PETROLEUM AND NATURAL GAS REGULATORY BOARD

NOTIFICATION

New Delhi, the 27th August, 2008

G.S.R. 612(E). ---- In exercise of the powers conferred by Section 61 of the Petroleum and Natural Gas Regulatory Act, 2006 (19 of 2006), the Petroleum and Natural Gas Regulatory Board hereby makes the following regulations, namely: -

1. **Short title and commencement**.

(1) These regulations may be called the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. **Definitions**.

(1) In these regulations unless the context otherwise requires, -

(a) "Act" means the Petroleum and Natural Gas Regulatory Board Act, 2006;

(b) "active regulator" means a regulator in pressure regulating station (PRS) that normally controls the outlet pressure;

(c) "authorized person" means a competent person who is assigned by the owner or operator to carry out a specific job based on his competency level as laid down by the Board under regulations;

(d) "city or local natural gas distribution network" (hereinafter referred to as CGD network) means an interconnected network of gas pipelines and the associated equipments used for transporting natural gas from a bulk supply high pressure transmission main to the medium pressure distribution grid and subsequently to the service pipes supplying natural gas to domestic, industrial or commercial premises and CNG stations situated in a specified geographical area;

(e) "consumer meter" means a meter that measures gas delivered to a consumer at the consumer's premises;

(f) "creep relief valve" means a relief valve installed to relieve over pressure caused by creep in the downstream system and having maximum 1 % flow capacity;

(g) "city gate station (CGS)" means the point where custody transfer of natural gas from natural gas pipeline to the CGD network takes place and this may also be referred to as City Gate Measuring and Pressure Regulating Station;

[1][Provided that if CGS is established outside the Authorized Geographical Area then pipeline connecting from CGS to authorized CGD network shall be considered as a part of CGD network, [2][[3][if required, subject to prior approval from PNGRB, the authorized entity may set up and operate compression facilities along with such CGS for an initial period of two (02) years from the date of approval of the Board. Further extension for operating such compression facilities along with CGS may be considered by the Board, on case-to-case basis. Upon expiration of approved period, the authorized entity shall immediately cease the operation of such compression facilities] along with such CGS for an initial period of 2 years from the date of its authorization. Upon the expiration of 2 years period, the authorized entity shall immediately cease the operation of such compression facilities] [4][However, in any case,] the authorized entity shall not supply natural gas to any customer [5][****] outside its geographical area.]

[6][Provided further that in cases where CGS is established inside or outside the Authorized Geographical Area, but the Board is satisfied that there is necessity or expediency that the pipeline connecting from such CGS shall have to pass through other Geographical Area(s), then the Board may grant approval for such pipelines, and such approved pipelines shall be considered as a part of the authorized CGD network, however the authorized entity shall not supply natural gas to any customer from such pipeline outside its geographical area.]

(h) "competent person" means an individual recognized by the CGD network owner/operator based on his proficiency and skill set achieved by appropriate combination of education, training and practical experience in the critical traits as laid down by the Board under regulations;

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[1] Ins. by Cl. (i) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2020 (w.e.f.30.06.2020).

[2] Ins. by sub-cl. (a) of Cl. (i) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2024 (w.e.f. 16.02.2024).

[3] Subs. by Cl. (1) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Third Amendment Regulations, 2024 (w.e.f..23.12.2024).

[4] Subs by sub-cl. (b) *ibid.* (w.e.f. 16.02.2024)

[5] The words specified shall be omitted by sub-cl. (c) *ibid.* (w.e.f. 16.02.2024).

[6] Subs by sub-cl. (d) *ibid.* (w.e.f. 16.02.2024)

(i) "Distribution Pressure Regulating Station or District Regulating Station (DPRS)" means a station located within authorized area for CGD network having isolation, pressure regulating and overpressure protection devices;

(j) "electro fusion joint" means a joint made in thermo plastic piping by passing the current through the electrical coil provided in the fitting and heating the parts sufficiently to permit adequate flow and fusion of the materials between the two surfaces put in contact;

(k) "Monitor and Active Regulators" means an arrangement of two regulating devices in series whose pressure settings are stepped so as to allow one (Active) normally to control the outlet pressure and the other (Monitor) to assume control in the event of failure of the active device;

(l) "operator" means an entity that operates CGD network with the authorization of the Board;

(m) "owner" means an entity that owns the CGD network and has been authorized by the Board;

(n) "primary network" means a part of CGD network that operates at pressure above 100 psig (7 bar) and below 711 psig (49 bar) and pipelines forming part of this network called Gas Main or Distribution Main or Ring Main shall be designed to ensure uninterrupted supply of gas from one or more City Gate Stations to supply gas to the secondary gas distribution network or service lines to bulk customers through service lines;

(o) "Slam Shut Valve" means a valve that is designed to close quickly in the event of an abnormal pressure (whether excess or low) being detected at a selected point in a gas system;

(p) "secondary network" means a part of CGD network that operates at a pressure below 100 psig (7 bar) and above 1.5 psig (100 mbar) and pipelines forming part of this network shall be called low-Pressure Distribution Mains which shall be designed to ensure uninterrupted supply to tertiary network or to industrial consumers through service lines;

(q) "sub-transmission pipeline" means a high pressure pipeline connecting the main transmission pipeline to the city gate station but is owned by the CGD entity;

(r) "tertiary network" means a part of CGD network that operates at pressure less than 1.5 psig (100 mbar) and pipelines forming part of this network to

service Pressure Distribution Mains shall be designed to ensure uninterrupted gas supply to service lines;

(2) Words and expressions used and not defined in these regulations, but defined in the Act or in the rules or regulations made thereunder, shall have the meanings respectively assigned to them in the Act or in the rules or regulations, as the case may be;

3. **Application**.

Definitions, design, materials and equipment, welding, fabrication, installation, testing, operation and maintenance and corrosion control of CGD network shall be in accordance with requirements of ASME B31.8 except in so far as such requirements are specifically cancelled, replacedormodified by the requirements specified in these regulations.

4. Scope.

(a) These regulations cover the design, materials, fabrication, installation, inspection and testing, commissioning, operation, maintenance, modifications and abandonment of CGD network for domestic, commercial and industrial users.

(b) Requirements of these regulations shall apply to all pipelines, distribution mains and piping facilities downstream of inlet isolation valve of city gate station (CGS) up to and including consumer meter for commercial or industrial customer and up to final isolation valve including connecting hose to gas appliance for domestic consumer.

(c) Design, materials, fabrication, installation, inspection and testing, commissioning, operation, maintenance, modifications and abandonment of steel pipeline between city gate station and natural gas pipeline (sub transmission pipeline) shall be as per separate regulations.

[1][(d) The CNG Station shall be designed, operated and maintained in line with the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Retail Outlets dispensing Petroleum, Auto LPG and CNG) Regulations, 2018.]

(d) These regulations also cover safety aspects of operation and maintenance of CGD network and the requirements covered herein these regulations are meant to supplement the safety requirements already covered under ASME

[1] Subs. by Sub-Cl. (i) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019, for 'Regulation 4' (w.e.f. 07.11.2019).

B 31.8.

5. Intent.

(a) It is intended to apply these regulations to all new and such aspects of already existing networks as design, fabrication, installation, testing at the time of construction and commissioning. However, if an entity has laid, built, constructed or expanded the CGD infrastructure based on some other standard or is not meeting the standards specified in these regulations, the entity needs to carry out a detailed technical audit of its infrastructure through a Board authorized or approved third party agency by the Board. The entity thereafter shall submit the recommendations made by the third party along-with its time-based mitigation plan and implementation schedule to the Board for authorization within six months from the date of notification of these regulations.

(b) The continuation of operation of existing CGD network shall be allowed only if it meets the following requirements, namely: -

(i) The CGD system downstream of city gate station shall have been tested initially at the time of commissioning in accordance with ASME B 31.8 Chapter IV (with minimum test pressure of 1.4 times of MAOP for steel network and 1.4 time MAOP or 50 PSI whichever is higher for PE network). The entity should have proper records of the same. Such test record shall have been valid for the current operation. Alternatively, if such a record is not available, the entity should produce in service test record of the CGD network having tested at a pressure of 1.1 time of MAOP as per ASME B 31.8;

(ii) The CGD system has leak detection system in position and is operative. For pipeline network it shall be odorisation based and for enclosures such as CGS, above ground DPRS, it shall be gas leak detection based.

(iii) The CGD system has in position necessary pressure relief valves; and

(iv) There shall be protection of the system against third party damages both in respect to steel pipe, PE pipe and copper tubing.

Provided that-

(a) The entity shall submit self-certification in support of meeting the above requirements within a month of notification of these regulations and in addition the certification by the approved or authorised third party shall be made available to the Board within six months of notification;

(b) Certifications referred to in para (a) shall be done both for operation and maintenance and infrastructure of the entity and shall be submitted to the Board with mitigation plan and implementation schedule;

(c) The critical components of the system as identified by the Board for such existing networks shall be complied with these regulations within a period specified at Appendix-I and the authorized entity shall maintain the integrity of the existing system at all times; and

(d) Provisions of these regulations related to operation and maintenance procedures shall also be applicable to all such existing installations.

6. The standard.

Technical standards and specifications including safety standards (hereinafter referred to as standards) for city or local natural gas distribution networks are as specified in Schedule–I which cover material and equipment (Schedule–1A), welding (Schedule–1B), piping system components and fabrication (Schedule–1C), design, installation and testing (Schedule–1D), operating and maintenance procedures (Schedule–1E), corrosion control (Schedule–1F) and miscellaneous (Schedule–1G).

7. Default and consequences.

(1) There shall be a system for ensuring compliance to the provision of these regulations through conduct of technical and safety audits during the construction, commissioning and operation phase, as well as on an on-going basis as may be specified from time to time.

(2) The Board shall monitor the compliance to Technical Standards and Specifications including Safety Standards either directly or by accredited third party through separate regulations on third party conformity assessment.

(3) In case of any deviation or shortfall, in achieving the targets for implementing the specified standards, the entities shall be liable to face the following consequences, namely: -

(i) in case of critical activities at Appendix-1, the entity shall be given a single notice by the Board specifying the time limit to remove the specified shortcoming and ensure compliance and if the entity fails to comply within the specified time limit, immediate suspension or termination, as deemed appropriate, of authorization shall be done;

(ii) in other cases, the Board may issue a notice to defaulting entity allowing it a reasonable time to remove the specified short coming and

ensure compliance and in case the entity fails to comply within the specified time or in case the entity defaults on more than three occasions, its authorization to lay, built, operate or expand the CGD network shall be liable for suspension or termination apart from taking legal action under the provision of the Act and regulations thereunder.

8. Requirements under other statutes.

It shall be necessary to comply with all statutory rules, regulations and Acts in force as applicable and requisite approvals shall be obtained from the relevant competent authorities for the CGD network.

9. **Miscellaneous**.

(1) These standards are intended to ensure uniform application of design principles and to guide selection and application of materials and components. Though the standard primarily focuses on safety of employees, public and facilities associated with city or local natural gas distribution networks, it does not eliminate the need for a competent designer and good engineering judgment.

[1][(2) If any question arises as to the interpretation of these regulations, the same shall be decided by the Board.]

[1] Subs. by Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2014, for 'Sub-Cl. (2) of Cl. 9' (w.e.f. 01.01.2015).

APPENDIX-I

LIST OF CRITICAL ACTIVITIES
In CGD NETWORK

{See regulation 7(3) (i)}

Sr. No.	Critical infrastructure/activity/ processes	Time period for implementation	Implementation plan
1	Pressure reduction skid CGS (active /monitor combination) with a minimum 50% redundancy including slam shut valve for over pressure protection and creep relief valves.	1 year	Modification of CGS skid
2	On line odorisation equipment designed to minimize fugitive emissions during loading, operation and maintenance.	1 year	Automated odorization systems to be used
3	Height of the vent shall be minimum 3 meters above working level	6 months	Increase height of vent
4	Gas detectors shall be installed at critical locations	1 year	Install gas detectors in the CG and District Pressure Regulating Station.
5	Pressure reduction for DRS (active / monitor combination) skid with minimum 50% redundancy including two safety devices at least one of them shall be a slam shut valve for over pressure protection/under-pressure and inlet and outlet isolation valves.	2 years	Modification/replacement
6	[1][Steel reinforced rubber hose conforming to IS 9573 Type II]	6 months *	Replacement of all rubber hoses @ fifty thousand per year

[1] Subs. by point (i) of Cl (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, for 'Appendix I' (w.e.f. 24.11.2016).

7	Pipeline test record and joint radiography and cover in the form of pipe book	3 months	Can be submitted in stages
8	HSSE Management System	6 months	To be implemented
9	[1][Emergency Response Plan, Disaster Management Plan and written emergency procedures. Also, provide for an Emergency Control Room, manned round the clock and equipped with effective communication system and emergency vehicles equipped or provided with communication facilities, first aid equipment, fire extinguishers, gas detectors, repair kits and tools, maps, plans, material safety data sheets etc. at its disposal.].	6 months	To be implemented

* commencement of implementation

[1] Subs. by point (b) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).

