (minimum).

The application and services temperature of the tape shall be in range of 14 °F to 122 °F. The tape shall be supplied in black color and in rolls of 100 mm width and 60 meter length.

The tape system comprised of primer, 3 layer inner tape and two layer outer tape each having 50% overlap, shall comply with EN 12068 (stress Class C-50).

87.7. Wrap (2ply):

Two ply plastic tape, black colour, consisting of a stabilized low density polyethylene backing with plastic butyl rubber on one side. The outer-wrap tape must be fully self amalgamate with the inner-wrap tape at contact area.

Application temperature -40 °F to + 140 °F.

Operating temperature -76 °F to + 122 °F.

88. GAS BAG

The round gas bag shall consist of rubber bladder enclosed in canvas cloth suitable for sealing of seepage of natural gas pipeline during pipe cutting, hot tapping / stoppling operations for pipe having nominal dia 8” to 36” respectively. ¼” BSP one side female threads and of holding maximum pressure upto 15 Psig.

89. SOIL RESISTIVITY METER

Soil resistivity meter shall conform to the requirements as under:

Measurement ranges:

0-1000 ohms

0-100 K ohms

0-1000 K ohms

Shall be useful for 4 pin method.

Operating temperature upto 131 °F.

Sd/-
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ABBREVIATIONS

AGA	American Gas Association
AISI	American International Standards institute
ANSI	American National Standard Institute
API	American Petroleum Institute
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
ASA	American Standard Association
ASTM	American Society for Testing and Materials
AWS	American Welding System
BS	British Standards
BSP	British Standard Pipe
CS	Carbon Steel
Deg	Degree
DFT	Dry Film Thickness
Dia	Diameter
DIN	Deutsches Institut für Normung (German Institute for Standardization)
IEC	International Electro-technical Commission
ISO	International Organization for Standardization
MSS	Manufacturer Standardization Society
NACE	National Association of Corrosion Engineers
NEMA	National Electrical Manufacturing Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Administration
PE	Poly Ethylene
PTFE	Poly Tetra Fluoro Ethylene
PVC	Poly Vinyl Chloride
RF	Raised Face
RTJ	Ring Type Joint
SCADA	Supervisory Control and Data Acquisition
SS	Stainless Steel
SCFH	Standard Cubic Feet per Hour
WCB	Working Class B
WCC	Working Class C