Schedule – I
(see regulation 6)

Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Network

Schedule- 1A	**MATERIALS AND EQUIPMENT**
Schedule- 1B	**WELDING**
Schedule- 1C	**PIPING SYSTEM COMPONENTS AND FABRICATION DETAILS**
Schedule- 1D	**DESIGN, INSTALLATION AND TESTING**
Schedule- 1E	**OPERATING AND MAINTENANCE PROCEDURES**
Schedule- 1F	**CORROSION CONTROL**
Schedule- 1G	**MISCELLANEOUS**

Schedule – 1A

MATERIALS AND EQUIPMENT

MATERIALS AND EQUIPMENT

All materials and equipment forming a permanent part of the any piping system constructed according to this standard shall be qualified for conditions in which it is to be used.

MATERIALS FOR USE IN COLD CLIMATES

Materials to be used in facilities exposed to low ground or low atmospheric temperatures or low operating temperatures shall have adequate impact properties to prevent brittle fracture at low temperatures.

MATERIAL SPECIFICATIONS

In addition to standards and specifications covered in ASME B 31.8, standards and specifications listed in Annexure-I shall also be acceptable for manufacturing of various piping components forming part of the CGD network.

Steel Pipe

Carbon steel used in CGD networks shall meet following requirements:

Carbon Equivalent

For pipes having Carbon Content > 0.12%

$$CE(IIW) = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$$

CE (iiw) value shall be ≤ 0.43%.

For pipes having Carbon Content ≤ 0.12%

$$CE(Pcm) = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B$$

CE (Pcm) value shall be ≦ 0.25%.

Notch Toughness

For carbon steel pipes of size NPS 2 and above, notch toughness shall be specified.

Electric welded pipes used shall also meet additional requirements specified under Annexure-III of this standard.

[1][**Reinforced Thermoplastic Pipes (RTP) or Multi Layered Thermoplastic Pipes**

Reinforced Thermoplastic Pipes (RTP) or multilayered thermoplastic pipes shall comply with the following requirements, namely: -

a. The system in its entirety that is to say pipe, associated fittings, tools etc. shall conform to API 15S or ISO 18226 or ASME NM 1;
b. Integrity of all fittings, joint, valves etc. shall commensurate with original pipeline design as per applicable standards;
c. In case, the operating pressure is less than 7 Kg/cm^2, all the provisions of this regulation related to the use of PE (polyethylene) pipes shall be complied with;
d. If the operating pressure is greater than 7 Kg/cm^2, additional protective measures for impact resistance such as concrete slabs, high impact resistance plastic sheets, steel casing shall be provided;
e. The cathodic protection for steel fittings in the system shall be provided in line with the design or service life and shall be monitored for effective protection;
f. Quantitative risk analysis shall be carried out by the entity for the entire system and mitigation measures shall be taken to ensure integrity of the system; and
g. The proposal, for use of Reinforced Thermoplastic Pipes (RTP) or multilayered thermoplastic pipelines, shall be approved by the board of the entity with complete disclosures on associated risk]

Ductile Iron Pipe

Use of ductile iron pipe is not permitted for CGD networks for transport of natural gas.

Plastic Pipe and Components

Thermoplastic pipes, tubes and fittings are recommended for use in city gas distribution networks.

[2][Polyethylene (PE) pipes conforming to IS 14885 or ISO 4437 and PE fittings conforming to ISO 4437 Part 3 or EN 1555 Part 3 shall be acceptable.]

Reprocessed material shall not be used.

Colour of pipes used for gas service shall be yellow for PE 80 grade and Orange for PE 100 grade.

PE pipes shall be permanently marked (either impressed or embossed to a depth / height of

[1] Ins by Cl. (1) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020).

[2] Subs. by point (iv) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

0.02 to 0.15 mm).

Pipes and tubing for above ground service lines up to meter set assembly

[1][Galvanized Iron (GI) pipes shall be used in above ground service lines up to consumer meter or meter control valve. The use of copper tubing shall only be after consumer meter such that this is not accessible to third party. Use of copper pipe / tube before consumer meter should be inside the kitchen only. As an alternate to copper pipe/ tube, multi layered composite pipe complying with the requirements of ISO 17484-1 can also be used. GI pipes, copper tubing and multilayer composite pipes shall conform to the requirements given in Annexure-IV of this standard. Use of non-galvanized pipes should be restricted as far as possible; however, in case they are used they shall be properly protected and painted. PE pipe shall not be used for above ground gas pipes unless it is specifically permitted in the regulations.]

Tubing / Hose pipe for connecting consumer meter set assembly and consumer appliance

The connection between consumer meter set assembly and gas appliance (provided by consumer) may be made by GI pipes or copper tubing meeting requirements given in Annexure–IV of this standard or steel reinforced rubber hose.

Steel reinforced rubber hose shall conform to IS: 9573 Type IV.

EQUIPMENT SPECIFICATIONS

Equipment used in CGD network manufactured to standards listed in Annexure-II of this standard shall also be acceptable.

CONDITIONS FOR REUSE OF PIPE

Reuse of Ductile Iron Pipes

[2][****]

Reuse of Plastic Piping

Reuse of plastic pipes is permitted subject to the following.

a. Its original and manufacturing specifications are known and documented.

b. It meets the requirements of new pipes conforming to its manufacturing specifications.

c. The pipe is free from visible defects.

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[1] Subs. by Sub-Cl. (ii) of Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019, for 'Schedule 1A' (w.e.f. 07.11.2019).

[2] The words specified under the heading 'Reuse of Ductile Iron Pipes', shall be omitted by point (v) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

d. It is installed and tested in accordance with requirements of this standard. All testing shall be carried out at recognized independent laboratory and records of the same are maintained.

Schedule – 1B

WELDING

GENERAL

These requirements apply to steel pipe and components only.

Notches or laminations on pipe ends not permitted and must be removed by cutting pipe as a cylinder and re-beveling of pipe end prior to welding.

QUALIFICATION OF PROCEDURES AND WELDERS

Welding procedures and welders for welding of gas pipelines shall be qualified as per API 1104 and shall include toughness testing requirements as applicable for the line pipe.

Welding procedures and welders, for station piping shall be qualified as per ASME Boiler and Pressure Vessel (BPV) Code Section IX or API 1104.

When welders qualified under API 1104 are employed for station piping, their qualification shall be based on destructive mechanical testing as per API 1104.

INSPECTION OF WELDS

All Non-Destructive Testing (NDT) including radiographic examination shall be performed in accordance with the requirements of API 1104 except that no root crack shall be permitted.

Regardless of operating hoop stress as well as location class all carbon steel butt welds shall be 100% radiographed. In case radiography is not possible due to safety reasons, weld shall be examined by using ultra sonic techniques.

REPAIR OR REMOVAL OF DEFECTIVE WELDS

Welds having defects shall be removed or repaired in accordance with API 1104 or ASME BPV code Section IX as applicable. Welders employed for repairs shall be qualified in accordance with “Qualification of Procedures and Welders”.

Weld repair areas shall be subjected to additional radiography or ultrasonic testing after repair.

Schedule – 1C

PIPING SYSTEM COMPONENTS AND FABRICATION DETAILS

PIPING SYSTEM COMPONENTS

General

In addition to standards and specifications covered under ASME B 31.8 for various piping components, piping components manufactured conforming to standards and specifications listed under Annexure–I of this standard shall also be acceptable.

Valves and Pressure Reducing Devices

[1][Valves body, bonnet, cover and/or end flanges components made of cast iron and / ductile iron (as per ASTM A 395) shall not be used in CGD networks. However, in case of regulators, the body or components may be made of material as permitted under the specific code as mentioned in these regulations.]

Valves used in service lines of size NPS 2 and below shall conform to BS EN 331.

Flanges

Flanges made of cast iron, ductile iron and non-ferrous materials (brass or bronze) shall not be used in CGD networks.

Use of flanges in natural gas transmission and distribution piping is not permitted except for station piping e.g. CGS, DRS, MRS etc.

For piping class 150 or above all the flanges shall be with raised face.

Bolting

All stud bolts and nuts used in CGD networks shall be hot dipped galvanized as per ASTM A 153 or equivalent.

Fittings other than Valves and Flanges

Fittings made of cast iron and ductile iron shall not be used in CGD networks.

All plastic fittings used in CGD networks must have been type tested by an internationally recognized testing agency prior to their use.

[1] Subs. by point (b) of Cl. 2, *ibid.*, for 'Schedule 1C' (w.e.f. 09.03.2016).

[1][Thermoplastic fittings conforming to ISO 4437 Part 3 or EN 1555 Part 3 shall be acceptable and shall meet following requirements:]

a. Polyethylene resin used for manufacture of thermoplastic fittings shall be virgin, cadmium free pigmented compound. Anti-oxidant and UV stabilizers used in PE resin shall [2][meet the requirements as per EN 1555-1, and ISO 4437-1]. Reprocessed material shall not be used.

b. Grade of PE compound used for the fittings should not be less than that of PE pipes. In case fittings are of different grade than that of pipes, compatibility of the same with pipes shall be established prior to their use. However, in case of higher grade fittings separate compatibility test shall not be required. [3][****]

c. Colour of fittings shall be yellow or black.

d. Electro-fusion fittings complying with ISO 8085 Part 3 / EN- 1555 -3 shall be used for all sizes of PE pipes. Fittings fabricated from pipe shall not be used. Only injection moulded fittings are recommended.

e. [4][For fusion fitting upto 63 mm, the entity may consider usage of fusion fittings with integral fixation device. However, external alignment clamp shall be used for all sizes.]

f. Each Electro Fusion fitting shall be bar coded. Fusion fittings shall have permanent fusion indicator or a data card conforming to ISO-7810/ISO- 7811.

g. The fusion jointing shall be carried out as per the procedure outlined in the standard DVS 2202 or equivalent.

h. Carbon steel part of transition fittings used for connecting PE system with Carbon Steel system may have butt weld/plain/flanged ends.

Special Fittings

Mechanical fittings for making hot taps on pipelines and mains shall not be used. Fittings for hot taps shall be welded type (for steel pipelines and mains) and electro fusion type (for thermoplastic mains and service lines).

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[1] Subs. by point (vi) of Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

[2] Subs. by Cl. (2) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020).

[3] The words specified under the heading 'Fittings other than Vlves and Flanges, shall be omitted by point (v) of Cl. (2) *ibid.* (w.e.f. 24.11.2016).

[4] Subs. by point (A) of Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2014, for point (e) of Schedule 1C (w.e.f. 16.12.2014).

EXPANSION AND FLEXIBILITY

Flexibility Requirements

When maximum gas temperature expected during operation is below 65°C, thermal expansion and stresses in the above ground steel piping shall be evaluated considering pipe temperature of 65°C.

Schedule – 1D

DESIGN, INSTALLATION AND TESTING

DESIGN INSTALLATION AND TESTING

General Provisions

The selection of design for city gas distribution network shall be based on the gas properties, required flowrates, operating pressures and the environment.

CGD network Description

A typical CGD Network should comprise of one or more or all of the following:

i) *Primary network: A medium Pressure Distribution System comprising of Pipelines, Gas Mains or Distribution Mains normally constructed using steel pipes and connects one or more Transmission Pipeline to respective CGS or one or more CGS to one or more DPRS. The maximum velocity in the pipeline network should be limited to 100 ft / sec (30 m/sec) immediately after pressure regulating instrument.*

As far as practical, primary network should be fed through more than one city gate stations / sources of supply. The operating pressure shall be as defined under General Terms.

ii) *Secondary Network:* A *low Pressure Distribution System* comprising of *Gas Mains or Distribution Mains* usually constructed using thermoplastic [1][(PE)] piping[2][****] and connects DPRS to various service regulators at commercial, industrial, and domestic consumers. The network shall be sized for maximum flow velocity of 100 ft / sec (30 m/sec).

iii) *Tertiary Network:* A *service Pressure Distribution System* comprising of *Service Lines, Service Regulators* and customer/ consumer *Meter Set Assemblies* constructed using a combination of thermoplastic [3][(PE)] [4][****] piping and GI/ copper tubing components.

[Note: For italicized terms used in description of above networks, definitions as per ASME B 31.8 shall apply]

iv) *City gate station (CGS)*: typically comprising of, but not limited to, the following facilities:

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[1] Ins. by point (i) of sub-cl. (A) of Cl. (3) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020)

[2] Omitted by Supra 1 (w.e.f. 15.09.2020).

[3] Ins. by point (ii) of sub-cl. (A) of Cl. (3) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020)

[4] Omitted by Supra 2 (w.e.f. 15.09.2020).

- Filters
- Separators (if required).
- Metering facilities.
- Heater (if required)
- Pressure reduction skid comprising active and monitor combination with a minimum 50% redundancy with stream discrimination arrangement, including slam shut valve for over and under pressure protection and creep relief valves [1][***].
- Online odorization equipment designed to minimize fugitive emissions during loading, operation and maintenance.

v) *Distribution Pressure Regulating Station or District Regulating Station (DPRS):* Located at various demand centers for domestic / commercial users typically consists of:

- Gas filter
- Heater (if required)
- Pressure reduction skid comprising active and monitor combination with minimum 50% redundancy with stream discrimination arrangement, including slam shut valve for over and under pressure protection with additional feature of under pressure protection ifrequired [2][***].
- Inlet and outlet isolation valves.

vi) Individual Pressure Regulating Station (IPRS): Located at the premises of an individual customer and having facilities similar to DPRS however, monitor regulator may or may not be provided. Metering facilities may or may not be part of this station.

vii) *Service Regulators: Usually located at customer premises for maintaining sup*ply pressure and designed to maintain safe condition even in the event of rupture in the regulator downstream section.

Network Design Requirements

The design of CGD Networks and its components shall be such that it ensures:

- Supply of gas at constant volume into a system, which fluctuates in pressure between pre-determined upper and lower limits in the distribution network, or
- Supply of gas at a constant pressure at consumer end, and
- The design should recognize the need for safe guard against malfunction of any equipment and provide sufficient redundancy to ensure that the supply is secured against such malfunctions.

Facilities forming part of CGD networks shall be designed considering:

[1] The words and expression specified under point (iv) shall stand omitted by point (viii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

[2] The words and expression specified under point (v) shall stand omitted by point (viii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

- Range of flow rates and pressures required in various sections of the network
- Quality of gas, including cleanliness in respect of both solid and liquid particles.
- Metering requirements.
- Noise control and
- Corrosion Protection

Necessary calculations shall be carried out to verify structural integrity and stability of the pipeline for the combined effect of pressure, temperature, bending, soil/pipe interaction, external loads and other environmental parameters as applicable, during all phases of work from installation to operation. Such calculations shall include, but not limited to, the following:

- Buoyancy control and stability of pipeline in areas subjected to flooding / submergence,
- River crossing to be installed by trench less techniques, wherever soil data is favorable for such installations,
- Damage potential for steel pipeline from hazards associated with earthquake, if applicable.
- Layout of Station *Facilities*

The following aspects are to be considered in deciding layout of facilities at CGS, DPRS, IPRS, etc.

i. Type and size of equipment.
ii. P&IDs
iii. Utility requirement.
iv. Venting wherever required.
v. Operation and Maintenance philosophy.

(a) *City Gate Station*

As far as possible the city gate station (CGS) shall be installed at the periphery of populated area. The entity should make best endeavor to have more than one CGS for supply security.

Inter distance between various facilities required at CGS shall be as per Table – 1.

Table – 1: Inter-distance between Facilities at CGS

Sr. No.	**From/To**	1	2	3	4	5	6
1	Compound Wall	-	6	6	6	6	6
2	Control Room / Office Building / Store	6	-	12	12	2	15
3	Pressure Regulation and / or Metering	6	12	-	2	12	15
4	Odorant System	6	12	2	-	12	15

5	Electrical Sub Station	- #	2	12	12	-	15
6	Gas fired heaters	6	15	15	15	15	-

Notes:

1. All distances are in meters. All distances shall be measured between the nearest points on the perimeter of each facility.

2. For all the distance from the compound wall, the distance mentioned in this table and the local byelaws, whichever is higher is to be considered.

As per State Electricity Board recommendations.

Properly laid out roads around various facilities shall be provided within the installation area forsmooth vehicular access.

Facility shall be provided with proper boundary wall / fencing with gate(s) in line with MHA (Ministry of Home Affairs) guidelines.

Buried piping inside the CGS area shall have a minimum depth of cover of 1.2 m. Where buried pipes come out of the ground, the underground coating on the pipe will continue for a length of at least 300 mm above ground.

Platforms and crossovers shall be provided for ease of operation and maintenance of equipment and piping where required.

Provision should be made for venting, purging and draining all sections of pipe work and equipment that may have to be isolated during construction or maintenance.

All vents shall be routed to a safe area and in a manner that gas vented out is blown away from the nearest building. Height of vent shall be minimum three (3) meters above working level. Distance between vent and boundary wall / fence shall be minimum five (5) meters.

Gas detectors shall be installed at strategic locations covering to detect any gas leakage.

In case fired gas heaters are installed for heating of gas, all other facilities handling gas should be located down wind from heaters.

(b) *Distribution Pressure Regulating Station (DPRS) and Individual Pressure Regulating Station (IPRS)*

DPRS facilities can be located above ground or below ground.

In case DPRS is located below ground, the facilities shall either be inside a enclosed chamber with a provisions for entry of authorized personnel or be a buried hermetically sealed module type with proper cathodic protection.

[1][In case butterfly valves are used in underground DPRS, the same shall conform to the requirements given in Annexure – I. Further, a dedicated isolation valve shall be installed upstream of such underground skid.]

For below ground installations, the vent line shall be terminated at a minimum height of three (3) meters above the ground level.

IPRS shall normally be located above ground.

DPRS/IPRS installed above ground shall be provided with proper security fencing as per requirement of local authorities. The distance between fencing and the wall of nearest building / structure shall not be less than two (2) meters.

[2][For Wall mounted regulating system, safety features like crash guards, caging of facilities and like other facilities shall be provided. Further, the maximum outlet pressure shall be restricted up to 2.0 bar (g).]

[NOTES:

i. **The consumer, shall be responsible for ensuring the separation distances for customer owned IPRS**

ii. **Customer shall ensure that IPRS installation has been independently approved by certified third party agency before the entity supplies the gas.**

iii. **The consumer shall ensure recertification once in 3 years.]**

Requirements for Electrical Installations in CGD Network

All electrical equipment / installations shall meet following requirements:

- Electrical area classification of Installation, as basis for selection of Electrical Equipment, shall follow IS-5572.

- The specification of Electrical equipments shall be in line with IS-5571, "Guide for selection of Electrical Equipment for Hazardous Area".

- Fire protection in Electrical installations shall be provided as per requirements specified in this standard.

- All electrical equipment, systems, structures and fencing, etc. shall be suitably earthed in accordance with IS 3043. The earthing system shall have an earthing network grid

[1] Ins. by point (A) of Sub-Cl. (iii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019, (w.e.f. 07.11.2019).
[2] Ins. by point (A) of Sub-Cl. (iii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019, (w.e.f. 07.11.2019).

with required number of electrodes. All Electrical equipment operating above 250 volts shall have two separate and distinct connections to earth grids. Separate earthing grid shall be provided for instrument and electrical power.

- Lightening protection shall be provided as per the requirements of IS:2309. Self-conducting structures having metal thickness of more than 4.8mm may not require lightning protection with aerial rod and down conductors. They shall, however, be connected to the earthing system, at least, at two points at the base.

Instrument and Control System

Instrumentation and control system for the CGD networks, shall in general meet the requirement of API Standards: API- RP-551, 552, 553, 554, 555 and 556 "Manual on Installation of Refinery Instruments and Control Systems" to the extent applicable.

Buildings Intended for Human Occupancy and Location Classes for Design and Construction

For the purpose of determining number of building for human occupancy and Location Classes, 1 -mile distance shall be replaced by 1600 m and fractions thereof.

In case of cluster of buildings, Location Class 2 or Location Class 3 may be terminated a distance of 200 m from the nearest building in the cluster.

Location Class 2 or 3 shall be terminated at least 200 m from the end dwelling i.e. dwelling located at the boundary of the Location Class 2 or 3 as the case may be.

When presence of multi-story buildings alone result in Location Class 4, the Location Class 4 ends 200 m from the nearest building with 4 or more stories above ground.

This standard does not allow Design of pipelines and piping as per Location Class 1, Location Class 2 and Location class 3.

Location Class 1, 2 and 3 shall be used only for re-certification of existing Installations and facilities, which were laid/built/constructed before the date of notification of these regulations.

STEEL PIPE

Additional Requirement for Nominal Wall Thickness

Consideration shall also be given to loading due to following while selecting nominal wall thickness t as per ASME B 31.8 as appropriate:

- Overburden loads
- Dynamic and seismic loads
- Cyclic and vibratory loads
- Internal pressure fluctuations
- Geo-technical loads (including slides, differential settlement of piping, loss of support, and thermal effect of the pipeline on soil properties).

In any case minimum thickness of pipe permitted as per this standard shall not be less than 6.4 mm, irrespective of the grade of the pipe material.

[1][In any case minimum nominal thickness of pipe permitted as per this standard shall be 6.4 mm for pipe size 4 inch nominal dia. and above, irrespective of the grade of the pipe material.

In all existing cases where thickness of pipe is less than 6.4 mm for pipe size 4 inch and above, Quantitative Risk Assessment shall be carried out and the risk level shall be reduced to ALARP (As low as reasonably possible).

For both aboveground and underground pipe size less than 4 inch nominal dia., the minimum nominal thickness shall be as per table below:

Minimum Pipe Wall Thickness (Ref ASME B36.10 M)		
ANSI Rating- 150 # to 300 #		
NPS	**Identification**	**Schedule No.**
0.5	XS	80
0.75	XS	80
1	XS	80
1.5	XS	80
2	XS	80
3	STD	40

]

Design Factors F and Location Classes

Design factor corresponding to Location Class 4 shall only be used.

All exceptions to basic design factors to be used in design formula shall be as per Table – 2 of this standard.

Pipelines or Mains on Bridges

Pipeline on bridges should be avoided. Under unavoidable conditions, pipeline installed on

[1] Subs. by point (B) of Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2014, for 'para 2 & 3 under the head of Steel Pipe in Schedule 1D' (w.e.f. 16.12.2014).

railroad, vehicular, pedestrian, or other pipeline bridges, a design factor of 0.40 shall be used for Location Class 4.

In cities where crossing the river through HDD crossing is not possible, pipeline laying on river bridges is permitted.

Metering Facilities

Upstream dry gas filter(s) shall be installed when rotary or turbine meters are used.

Pressure / Flow Control Facilities

(a) Protection against over pressure of pipeline or mains downstream of city gate station (CGS) shall be provided as follows:

(1) The provision of *Active / Monitor Regulator System* (i.e. monitor regulator in series with a controlling (active) regulator) shall be the principal method of controlling pressure.

[**Note: To avoid problems associated with a regulator being at rest for prolonged periods it is recommended that the monitor regulator is so impulsed that it can also operate as a first stage regulator.]**

(2) Adequately sized pressure relief valve(s) could be used for overpressure protection downstream of controlling regulator(s) provided Quantitative Risk Assessment is made for environmental hazards (fire / explosions) associated with large release of gas volume of gas release and the risks are found within acceptable level.

Pressure relief valve(s) should be carefully sized to meet their required duty and to minimize the volume of gas released. The speed of relief valve opening should be adequate and they should re-seat cleanly when normal pressures are restored. The relief valve should be installed and provided with test connections in the impulse pipe work in such a way as to enable them to be set up and tested in-situ.

(3) Over pressure of shut-off valve(s) or Slam-Shut Valve(s) upstream of the controlling regulators are preferred as overpressure protective devices instead of pressure relief valves. Being ultimate overpressure protection for the pipeline system, it is essential that the Slam-Shut valves are fast closing, highly reliable and secure valve.

(b) The isolation valve of the sensing lines of regulators and slam shut valves should have provision for locking in open position.

(c) Additionally suitable gas heaters upstream of regulators / control valves/ pressure reduction system should be provided in case after pressure let down operating conditions would result in low temperatures beyond design conditions of downstream facilities.

(d) Sound pressure levels shall be limited to the values prescribed by Environmental

Authorities but in no case it shall exceed 110dbA.

Table 2 - Design Factors for Steel Pipe Construction				
Facility	Location Class			
	1*	2*	3*	4*
Pipelines	0.72	0.60	0.50	0.40
Crossings of roads, without casing: (a) Private roads (b) Unimproved public roads (c) Roads, highways, or public streets, with hard surface	 0.72 0.60 0.60	 0.60 0.60 0.50	 0.50 0.50 0.50	 0.40 0.40 0.40
Crossings of roads, with casing: (a) Private roads (b) Unimproved public roads (c) Roads, highways, or public streets, with hard surface and Railway crossings	 0.72 0.72 0.72	 0.60 0.60 0.60	 0.50 0.50 0.50	 0.40 0.40 0.40
Pipelines on bridges	0.60	0.60	0.50	0.640
Parallel Encroachment of pipeline on roads and railways (a) Private roads (b) Unimproved public roads (c) Roads, highways, or public streets, with hard surface and Railway crossings	 0.72 0.72 0.60	 0.60 0.60 0.60	 0.50 0.50 0.50	 0.40 0.40 0.40
Pipeline on bridges	0.50	0.50	0.50	0.40
River Crossing- open cut [1]	0.72	0.60	0.50	0.40
Horizontal Direction Drilling (HDD) [1]	0.72	0.60	0.50	0.40
Compressor station piping	0.50	0.50	0.50	0.40
Fabricated assemblies (scraper traps, SV stations, pressure/flow control and metering	0.60	0.60	0.50	0.40

facilities, etc.) [2]				
Near concentration of people in Location Classes 1 and 2[3]	0.50	0.50	0.50	0.40

Notes:

1 Higher thickness may be used if required to control stresses or stability during installation and operation.

2 Thicker pipe in Location Class 1 is required throughout the assembly and for a distance equal to lesser of 5 diameters or 10 ft in each direction beyond the last fitting.

3 Near concentration in Location Class 1 and 2 means places of public assembly (school, temple, church, hospital, club, markets places etc.) used by 20 or more people frequently.

***Location Class 1, 2 & 3 shall be used for the purpose of recertification of Existing Installations only.**

(e) Gas velocities in piping up to 20 m/sec before filter and 40 m/sec (120 ft / sec) after filter, at peak flow conditions, may be permitted provided care is taken to ensure that allowable sound pressure values are not exceeded and materials selected are suitable to prevent erosion at such high velocities.

However, the gas velocity shall not cross the recommended velocity given by the Original Equipment Manufacturer for the equipments used in the PRI**.**

(f) Gas filtration facilities with 100% redundancy shall be provided to avoid damage to instrumentation and other facilities.

(g) Immediately downstream of regulators or control valves, use of conical reducers is recommended.

(h) In order to prevent over pressurization of piping downstream of regulators / control valves, creep relief valve should be provided, if required.

(i) For isolation of the CGS during emergency, quick closing valve (with remote operation facility in case of unmanned station) shall be installed at the inlet of CGS.

Protection of pipelines and mains from hazards

When steel pipelines or mains are installed in areas that are normally under water, anti-buoyancy measures adopted shall be such that specific gravity of resulting installation is 1.10 or more.

Pipelines and mains installed on bridges and other locations where they are exposed to accidental damages due to vehicular traffic, suitable barricades / crash guards shall be installed for their protection.

The pipeline in close proximity to unstable structures, landfill sites or where construction could lead to damage to pipeline, should be avoided.

Pipelines and mains installed in the areas normally under water or subject to flooding (i.e. lakes, bays, or swamps etc.) shall be provided with addition anti-buoyancy measures such as concrete weight coating, geo-textile bags filled with graded stones or anchorages, etc. toprevent floatation. Minimum specific gravity of installation shall be 1.2 afterproviding anti-buoyancy measures.

Cover, Clearance and Casing Requirements for Buried Steel Pipelines and Mains

Minimum depth of cover for buried steel pipelines shall be as per the table given below;

Table – 3: Minimum Cover Requirements for Steel Pipelines	
Location	**Min. Cover [1] (m)**
Normal / rocky terrain	1. 0
Minor river / unlined canal / nala crossings, tidal areas and other watercourses [2]	1. 5
Major river crossings [2]	2.5
Rivers with rocky bed	1.5
Lined canals / drains / nalas etc.	1.5
Drainage ditches at roadways and railroads	1. 0
Rocky Areas	1. 0
Cased / uncased road crossing [3]	1. 2
Cased railroad crossings [3]	1. 7

NOTES:

1. Cover shall be measured from the top of coated pipe to the top of the undisturbed surface of soil or the top of graded working strip, whichever is lower. The fill material in the working strip shall not be considered in the depth of cover.

2. For river / watercourses that are prone to scour and / or erosion, the specified cover shall be measured from the expected lowest bed profile after scouring / erosion. Where scour level cannot be established, an additional cover of minimum 1 meter shall be provided from the existing bed of the river/water course.

3. The cover shall be measured from the top of road or top of rail, as the case may be.

Whenever the above provisions of cover cannot be provided due to site constraints, additional protection in form of casing/ concreting etc. shall be provided.

Clearance between Pipelines or Mains and other underground structures

(a) When a buried steel pipeline or main has to cross any existing underground pipeline, cable, drain or other services, the pipeline shall be laid at least 300 mm below from

such services.

(b) When laid parallel to any existing underground cable, drain or other utilities, the pipeline or main shall be laid with a clear distance of at least 300 mm from existing utility.

(c) As far as practical, a minimum separation of three (3) meter should be maintained between the steel pipeline or main and footing of transmission tower.

(d) A clearance sufficiently large to avoid electrical fault current interference shall be maintained between the pipeline and the grounding facilities of electrical transmission lines.

(e) Clear distance between new steel pipeline or main running parallel to existing pipeline should be minimum 5.0 meters when heavy conventional construction equipment is expected to be utilized. This distance may be reduced, after careful assessment of construction methodologies, to three (3) meters, provided it does not result in unsafe conditions during construction. Existing pipeline should be clearly marked on the ground during construction. Bi-language (local language and Hindi / English) caution signs should be installed while working in such areas.

(f) While laying more than one new hydrocarbon pipelines or mains in the same trench, clear separationof minimum 500 mm shall be maintained between adjacent pipelines.

(g) No steel pipeline or main should be located within three (3) meters of any habitable dwelling or any industrial building unless it is provided with at least 300 mm of cover over and above minimum cover specified under Table –3 above or special protective measures such as concrete slab, steel casing are provided.

Casing Requirements under Railroads, Highways, Roads or Streets

Steel casing at road/railway crossings, when provided tomeet statutory requirements,shall be designed in accordance with API 1102. Casing pipe diameter shall be minimum two pipe sizes bigger than carrier pipe. In case of PE, the casing can be RCC pipe of min NP3 class.

Bends, Elbows and Miters in Steel Pipelines and Mains

Miters bends and wrinkle bends are not permitted in pipelines and mains used in CGD networks regardless of operating hoop stress.

Cold field bend radius for pipes of size NPS 20 and larger shall be minimum 40 times the pipe diameter.

As far as possible use of short radius elbows should be avoided.

Hot Taps

Split tees designed to fully encircle the pipe shall be used for making hot taps. The split Tees

shall be designed considering a minimum design factor F = 0.40.

However, in case of Hot taps of size upto 1/4th of the nominal bore of the main pipeline, use of weldolets is permitted in place of split tees.

Full bore ball valve shall be used when making branch connections using hot taps.

Recommendations as per API RP 2201- Recommended Practice forSafe Hot Tapping Practices in the Petroleum and Petrochemicals Industry shall be followed while carrying out hot tapping works.

Where it is not possible to maintain the clearances, cover, vent locations etc. mentioned in this standard, the entity shall carryout special design and construction methodologies through experienced personnel/consultant and seek clearance from the Board.

Testing after Construction

General Provisions

Proper communication facilities shall also be arranged for during testing.

Testing equipments / instruments shall be properly inspected and shall have valid calibration certificates before they are used for testing.

Test Required to Prove Strength of Pipelines and Mains to operate at Hoop Stresses of 30% or more of Specified Minimum Yield Strength of Pipe

All buried steel pipelines and mains shall be pressure tested after installation using water as a test medium. Minimum test pressure shall be equal to 1.4 times *Maximum Allowable Operating Pressure.*

Test procedure as per ASME B 31.8 Appendix N "Recommended Practice for Hydrostatic Testing of Pipelines in Place" shall be followed.

Hold-up time for the pressure testing shall be minimum 24 hours for underground and four hour aboveground pipeline.

Safety During Tests

Relevant Warning Signs shall be displayed at the test area.

The test area shall be properly cordoned to prevent any accidents.

A proper Emergency Response Plan shall be in place and emergency contact numbers of relevant agencies should be visible.

Commissioning of Facilities

Appropriate Work Permit should be issued based on the kind of activity.

Fire fighting equipments should be available during commissioning.

Proper communication facilities should also be arranged for.

A proper Emergency Response Plan should be in place and emergency contact number of relevant agencies should be available.

OTHER MATERIALS

Ductile Iron Piping System Requirements

Use of ductile iron piping is not permitted for CGD networks as per this standard.

Design of Plastic Piping

Plastic pipe shall not be used for *Pipeline and Distribution Mains* operating at pressure in excess of 100 psig.

Use of thermosetting plastic piping is not permitted as per this standard.

Plastic Pipe and Tubing Design Formula

[1][The design pressure for plastic gas piping systems or the nominal wall thickness for a given design pressure shall be determined by the following formula:]

$$P = 2S * (t / (D-t)) * 0.32$$

Where

D	=	Specified outside diameter in mm
P	=	Design pressure in psig
t	=	Nominal wall thickness in mm
S	=	Long term hydrostatic strength in barg(psig) determined in accordance with applicable pipe specification at temperature equal to 73°F, 100°F or 120°F.

Thermoplastic Design Limitations

The design pressure shall not exceed 100 psig (7 bar).

Thermoplastic pipe, tubing and fittings shall not be used where operating temperature of the materials will be:

[1] Subs. by point (ix) of Cl. (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

1) Below 32°F (0 degree centigrade) or

2) Above 120°F (50 degree centigrade) or temperature at which long term hydrostatic strength used in design formula in para 842.31 of ASME B 31.8 is determined, (whichever is lower).

Minimum thickness shall not be less than 2.3 mm.

Pipe wall thickness selected shall be such that it corresponds to Standard Dimension Ratio indicated in Table–4 below. Pipes with non standard SDR should not be used.

Table 4 - Wall Thickness and Standard Dimension Ratio for Thermoplastic pipes

Nominal Outside Diameter in mm	Minimum wall thickness in mm for Standard Dimension Ratio, SDR			
D	**17.6**	**13.6**	**11**	**9**
16	2.3	2.3	2.3	2.3
20	2.3	2.3	2.3	2.3
25	2.3	2.3	3.0	3.0
32	2.3	2.3	3.0	3.6
40	2.3	3.0	3.7	4.5
50	2.9	3.7	4.6	5.6
63	3.6	4.7	5.8	7.1
75	4.3	5.5	6.8	8.4
90	5.2	6.6	8.2	10.1
110	6.3	8.1	10.0	12.3
125	7.1	9.2	11.4	14.0
140	8.0	10.3	12.7	15.7
160	9.1	11.8	14.6	17.9
180	10.3	13.3	16.4	20.1
200	11.4	14.7	18.2	22.4

Design Pressure of Plastic Fitting

All fittings used shall be electro fusion type. Other types of fittings are not permitted**.** [1][All PE fittings shall conform to ISO 4437 Part 3 or EN 1555 Part 3]. The wall thickness of the fittings shall be more or equal to the wall thickness of the pipe jointed.

Protection from Hazards

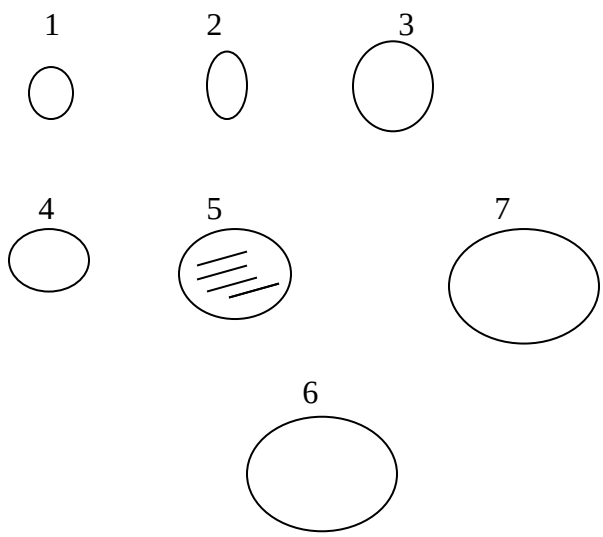
[1] Subs. by point (x) of Cl. (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

In addition to requirements specified under Para titled *Protection of Pipelines and Mains from Hazards* in this standard, following additional requirements shall be complied with.

The relative position of CGD network with respect to other underground utilities shall be as given in Figure 1:

Where open cut techniques are used, a warning tape of Yellow colour shall be laid 200 mm above the pipe.

Road Berm / Footpath



1 / 2 - Elec. Cable (Low Voltage)

3 Telecom Cable

4 Elec. Cable (High Voltage)

5 Gas Pipeline

6 Water Pipeline / sewage line7 Other hydrocarbon product pipelines

Figure 1 – Relative Position of Gas Pipeline and Distribution Mains

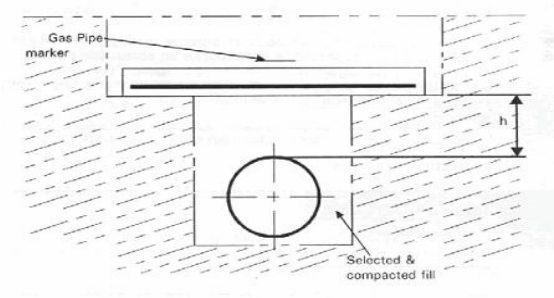


Figure 2 (a) - Concrete Slab

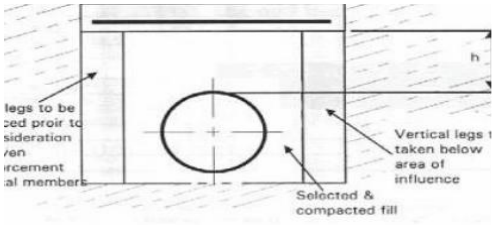


Figure 2 (b) - Concrete Slab with supports

When insisted by the authorities at identified locations, a layer of brick /concrete or impact resistant tape may be laid over pipeline as a protection against excavating machinery as indicated in the Figure – 2 (a) or (b).

Plastic Pipe and Tubing Joints and Connections

General Provisions

Threaded joints in plastic pipe are not permitted.

Plastic piping joints shall be made by Electro Fusion fittings only. [1][****]. Jointing of plastic piping by butt fusion method, solvent cement method, adhesive method, heat fusion method or by means of compression couplings or flanges is not permitted. Recommendations of the fitting manufacturer shall be followed in this regard.

All electro fusion fittings shall be bar coded and the control unit shall be equipped with bar code reader to directly transfer fusion data to control unit. Bar coding shall be long lasting even when the joint is buried in corrosive soil, alternatively each fitting shall have a data card which can be read by the computer and thereafter the card is positioned with the joint.

Installation of Plastic Piping

Installation Provision

Use of thermoplastic piping in above ground piping is not permitted unless the piping is completely protected against deterioration (e.g. high temperature ultra violate degradation) by corrosion protected metallic or reinforced concrete or Glass Reinforced Plastic (GRP) enclosure.

Direct Burial

Directly buried thermoplastic pipe shall have a minimum thickness of 2.3mm.

[1] The words and expression specified under General provision of Schedule 1D, shall stand omitted by point (xi) of Cl. (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016, (w.e.f. 24.11.2016).

Trench width shall be at least 300 mm.

The bed of the trench shall be free of sharp objects, stones etc. In rocky areas trench shall be padded with soft soil or sand to minimum depth of 150 mm below the pipe.

Bends and Branches

Branch connections shall be made only by socket type electro fusion tees or electro fused Saddle connections.

Hot Taps

Use of special saddle or split tee type electro fusion fittings for hot tapping is permitted.

Testing Plastic Piping after Construction

General Provisions

Testing equipments / instruments shall be properly inspected and shall have valid calibration certificates before they are used for testing.

Proper communication facilities shall be available during testing.

Test Requirements

Thermoplastic piping shall not be tested at material temperature above 120°F (50 degree centigrade).

Test medium shall be air or nitrogen for test pressure up to 100 psig. For test pressure higher than 100 psig, water shall be used as test medium.

Test duration shall be minimum 24 hours for plastic distribution mains of length greater than 1 km and minimum 4 hours for length shorter than 1 km.

In case water is used as test medium, test duration shall start after achieving thermal stabilization.

Suitable relief valve set at 5% higher than test pressure shall be fitted at the test heads to avoid over pressurization during testing.

Test Requirements for DPRS and IPRS Piping

DPRS and IPRS piping shall be subjected to strength test and leak test, before commissioning, as given in table-5 below:

Table 5 – Testing Requirements for DPRS and IPRS Piping

Design Pressure	Min. Test Pressure	Test medium	Min. Test Duration
Up to 138 mbarg (2 psig)	3.45 barg (50 psig)	Air	2 hours
From 138 mbarg to 4.14 barg (2 to 60 psig)	1.5 times Design Pressure	Air	2 hours
Above 4.14 barg (60 psig)	1.5 times Design Pressure	water	2 hours

Acceptance criteria shall be no pressure loss after accounting for temperature variation.

Safety During Testing

Relevant Warning Signs shall be displayed along the test section.

The test area should be properly cordoned to prevent any accidents.

A proper Emergency Response Plan shall be in place and emergency contact numbers of relevant agencies should be available.

CONTROL AND LIMITING OF GAS PRESSURE

[1][Control and Limiting of Gas Pressure in High Pressure Steel or PE Distribution System]

Use of automatic shut-off device (slam shut valves) as a means of accidental over- pressure of high pressure distribution system is preferred over pressure relief valves or weight-loaded relief valves or spring loaded diaphragm type relief valve.

DPRS/IPRS shall normally be equipped with minimum two safety devices. At least one of them shall be a slam shut valve operating on over pressure for those installations whose inlet operating pressure is more than 60 psig.

To prevent over pressurization of downstream system during periods of low flow, creep relief valve can be used. If a monitor regulator is installed in the system, it shall be such that it is the first acting device in the pressure safety system.

Control and Limiting of Gas Pressure in low Pressure Distribution Systems

[1] Subs. by point (xii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

A combined Over Pressure Shut-Off (OPSO) regulator with built-in creep relief is also acceptable device for control and limiting of gas pressure in low pressure distribution system.

[1][****]

Service regulator with a built-in Under Pressure Shut-Off (UPSO) regulator is also acceptable device for control and limiting of gas pressure to consumer.

VALVES

As far as practical, the valves in the distribution mains should be installed below ground with the valve operating device readily accessible. A stem extension may be used to elevate the valve operator above ground provided it does not cause obstruction to traffic and / or pedestrians. In such cases, sealant / lubrication points and vent pipe work shall also be extended above ground for ease of operation.

Valves of size 4 inches and above shall be fitted with double block and bleed facility.

Spacing between valves on distribution mains, whether for operating or emergency purpose shall be decided as follows:

(a) High Pressure Distribution System:

Based on operation and maintenance flexibility requirements, valves may be provided on:

- Either side of water body crossings.
- Strategic take-off points including future developments.

Based on risk associated with emergency situations requiring speedy isolation and resulting number and type of customers affected by such emergencies etc.

- In steel distribution mains valve spacing should normally not be more than 3 km,

[2][The inter–distance between the Sectionalising Valves in steel pipes in CGD networks outside municipal limits can be maintained as per PNGRB (Technical Standards and Specifications including safety Standards for Natural gas pipelines) Regulations, 2009 considering the location class after complying the following, namely:

i. The steel pipelines in the CGD networks shall be designed considering location Class-4;

[1] Subs. by point (xiii) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).
[2] Ins. by sub-cl (B) of CL. (2) of reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020).

ii. The gas in the network is odorized and filtered; and

iii. Additional number of SVs shall be provided to meet the requirements as per location class in case of, the change in the population density. The assessment of location class shall be undertaken every year]

- In plastic distribution mains valve spacing should normally not be more than 1 km.

The above spacing, however, may be increased or decreased based on risk assessment and to allow location of valve at an easily accessible location.

(b) Low Pressure Distribution System:

Valves in low pressure distribution system may be provided at locations requiring isolation for ease of maintenance in addition to those required as per following Para.

Distribution System Valves

A valve shall be installed on the inlet and outlet piping of each regulator station controlling flow or pressure of gas in distribution system. The distance between the valve and regulator(s) shall be adequate to allow operation of the valve during emergency (such as large leakage or fire). These valves should be located in a manner that they are easily accessible during emergency.

VAULTS

Accessibility

In case part of Vault or Pit extends above ground (e.g. to avoid water flooding in low lying areas that cannot be avoided), then, it shall be located such that it causes minimum interference / hindrance to the traffic / pedestrians.

CUSTOMERS' METERS AND REGULATORS

Location for Customers' and Regulator Installations

Customer meter shall preferably be located on the wall outside the kitchen, however, when customers' meters and regulators are located inside the building, it should be located in a well ventilated area.

GAS SERVICE LINES

General Provisions Applicable to Steel, Copper and Plastic Service Lines

Service lines shall be sized for a maximum flow velocity of 15 m / sec.

Installation of Service Lines

[1][All plastic pipe and fittings shall be laid underground and shall not be exposed.

The buried service lines shall be provided with a minimum cover of 1.0 m. Where it is impractical to provide 1.0 m cover due to physical constraints, additional protective measures such as concrete slabs or high impact resistance plastic sheets shall be installed at least 300 mm above the service line. In no case the depth of cover shall be less than 600mm.

For transition from plastic pipe to GI pipe, transition fittings shall be used. Plastic part of transition fitting protruding above ground shall be protected by encasing it with concrete guard.

In case carbon steel section beyond transition fitting is below ground, it shall be protected against corrosion by minimum 400 micron thick 2 pack high build epoxy coating.

Above ground service piping shall be Galvanized Iron or copper or carbon steel protected by anti-corrosive coating.

Wherever the service line riser is installed in confined spaces like basements, only welded risers shall be used. The gap between riser and wall shall be minimum 25 mm to and shall be supported at every 2 m. Ventilators shall be provided in confined space. [2][In case, natural ventilation is not available, the Petroleum and Natural Gas Regulatory Board (Gas Supplies to Multi Occupancy Residential Buildings) Guidelines, 2020 and the Petroleum and Natural Gas Regulatory Board (Gas Supplies to Industrial, Commercial Customers) Guidelines, 2020. as applicable shall be adhered to.]

[3][The depth of cover can be further reduced upto 375 mm provided it meets the following requirements:

i. The line pressure shall not exceed 110 mbar.
ii. The diameter of pipe shall not exceed 63mm.
iii. Pipe shall be laid in a trench with Reinforced Cement Concrete (RCC) slab at the top and bottom. The RCC slab of the roof of basement shall be treated as the bottom.
iv. There shall be a sand filling across three sides of the line pipe of 100 mm each.
v. RCC on top shall have minimum thickness of 150mm.
vi. The top side shall be covered by warning mat.
vii. The Quantitative Risk Assessment (QRA) of the site shall be carried out and specific approval from management shall be taken for reducing the depth of cover upto 375mm.
viii. The site shall be private property i.e. multi-storey buildings / apartments with no movement of heavy vehicles.]

[1] Subs. by point (c) of Cl. 2, ibid., for 'Schedule 1D' (w.e.f. 09.03.2016).
[2] Ins. by sub-cl (C) of CL. (2) of reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020).
[3] Ins. by point (xiv) of Cl (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

Usage of PE pipes to construct above-ground risers is permitted, subject to meeting the following requirements, namely: -

(a) PE pipe employed shall conform to the requirements specified at Annexure 1 of these regulations;

(b) The PE pipe shall be used starting from a height of 3 metres from the ground level, up to which GI pipe shall be used ;

(c) The PE pipe shall be entirely protected from exposure to sunlight and any damage due to external impact;

(d) The fittings employed and the jointing method for the PE riser system shall conform to the requirements of GIS / PL3: 2006 standard.]

Type of Valves Suitable for Service Line

Valves

Soft seated valves in service lines are not permitted.

Steel Service Lines

Design of Steel Service Lines

All underground steel service lines shall be joined by welding using qualified welding procedure and welders.

Installation of Service Lines into or Under Building

Use of sleeve for laying steel pipe through wall, or under outer wall foundations of building or under the building is not recommended. Such underground lines shall be protected against corrosion by minimum 400 micron thick 2 pack high build epoxy coating.

Ductile Iron Service Lines

Use of ductile iron service lines is not permitted.

Plastic Service Lines

Design of Plastic Service Lines

Only electro fusion fittings shall be used in plastic service piping including pipe to pipe joints.

Installation of Plastic Service Lines

Installation of plastic pipe above ground is not recommended. In case any section of plastic pipe extends above ground, it shall be completely encased in a concrete casing. Use of

flexible conduit is not permitted.

Installation of Plastic Service Lines into or Under Buildings

Installation of plastic service lines under or inside the building is not permitted as per this standard.

Service Line Connections to Mains Service Lines Connections to Steel Mains

Service line connection to steel mains shall be as follows:

- In case of plastic service line, connection to underground steel main shall be by use of transition fitting in plastic piping with steel part of transition fitting welded to steel main piping.

- Direct connection of galvanized iron or copper service lines to underground steel mains is not permitted.

Service Lines Connections to Plastic Mains

- In case of plastic service line, connection to plastic main shall by use of electro fusion fittings only.

- Direct connection of galvanized iron or copper service lines to underground plastic mains is not permitted.

PIPING BEYOND CONSUMER METER SET ASSEMBLY TO GAS APPLIANCE

Piping connecting consumer meter set assembly to consumer gas appliance shall be either GI or copper up to last valve located near actual appliance.

[1][A metal seated leak detection cum excess flow shut off valve may be provided near the appliance located at easily accessible location by the authorised entity.]

A metal seated leak detection cum excess flow shut off valve shall be provided near the appliance located at easily accessible location by the authorised entity. The valve shall be designed to shut off in case of sudden leakage of gas from the hose or in case of burner flame-off condition.

Appliance shall be connected to gas line with a flexible and braided hose as per IS 9573. The hose shall not be exposed to internal or external temperature exceeding the recommended limits. Care shall be exercised not to exceed permissible bend radius specified in IS: 9573 (Table 1 - Dimensions and bend radii for rubber hoses).

Length of this hose shall be kept minimum. However, in no case the length shall be more than

[1] Subs. by point (B) of Sub-Cl. (iii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019, (w.e.f. 07.11.2019).

1.5 meters. Both ends of the hose shall be firmly clamped on the nozzle by metallic clamps.

Schedule – 1E

OPERATING AND MAINTENANCE PROCEDURES

The present standard covers the City Gas Distribution, Design, Installations, Commissioning and Operation in general. The Operation and Maintenance Procedures prescribed herein under are for general guidelines to be implemented as per the provisions of the standard. The entities engaged in laying, building, operating and expending City or Local Gas Distribution Network will create an organization handling operating and maintenance including meeting the emergencies arising in the system.

The main operation area would be to handle gas receipt, odorisation and pressure reduction (including heating the gas, if required) and managing the district regulating station, field

regulators and gas metering for all kind of customers such as domestic, commercial and industrial.

The gas measuring billing including energy balance shall be part of the operation. The safety, health and environment including compliance of regulatory measures shall be a part of the responsibility of the operating group. The maintenance activity shall cover the maintenance and upkeep of the City Gate Station(s), District Regulating Stations, Field Pressure regulating Stations and end consumers facilities, sectionalising valves and other assets and facilities. This inter-alia will evolve regular maintenance, route patrolling to contain third party damages and maintenance of safety provisions including offsite emergency plan and onsite emergency plan, mutual aid and disaster management plan. The following sections briefly refer to such activities: -

1. Operating and Maintenance Procedures affecting the safety of gas transmission and distribution facilities.
2. External Corrosion Control
3. Odorisation

OPERATING AND MAINTENANCE PROCEDURES AFFECTING THE SAFETY OF GAS TRANSMISION AND DISTRIBUTION FACILITIES.

Basic Requirements

The entity operating a CGD network shall have an effective Health, Safety and Environment Management System (HSE Management System) and Management of Change System in place to ensure overall safety during operation and emergencies.

The HSE Management System shall cover the following key elements.

- HSE Policy Statement
- Organizational objectives to ensure implementation of the policy
- Set of detailed processes supporting each activities of the HSE management system
- Implementation of control and monitoring activities
- Periodic monitoring, review and reporting of performance
- Audit of internal and external activities

Following processes shall be prepared as part of HSE Management System:

- Emergency Management System to safely handle emergencies with minimal risk.
- Disaster Management Plan encompassing offsite and onsite emergency response plans and mutual aid system
- Hazard Identification Processes such as HAZOP
- Risk Analysis and Risk Assessment Process such as QRA
- Safety and Technical Competency System.
- An Operational Health and Safety Legal applicability Matrix as well as Operational Health and Safety (OH&S) Legal Compliance matrix.
- An Environmental Legislative Register (ELR) to provide the user a register of

practical implementation in terms of day-to-day activities with which the operation has to comply. Of particular relevance are the details of consents / permits / authorization or licenses required for an activity and from whom and how it is obtained.

- Additional practices like carrying out periodic Work Place Inspection of all Critical Activities by senior management team, implementation of Behavior Based Safety Programs and implementation of Safety Intervention System should be considered to improve the safety culture of the organization.

For Safe Control of Operations (SCO), a systematic *Management of Change* process shall be developed to identify and consider the impact of changes to pipeline systems and their integrity. Management of Change should address technical, physical, procedural and organizational changes of the system, whether permanent or temporary

GIS based asset management system: The entity operating a CGD network shall put in place a GIS (Geographical Information System) based system with the intention of capturing the entire underground gas network and customer database. This system shall include details of the entire pipe network. All the pipelines laid shall be identified in GIS through geo-referenced co-ordinates. All failures in the pipelines shall be mapped in GIS for investigations.

The system shall include the following features: -

A) Entire network view ability on one platform to manage the huge database.

B) All network extension and expansion to be mapped and updated in GIS with geo-referenced co-ordinates for better identification.

C) Immediate availability of the new constructed pipeline locations and customer base information to the user groups allowing related analysis, planning and future projections of new possibilities of pipelines, customers, gas volumes and revenue including jobs to be undertaken by third party.

GIS shall be used during the entire life cycle of the asset.

Essential Features of the Operating and Maintenance plan

Operating and Maintenance procedure should also address the following;

- Preventive maintenance plan and procedures required in accordance with recommendations of Original Equipment Manufacturer(s) (OEMs).

- A well-designed system of periodic inspection for all facilities.

- Calibration plan for meters, gauges and other instruments affecting quality and safety of system.

- Plan for functional testing of pressure regulation and control equipment (Active / Monitor Regulator, Slam Shut Valve, Pressure Relief Valves, control valves etc.).

- Isolation scheme (complete with drawings showing the orientation of the facilities, location of major services, power switches, entry and emergency exits, fire assembly points etc.). It should cover main components, including their identification number.

- Limits of operating parameters (pressure, temperature, flow, levels etc.)

- An Alarm Management System to monitor, analyze, segregate and appropriate action.

- "Work Permit" procedures to be followed by maintenance personnel for protection of property from damage and fire etc.

- Procedures to log operation and maintenance activities.

- Personal Protective Equipments (PPE) to be used by all operating personnel.

- Do's and Don'ts and safety precautions during operation and maintenance.

Provisions of periodic inspections along the route of steel pipelines or mains shall include all sections of pipelines and mains irrespective of operating hoop stress.

Essential Features of the Emergency Plan

Entities operating CGD Networks shall provide for an Emergency Control Room, manned round the clock and equipped with effective communication system and emergency vehicles fitted with communication facilities, first aid equipment, fire extinguishers, gas detectors, repair kits and tools, maps, plans, material safety data sheets etc. at its disposal.

The CGD entity shall put in place an Emergency Response Plan, a Disaster Management Plan and a Pandemic Plan. While preparing these plans the entity shall take into confidence the various local authorities (i.e. The Fire authorities, Police authorities, Health authorities, local administration, Disaster Management authorities, Mutual aid, Factory inspectorate etc.) and clearly elaborate on their role in case of an incident.

Accident / emergency reporting procedures

The entity shall put in place a documented in house accident reporting procedure and its response plan for all kind of accidents/emergencies such as (i) near miss accidents, (ii) accidents without loss of production, supply or human life, (iii) accidents with loss of production, supply or human life, (iv) fire (v) explosion or other emergencies leading to disaster effecting outside public. The level of reporting shall also be mentioned in the procedure. The Board shall be informed in respect of the accidents/emergencies under category (iii), (iv) and (v) above with remedial measures for avoiding recurrence in the format placed at Enclosure-I of Schedule -1E. The entities shall investigate and report each of the above incident/accident to different level as specified in the above enclosure.

Notwithstanding anything contained herein under, in case any incident escalates and gets media attention or gets published in newspapers, the entity shall proactively inform the Board of the same immediately with preliminary investigation report. Further, detailed report of the findings shall be furnished to the Board within a period of thirty days.

Written Emergency procedures

Special attention should also be given to following while preparing Emergency procedures:

- "Do's and Don'ts" during and emergency and other safety instructions.
- Telephone numbers of emergency response team members, emergency services, mutual aid industries, district authorities, law enforcing agencies, contractors / vendors, fire services, district civic authorities, etc.
- Actions to be taken during an emergency including warning / cordoning off of affected area and informing the civil authorities and / or other utility companies affected by any emergency.

Training

- Training shall be imparted to the CGD Network operating and maintenance staff at the time of induction followed by periodic refresher courses. The training program should cover following:
- Hazardous characteristics of Gas.
- Familiarization with commissioning, operation and maintenance procedures.
- Hands on experience on operation of emergency and manual shut down systems.
- Effective isolation of any gas leak.
- Safety regulations and accident prevention.
- Firefighting equipment operation and its upkeep.
- First Aid and Housekeeping

The training process should be subjected to periodic internal audits to ensure effective implementation and improvement.

Training shall include mock safety drills, at least twice a year.

Training program shall also envision imparting training to employees and contractors of other utility companies sharing the same corridor to make them aware about hazards associated with leak / damages

Liaison

Entity owning or operating CGD networks should have designated personnel to liaison with other existing utility companies, district local administration and gas supplying companies. A utility co-ordination team consisting of representatives from all other utility companies and civil authorities can substantially improve safety records.

Educational Programs:

Entities operating CGD Networks shall undertake a comprehensive public awareness program for consumers and general public. The educational material shall be prepared in local, Hindi and English language. Local audio visual media available should be used for such educational programmes.

Pipeline Failure Investigation

Besides reporting and recording of all instances of asset related failures, damage to the environment and third party property shall also be recorded.

Failure investigating team shall comprise personnel trained in failure investigations.

The data from all failure occurrences should be analyzed for trends so that proper initiatives including training could be taken to minimize failures.

Prevention of Accidental Ignition

Site Specific Risk Assessment should be carried out before commencing any repair activities. The outcome ofsuch risk assessment should be documented and considered while preparing safety plan for the repair work.

No hot work should be undertaken without proper work permit issued by authorized personnel.

Blasting Effects

No blasting should be carried out within city limits and near any third-party structures or facilities. In any case blasting shall only be used after proper authorization from civil authorities even if it is safe to carry out such operations.

DISTRIBUTION PIPING MAINTENANCE.

Markers

Markers shall be positioned along entire network at a maximum spacing of 100 meters in urban area and 200 meters within industrial parks for steel mains.

Additional warning signs or markers shall be installed to indicate the presence of a pipeline at road, highway, railroad, stream, canal, nala crossings and other locations where there is a

possibility of damage or interference.

A marker shall be marked in bold and legible local language and Hindi / English with at least the following:

- Name of CGD Network Operating Company
- Contact Telephone Number to report emergency
- Location Area Code
- Warning - "High Pressure Gas Line, Dial before Digging" etc.

Markers may not be installed for service pipeline within consumer premises, however, the Operating Company shall maintain such service pipeline routing drawings for easy reference. The operating company shall provide minimum safety information to the consumer/customer before starting the gas supply.

It shall be mandatory for the group housing societies/cluster of houses etc. which are providing the inbuilt facilities for the natural gas connectivity to each and every dwelling unit in such buildings to have the line diagrams of the connection piping fixed at the main entrance of such premises.

Patrolling

Patrolling schedule shall be such that entire primary network is inspected at least once in three (3) month and secondary network is inspected at least once every month to observe surface conditions, construction activity, encroachments, soil wash outs and any other factors that may affect the safety and operation of the network.

Leakage Surveys

Operating company must have an effective method to identify and locate leakages in the system. [1][Any one or combination of methods described in ASME B31.8 can be adopted based on their effectiveness for the specific areas.]

Highly congested areas shall be surveyed using gas detectors at least once in three months. Other less congested areas shall be surveyed at least once a year.

Leakage Surveys using gas detectors shall be done in accordance with the requirements of ASME B 31.8.

Gas detectors, duly calibrated, shall be available at all times in ready use conditions for emergency surveys and use.

[1] Subs. by point (xv) of Cl. (2). the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

Requirements for Abandoning, Disconnecting, and Reinstalling Distribution Facilities

Abandoning, disconnecting, or reinstalling distribution facilities shall be as per ASME B31.8.

Any activity associated with abandoning, disconnecting, or reinstalling of distribution facilities shall require Work Permit issued by the authorized person

Plastic Pipe Maintenance

The following safety precautions shall be ensured during emergency repairs or breakdown maintenance of pipelines:

- All naked flames, sources of ignition and mobile phones shall not be allowed in the immediate work area.
- Gas level should be monitored during the repair work with gas detectors. The repair shall not be carried out in atmosphere which contains natural gas.
- Adequate fire extinguishing equipment shall be available during such repair.

Squeezing-off and reopening of Thermoplastic Pipe or Tubing for Pressure Control

Location where Squeezing and reopening is done once shall be marked appropriately to identify that the pipe has been squeezed and reopened.

Squeezing of reopened pipe at the same location is not permitted. Minimum distance between consecutive squeeze-off locations shall not be less than five (5) meters.

Repair of Plastic Pipe or Tubing

Damaged or defective plastic pipe shall be cut and replaced with new pipe.

Repair of damaged plastic pipe by using repair patches is not permitted.

[1][Repair of Plastic Pipe or Tubing shall be in accordance with ASME B31.8.]

MISCELLANEOUS FACILITIES MAINTENANCE

Flexible steel braided hose used to connect consumer appliances should be inspected at least once every year for leakage, kinking, corrosion, abrasion or any other signs of wear and damage.

[1] Subs. by point (xvi) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

Any hose worn out or damaged must be removed from service and replaced.

PIPELINE SERVICE CONVERSIONS

Steel pipelines and mains used in CGD Network shall not be used for [1][dual] service.

Conversion of existing steel pipelines, previously used for service other than natural gas, for use in CGD Networks is not permitted [2][unless it meets the requirements of these regulations].

RECORDS

Besides the details of leak records as covered under ASME B31.8 Para 851.6 and 852.6, the CGD Network Company shall also maintain following records/ documents:

- Design specification
- Alignment sheets for primary network of steel pipeline and associated pipe book and other installation and test records
- Surveillance inspection and maintenance records
- Material certification including dimension, metallurgy, destructive and non-destructive testing records, performance and functional test reports
- Welding records including PQR, WPS and welder qualification record
- Commissioning reports
- Non-conformance / deviation records
- Calibration records of Inspection, Measuring, Metering and test equipment
- Audit compliance report
- Statutory clearances
- Approved drawings /documents
- HAZOP / Risk Assessment reports and compliance to recommendations of such reports
- All operation and maintenance manuals

Enclosure-1 of Schedule-1E

[1] Subs. by Cl. (4), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020, for the word 'duel', (w.e.f. 15.09.2020).
[2] Ins. by Supra 2 (w.e.f. 15.09.2020).

Reporting Format

	Type-I **Near Miss incident**	**Type-II** **Without Loss of Productio n, Supply**	**Type-III** **With Loss of Production , Supply or**	**Type-** **IV** **Fire**	**Type-V** **Explosio n /Fire/Gas Leakage/other**
Location	√	√	√	√	√
Time	√	√	√	√	√
First Witnessed by	√	√	√	√	√
Detailsof Incident	√	√	√	√	√
Action Taken	√	√	√	√	√
Reporting Authority	Operat or (O&M)	Operator (O&M)	Shift I/C	HSE Officer	Section I/C
Internal Investigating Authority	Head (HSE)	Head (HSE)	Head (O&M)	Head (HSE)	Head of Station
External Investigation	X	X	√	√	√
Reportto PNGRB	X	X	√ (*)	√(*)	√(*)

√ To be filled in/reported
X Not required to be reported
(*) Shall also include the history of Type-I & Type-II incidents

Schedule – 1F

CORROSION CONTROL

EXTERNAL CORROSION CONTROL

New Installation/Buried Steel Facilities Coating Requirements,

Coatings shall fulfill following requirements:

- Coating shall provide good electrical isolation between external surface of the pipe and environment.
- Coating shall have sufficient resistance to moisture transmission.
- Coating shall have sufficient ductility to resist cracking;
- Coating shall have good mechanical strength or otherwise be protected to resist damage due to normal handling (including concrete coating application where applicable) and soil stress.
- Coating shall be compatible with Cathodic Protection system and field joint coatings.

For carbon steel pipelines or mains of size NPS 2 and above, 3 Layer Polyethylene or Fusion Bonded Epoxy coating is recommended.

All buried bends and fittings shall be coated with Heat Shrink Sleeves or two pack high build liquid epoxy coating with minimum DFT 450 microns

Cathodic Protection Requirement

Electrical Isolation

Where insulating devices are installed to provide electrical isolation of pipeline system to facilitate the application of corrosion control, they shall be properly rated for temperature pressure, and electrical properties and shall be resistant to the gas carried in the pipeline systems. These devices shall not be installed in enclosed areas where combustible atmospheres are likely to be present unless precautions are taken to prevent arcing.

Pipes shall be installed so that the below grade or submerged portions are not in electrical contact with any casing, foreign piping systems or other metallic structures. This shall not preclude the use of electrical bonds where necessary.

Electrical Connection and Monitoring Points

Where a higher current carrying capacity is required, a multi-strand conductor shall be used

and the strands shall be arranged into groups no larger than No.6 AWG. Each group shall be attached to pipe with a separate charge. Attaching test leads directly to the pipe by other methods of brazing is prohibited.

When thermit welding process is used for electrical lead installation on pressurized pipelines or mains, precautions shall be taken to avoid possible failure of the pipeline or mains during installation due to loss of material strength at the elevated welding temperatures. Where a thermit welding process is not deemed suitable, consideration shall be given to other methods of installation.

Electrical Interference

Electrical interference due to following shall also be considered in cathodic protection design:-

Fault Currents

Fault current interference shall be taken into consideration.

Fault current resulting from lighting or upset conditions of electrical facilities could result in serious damage to coating and pipe wall and danger to personnel. These adverse effects may occur where a pipeline or main is close to the grounding facilities of electrical transmission line structures, sub-stations,generating stations or other facilities that have high short circuit current-carrying grounding networks.

Where a buried pipeline or main is close to grounding facilities, remedial measures may be necessary to control the effect of these fault currents in order to reduce the resultant rise in potential gradient in the earth near the pipeline or main to an acceptable level.

Induced Potential Interference

Pipelines or mains paralleling alternating current electrical transmission lines are subject to induced potentials. When studies or tests show that alternating current potentials will be or are being induced on a buried pipeline or main, devices shall be installed to reduce these potentials to a tolerable level.

When such pipelines or mains are under construction, or when personnel are in contact with the pipelines or mains, special precautions shall be taken to nullify the possible effects of induced alternating current potentials.

Install bonding across points where the pipeline or main is to be separated and maintain this connection while the pipeline or main is separated.

Make a study in collaboration with the electric company on the common problems of personnel safety, corrosion, electrical interference and lighting problems.

Existing Installations

Cathodically Protected Pipeline Systems Temporarily out of Service

Cathodic Protection systems shall be maintained on any pipeline or main temporarily out of service.

Temporary Cathodic Protection System

When considered necessary, a temporary Cathodic Protection system with sacrificial anodes shall be installed to ensure adequate protection of pipeline or mains from external corrosion from the time the pipeline or main is laid in the trench till the permanent Cathodic Protection system is commissioned.

The temporary cathodic protection system shall preferably be installed simultaneously keeping pace with the pipeline or main laying/installation work and shall be monitored periodically.

RECORDS

CGD Network Company shall also maintain following records/ documents related to corrosion control:

- Cathodic Protection Design documents
- Soil Resistivity Survey Report
- Electrical Interference Report
- Inspection and maintenance reports
- Material certificationincluding dimension, metallurgy, performance and functional report
- Material test reports
- Approved drawings/documents

Schedule – 1G

MISCELLANEOUS

ODOURISATION

Natural gas supplied through CGD Network shall have a distinct odour, strong enough to detect its presence in case of leakage.

[1][A pre – determined quantity of suitable odorant shall be dosed into the gas stream. The dosing should be such that it is safe for human as well as materials and equipments used in CGD system.]

Odour level tests shall be carried out to recognise the odour imparted by the gas supplier/distribution company. These tests are to be carried out at various defined locations on the network and at network extreme ends. If odou level falls below the minimum acceptable level same shall have to be intimated to the control room of the gas supplier and accordingly corrective actions are to be taken.

The odorizing equipment shall be located in a separate area at CGS. There should be a clear safety distance of 1.5 m around the odorizing and other facilities at the station to facilitate easy maintenance and personnel movement.

The odorant unloading should be done in a safe way. Precautions for handling odorant shall be prominently displayed.

Odourant absorber like activated carbon saw dust, dry sand and odorant neutralizer likesodium hypochlorite for spillage handling of odourant shall be provided.

Provision should be made for eye wash or emergency shower near odorant handling and injection systems, in case ethyl mercapton is used as odourant.

Use of personal protective equipment like face shield, mask, rubber hand gloves, gumboot, safety goggles etc. for handling of odourant spillage shall be ensured.

References

ASME B 31.8 – Gas Transmission and Distribution Piping Systems (ASME 3 Park Avenue, New York, NY USA 10016. www.asme.org).

API 1104– Welding procedures and welders for welding of gas pipelines.

ASME Boiler and Pressure Vessel (BPV) Code Section IX - Welding procedures and welders, for station piping.

[1] Subs. by point (C) of Cl. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2014 (w.e.f. 16.12.20140.

ASTM A 395 - Valves having shell body, bonnet, cover and/or end flanges) components made of cast iron and / ductile iron (as per shall not be used in CGD networks).

BS EN 331 - Valves used in service lines of size NPS 2 and below.

ISO 8085 - Electro-fusion fittings for sizes up to NPS 8.

IS-5572 - Electrical area classification of Installation for selection of Electrical Equipment

IS-5571, "Guide for selection of Electrical Equipment for Hazardous Area".

IS 3043 – For earthing of all electrical equipment, systems, structures and fencing, etc.

IS:2309 – for Lightening protection

IS 9573 – Steel braided Hose

ANNEXURE – I
List of Specifications of Piping Materials used in CGD Network

Steel Pipe	
API 5L	Specification for Line pipes
ASTM A106	Seamless Carbon Steel Pipe for High Temperature Service
ASTM A333	Seamless and Welded Steel Pipe for Low-Temperature Service
Galvanized Iron Pipes	
IS 1239 (Part-1)	Steel Tubes, Tubular and Other Wrought Steel Fittings - Specification - Part 1: Steel Tubes
Valves	
API 6D	Pipeline Valves
[1][API 609:	Double flanged, lug-type and wafer-type;
EN 13774:	Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar. Performance requirements;
BS EN 593:	Industrial valves. Metallic butterfly valves for general purposes
ASME B16.34	Valves Flanged, Threaded and Welding End
[2][BS EN ISO 15761	Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries.]
[3][BS EN ISO 17292	Metal ball valves for the petroleum, petrochemical and allied industries]
BS 1873	Specification for Steel globe and globe stop and check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries
Flanges and Blanks	
ASME B16.5	Steel pipe flanges and flanged fittings - Size upto 24" NB.
ASME B16.36	Orifice Flange
MSS SP-44	Steel Pipeline Flanges
API 590	Steel Line Blanks
Fittings	
ASME B16.9	Factory-Made Wrought Steel Butt Welding Fittings
MSS SP-75	Specification for High Test, Wrought, Butt Welding Fittings
MSS SP 97	Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded and Butt welding Ends
[4][IS 1239 (Part-2):	Steel Tubes, Tubular and Other Steel Fittings-Specification-Part

[1] Ins. by Sub-Cl. (iv) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2019 (w.e.f. 07.11.2019).
[2] Subs. by point (xvii) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).
[3] Subs. by point (xviii) of Cl. (2), *ibid.* (w.e.f. 24.112.2016).
[4] Subs. by point (xix) of Cl. (2), *ibid.* (w.e.f. 24.112.2016).

	2: Steel pipe fittings]
Stud Bolts and Nuts	
ASTM A194	Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or both.'
ASTM A193	Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel
ASME B18.2.1	Square and Hex Bolts and Screws, Inch Series
ASME B18.2.2	Square and Hex Nuts
Gaskets	
ASME B16.20	Spiral-wound metal gaskets and metal jacketed gaskets for use with raised face and flat face flanges.
Copper Tubes	
BS EN 1057	Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications
Copper Fittings	
BS EN 1254 PART 1	Copper and copper alloys. Plumbing fittings. Fittings with ends for capillary soldering or capillary brazing to copper tubes
Plastic Pipes	
ISO 4437	Buried polyethylene (PE) pipes for the supply of gaseous fuels -- Metric series -- Specifications
IS 14885	Specifications for polyethylene pipes the supply of Gaseous Fuels
Plastic Valves	
ASME B16.40	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
[1][EN 10204:	Metallic products- Types of Inspection documents]
EN 1555-4	Plastic piping system for supply of gaseous fuels polyethylene – Part 4
Plastic fittings	
ISO -8085 -3	International Standard for thermoplastic fittings
EN – 1555-3	European standard for plastic piping system for supply of gaseous fuels – Polyethylene (PE) Part -3: fittings
ISO/TC-138/SC4 N 521 & 523 – 1990 Thermoplastic fitting procurement requirements	
High Pressure SS Tubing and Fittings	
ASTM A269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
Brass Ball Valves (Up To 2”)	
BS EN 331	Manually operated ball valves and closed bottom taper plug valves for gas installations in buildings
Brass Fittings	

[1] Subs. by point (xx) of Cl. (2), *ibid.* (w.e.f. 24.112.2016).

IS 319	Free Cutting Leaded Brass Bars, Rods and Sections – Specification
[1][EN 12164:	Copper and copper alloys. Rod for free machining purposes
EN 12165:	Copper and copper alloys. Wrought and unwrought forging stock]

[1] Ins. by point (xxi) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

ANNEXURE – II

List of Specifications for Equipment used in CGD Network

Pressure Safety Equipment (Regulators, Slam Shut Valves and Creep Relief Valves)

EN 334	Gas pressure regulators for inlet pressures up to 100 bar
EN 14382	Safety devices for gas pressure regulating stations and installations - Gas safety shut-off devices for inlet pressures up to 100 bar
API 526	Flanged Steel Pressure Relief Valves
Filters	
ASME Section VIII Boiler and Pressure Vessel Code	
Metering Equipment	
AGA Report No. 3	Orifice Metering of Natural Gas and Other related Hydrocarbon fluids
AGA Report No. 5	Fuel Gas Energy Metering
AGA Report No. 9	Measurement of Gas by Multi-path Ultrasonic Meters
[1][OIML R 137-1&2:	[2][[3][***] Gas Meters [4][***]]
[5][BS 1359:	Gas meters - Diaphragm gas meters]
EN 12480	Gas meters - Rotary displacement gas meters
[6][***	]
AGA Report No. 7	Measurement of Gas by Turbine Meters
EN 12261	Gas meters - Turbine gas meters
[7][BS EN 14236:	Ultrasonic domestic gas meters
ISO 17089-2:	Measurement of fluid flow in closed Conduits -Ultrasonic meters for gas –Part 2- Meters for industrial applications]
[8][AGA Report No.	Measurement of Natural Gas by Coriolis Meter

[1] Subs. by point (xxii) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).

[2] Subs. by point (i) of Cl. (5) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Second Amendment Regulations, 2020 (w.e.f. 15.09.2020).

[3] The words and letters specified under sub heading 'Metering Equipment', row relating to "OIML R137-1 & 2" shall stands omitted by point ii of Cl. (1) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Third Amendment Regulations, 2024.(w.e.f 25.04.2024)

[4] The words and letters specified under sub heading 'Metering Equipment', row relating to "OIML R137-1 & 2" shall stands omitted by point ii of Cl. (1) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Third Amendment Regulations, 2024.(w.e.f 25.04.2024)

[5] Subs. by point (xxiii) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).

[6] The words and letters specified under sub heading 'Metering Equipment' shall stands omitted by point (xxiv) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).

[7] Ins. by point (ii) of Cl. (5) of Reg. 2, *ibid.* (w.e.f. 15.09.2020).

[8] Ins. by point (i.) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2021(w.e.f. 27.08.2021).

11 API MPMS Chapter 14.9	
IS 15672	Flow measurement of natural gas and fluids by Coriolis Meters
ISO 10790	Measurement of fluid flow in closed conduits- Guidance to the selection, installation and use of Coriolis flowmeters (mass flow, density and volume flow measurements)]
[1][AGA Report No. 8	Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases.
IS 15677	Metering of natural gas-Code of practice
EN 17526	Gas meter- Thermal-mass flow-meter based gas meter]
Pressure Measuring Equipment	
BS EN 837-1	Pressure gauges – Part 1: Bourdon tube pressure gauges; dimensions, metrology, requirements and testing
BS EN 837-2	Pressure Gauges - Part 2: Selection and Installation Recommendations for Pressure Gauges
BS EN 837-3	Pressure gauges - Part 3: Diaphragm and capsule pressure gauges; dimensions, metrology, requirements and testing
Electro fusion machine for jointing PE pipe and fittings	
[2][ISO 12176-2:	Plastic pipes and fittings- Equipment for fusion jointing polyethylene systems- Part 2: Electrofusion.
EMC Standards	
EN-55014:	Limits and methods of measurement of radio disturbance characteristics of electrical motor operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus
EN 61000-6-3:	Electromagnetic compatibility (EMC): Generic standards- Emission standard for residential, commercial and light-industrial environments
EN 61000-6-1:	Electromagnetic compatibility (EMC): Generic standards- Immunity for residential, commercial and light-industrial environments
EN-61000-3-2:	Electromagnetic compatibility (EMC): Limits- Limits for harmonic current emissions (equipment input current < 16 A per phase)
EN-60335-1:	Household and similar electrical appliances: Safety- General requirements
EN-60335-2-45:	Household and similar electrical appliances: Safety- Particular requirements for portable heating tools and similar appliances";]

[1] Ins. by point ii., Cl (1) of Reg. 2, the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Third Amendment Regulations, 2024.(w.e.f 25.04.2024)

[2] Subs. by point (xxv) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).

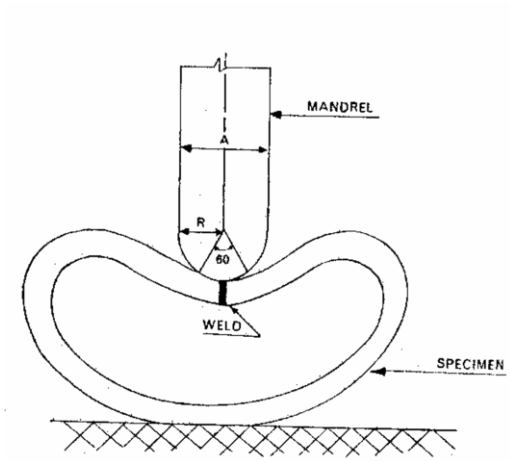
ANNEXURE – III

Additional Requirements for Electric Welded Pipes

Electric Welded pipes shall meet following requirements.

Reverse Bend Tests

Reverse bend tests shall be performed on the pipe piece cut from the crop end, selected from the front end of the first length and the back end of the last length produced from each coil. The specimen shall be 100mm to115mm long and shall be reverse bend tested in accordance with procedure and figure given hereinafter.



The reverse bend test shall be carried out with a mandrel. Radius (R) and width (A) of mandrel shall be calculated for any combination of diameter, wall thickness and grade with the formula.

$$A = 2R = \frac{1.4\,(D-t)\,t}{e\,(D-2t)-1.4\,t} - t$$

where,

D	-	Outside diameter of pipe
t	-	Wall thickness of pipe
1.4	-	Peaking factor
e	-	Strain

Minimum values of 'e' shall be as follows:

Grade of Steel	Min 'e' value
API 5L Gr. B	0.1425

API 5L X-42	0.1375
API 5L X-46	0.1325
API 5L X-52	0.1275
API 5L X-60	0.1225

Procedure

The mandrel is to be plugged into the specimen, with the weld in contact with mandrel, to such a depth that the angle of engagement between mandrel and specimen reaches 60° (see Figure). If the combination of diameter and wall thickness of pipe, and radius of mandrel is such that the angle of engagement does not reach 60°, the mandrel shall be plugged into the specimen until opposite walls of the specimen meet.

Acceptance Criteria

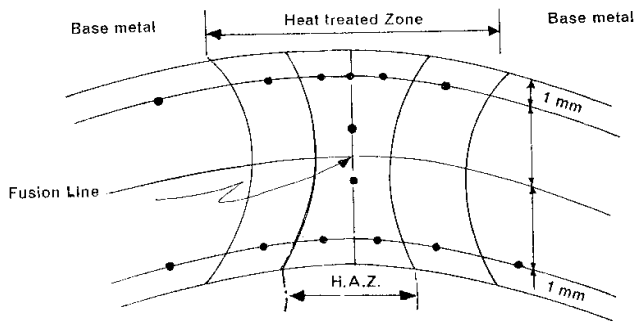
A specimen which fractures completely prior to the specified engagement of mandrel and specimen, or which reveals cracks and ruptures in the weld or heat affected zone longer than 4mm, shall be rejected. Cracks less than 6mm long at the edges of the specimen shall not be cause for rejection.

Micrographic and Hardness Examination

A test specimen shall be taken across the longitudinal weld from one length of finished pipe from each lot of maximum 100 lengths from the same heat manufactured from the same process.

These specimens shall be polished and etched for micro-examinations. The examinations shall provide evidence that heat treatment of weld zone is adequate and there is no un-tempered martensite left.

Hardness measurements on each specimen shall be made as indicated in figure given herein after in accordance with ASTM E-32. The maximum difference in hardness between base material and any reading taken in the Heat Affected Zone (HAZ) shall be less than 80 points vicker's HV_{10}



● — Locations where hardness measurement to be carried out.

Annexure IV

Minimum Requirements for GI Pipes and Copper Tubing used in service lines up to consumer appliance

Galvanized Iron (GI) Pipes

Pipes shall be conforming to IS: 1239 (Part-1) – 1990. The manufacturer shall have a valid license to use ISI Monogram for manufacturing of pipes in accordance with the requirements of IS: 1239 (Part-I) – 1990.

NOMINAL BORE	15 mm	25 mm	50 mm	80 mm
GRADE	MEDIUM (‘B’CLASS) or HEAVY (‘C’ CLASS)	MEDIUM (‘B’CLASS) or HEAVY (‘C’ CLASS)	MEDIUM (‘B’CLASS) or HEAVY (‘C’ CLASS)	MEDIUM (‘B’CLASS) or HEAVY (‘C’ CLASS)
O.D. mm max. Min.	 21.8 21.0	 34.2 33.3	 60.8 59.7	 89.5 88.0
THICKNESS mm	2.6 for B Class and 3.2 for C Glass	3.2 for B Class and 4.0 for C Glass	3.6 for B class 4.5 for C Glass	4 for B class and 4.8 for C Glass
NOMINAL WEIGHT Kg/mtr:	1.21 for B Class and 1.4 for C Glass	2.41 for B Class and 2.93 for C Glass	5.03 for B class 6.19 for C Glass	8.36 for B class and 9.90 for C Glass

Note:

Maximum tolerance on thickness (-) 10%, Tolerance on weight for single tube ± 10% and for quantities per load of 10 tones, ± 7.5%

- Pipes shall be designed to withstand a test pressure of 5 MPa (50 bar), maintained for at least 3 second without showing any kind of defects.
- Eddy Current test may be done in place of hydrostatic test as per the procedure given in Annex - C of IS: 1239 (Part-1) - 1990.
- All Galvanized Tubes shall be Zinc coated by hot dip galvanizing in accordance with IS: 4736-1986 & its relevant parts.

- Minimum mass of zinc coating determined as per IS: 6745-1972 shall be 400 gms / m^2.

  - The zinc coating on external and internal surfaces shall be adherent, smooth and free from such imperfections as flux, ash and dross inclusions, bare patches, black spots, pimples, lumpiness, runs, rust stains, bulky white deposits and blisters.

  - Rejection and acceptance for these defects shall be as per Appendix-A of IS: 2629-1985

  - The galvanized coating when determined on a 100 mm long test piece in accordance with IS: 2633 - 1986 shall withstand 4, one - minute dips.

  - The adherence of zinc coating on tubes above 50 mm nominal bore, shall be determined by the pivoted hammer test given in IS: 2629 - 1985.

Each pipe shall be legibly and durably marked at intervals of not more than one meter with the following information (i) Manufacturer's name or trade mark, (ii) Class of Pipe – HEAVY, (iii) Indian Standard mark – ISI, (iv) Batch No. of Production, if any.

Fittings conforming to the requirements of IS 1879: 1987, IS 14329: 1995 are permitted to be used in Tertiary network, operating at pressures 100 mbarg and below:

Copper Tubing

[1][***]

Soft soldering utilizes filler metals with melting points at temperatures up to 450°C. [2][Filler metals shall be as per BS EN ISO 9453: Electromagnetic compatibility (EMC). Generic Standards. Immunity for residential, commercial and light industrial environments.]. Solders for use with copper tube and fittings generally melt within the temperature range 180°C to 250°C. Compression fittings shall comply with BS 864 Part 2 or BS 2051 Part 1.

For capillary fittings:

- Soft solder shall not be used for pressure in excess of 75 mbar

- If the operating pressure is to exceed 75 mbar, then, a solder with a melting point of not less than 600 degrees C shall be used. This shall also apply to brass fittings.

Height limit for copper risers: Although there is no specific guidance regarding maximum height of copper risers, IGE/UP/2 only allows the use of steel for risers above heights of 15 meter. Thus, unless local information is available to the contrary, 15-meter maximum height shall be considered safe due to weight and mechanical strength of material.

General guidance in BS 6891 also states that copper pipe work is not acceptable inside a protected shaft. Requirements for ventilation and fire stopping shall apply to ducts conveying copper pipe work. For an external copper riser system, protection against lightning conductors shall be considered.

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[1] The words and letters specified under Part 1 & 2 of Annexure IV shall stands omitted by point (xxvi) of Cl. (2), the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Amendment Regulations, 2016 (w.e.f. 24.11.2016).
[2] Subs. by point (xxvii) of Cl. (2), *ibid.* (w.e.f. 24.11.2016).

A copper gas line shall never be used as a ground for an electrical system.

[F. No.-S-Admn/II/8/2007-Vol. I]

RATAN P. WATAL, Secy.

Foot Note: Principal regulations were notified vide No. G.S.R. 612 (E), dated 27th August, 2008 and amended vide G.S.R. 750 (E) dated 14th October, 2009, F. No. M (I)/T4S/CGD/1/2010 dated 16th December, 2014, F. No. L-MISC/VI/I/2007, dated 1st January, 2015, F. No. M(1)/T4S/CGD/1/2010, dated 9th March 2016, F. No. M(I)/T4S/ CGD/1/2010, dated 24th November, 2016, F. No. PNGRB/Tech/1-T4SCGD/(1)/2019, dated 7th November, 2019, F. No. PNGRB/Auth/1-CGD(06)/2020, dated 30th June, 2020, F. No. PNGRB/Tech/1-T4SCGD/(1)/2020, dated 15th September, 2020, F. No. PNGRB/Tech/1-T4SCGD/(1)/2021 (P-3369) dated 27th August, 2021 and F. No. PNGRB/Auth/1-CGD (04)/2023 (P-4451) dated 16th February 2024 and F. No. PNGRB/Tech/1-T4SCGD/(1)/2020 and F. No. PNGRB/Auth/1-CGD (04)/2023 (E-4451) dated 23rd December 2024.