

11. TECHNICAL STANDARDS AND SPECIFICATIONS INCLUDING SAFETY STANDARDS FOR CITY OR LOCAL NATURAL GAS DISTRIBUTION NETWORK



45 PETROLEUM AND NATURAL GAS REGULATORY BOARD NOTIFICATION New Delhi, the 27th August, 2008 G.S.R. 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 :— 2. 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) Regulations, 2008. (2) They shall come into force on the date of their publication in the Official Gazette. Definitions. (1) In these regulations unless the context otherwise requires,— (a) "Act" means the Petroleum and Natural Gas Regulatory Board Act, 2006; (b) "regulator" means a regulator in pressure regulating station (PRS) that normally controls the outlet pressure; (c) "authorized person" means a person who is assigned by the operator to carry out a specific job based on the competency level 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 equipment 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; (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; (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 connecting the main transmission pipeline to the city gate station but is owned by the CGD entity; "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; 47 3. 4



5. 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 insofar as such are specifically replaced or modified by requirements specified in these regulations. Scope. (a) These Regulations cover the design, materials, fabrication, installation, inspection and testing, operation, maintenance, modifications and abandonment of CGD for domestic, commercial and industrial users. (b) Requirements of these regulations shall apply to all pipelines, distribution mains and piping facilities downstream of inlet 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. (d) The CNG Station, CNG Mother Station, CNG On-Line Station and CNG Daughter Station shall be designed, operated and maintained in line with the requirements of the Chief Controller of Explosives as detailed in the Gas Cylinder Rules, 2004 as modified or amended from time to time. This includes compression, handling and transportation activities of compressed natural gas. (e) 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 B 31.8. 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 in these regulations, the entity needs to carry out a detailed technical audit of its infrastructure through 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 (b) The continuation of, operation of existing CGD network shall be allowed only if it meets the following requirements, namely:- OF : [PART 6. 7. (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 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 "be valid for the current operation". Alternatively, 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 (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 authorized 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. 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 which cover material and equipment (Schedule—IA), welding (Schedule—1B), piping system components and fabrication (Schedule—IC), design, installation and testing (Schedule—ID), operating and maintenance procedures (Schedule—I E), corrosion control (Schedule—tF) and miscellaneous Default and (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 49 8, 9. including Safety Standards either directly or by

accredited third party through separate regulations on third party conformity assessment. (3) In case any deviation or shortfall, in achieving the targets for implementing the specified standards, the entity shall be liable to face the following consequences, namely:- in case of critical activities at Appendix-I, the entity shall be given a single notice by the Board -Specifying the time limit to remove the specified 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; 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. 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*. 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. (2) If any dispute arises with regards to the interpretation of any of the provisions of these regulations, the decision of the Board shall be final. Further, the Board may at any time effect appropriate modifications in these regulations. 3225 GI/08—7 50 Sr. No.

1 2 3 4 5 6 7 8 9 OF ; APPENDIX-I LIST OF CRITICAL ACTIVITIES In CGD NETWORK {See regulation 7(3)(i)} [PART 11 -RFC. Critical Infrastructure activities/ processes Pressure reduction skid CGS (active I monitor combination) with a minimum 50% redundancy including slam shut valve for over pressure protection and relief valves. On line odorisation equipment designed to minimize- fugitive emissions during loading, operation and maintenance. Height of the vent shall be minimum 3 meters above working level Gas detectors shall be installed at critical locations Pressure reduction for DRS (active I 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. Steel rubber hose conforming to IS 9573 Type IV Pipeline test record and joint radiography and cover in the form of a book HSE Management System 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 vehicles fitted with emergency communication facilities, first aid equipment, fire extinguishers, gas detectors, repair kits and tools, maps, plans, material safety data sheets etc. at its disposal. Time period for Implementation plan Implementation 1 year 1 year 6 months 1 year 2 years 6 months * 3 months 6 months 6 months Modification of CGS skid Automated odorisation systems to be used Increase height of vent Install gas detectors in the C S and District Pressure Regulating Station, Modification/ replacement Replacement of all rubber hoses fit thousand r. ear Can be submitted in stages To be implemented To be implemented * commencement of implementation 51 Schedule —I (See regulation 6) Technical Standards *and Specifications including Safety Standards for City or Local Natural Gas Distribution Network Schedule Schedule Schedule Schedule Schedule Schedule

Schedule - IA MATERIALS AND EQUIPMENT -1B WELDING - IC PIPING

SYSTEM COMPONENTS AND FABRICATION DETAILS - ID DESIGN,, INSTALLATION AND TESTING - IE OPERATING AND MAINTENANCE PROCEDURES - IF CORROSION CONTROL - IG MISCELLANEOUS : EXTRAORDINARY 11—sae Schedule — IA 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 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 meet following requirements: Carbon Equivalent networks shall For pipes having Carbon Content $> 0.12\%$ CE (iiw) value shall be 0.43% . For pipes having Carbon Content so. 12% CE(Pcm) $-C + Si + Mn + Cu + V + 5B \leq 0.20$ CE (Pcm) value shall be $\leq 0.25\%$. Notch Toughness For carbon steel pipes of size NPS 2 and above, notch toughness shall be specified. Electric welded pipes used shall also meet requirements specified under Annexure-I of this standard. Ductile Iron PIPE Use of ductile iron pipes 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. Polyethylene (PE) pipes conforming to IS 14885 or ISO 4437, and PE fittings conforming to ISO 8085 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 0.02 to 0.15 mm). Pipes and tubing for above ground service lines up to meter set assembly. Galvanized Iron (GI) 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. GI pipes and copper tubing shall conform to the requirements given in Annexure—IV of this standard. Use of non-galvanized shall be restricted as far as possible; however, in case they are used they shall be properly primed and painted. PE pipe shall not be used for above ground gas Tubing Hose pipe for connecting consumer meter set assembly and consumer The connection between consumer meter set assembly and gas appliance

(provided by consumer) may be made by GI pipes or copper tubing meeting given in Annexure—IV of this standard or steel reinforced rubber hose. Steel reinforced rubber hose shall conform to IS: 9573 Type V. EQUIPMENT SPECIFICATIONS . Equipment used in CGD network to standards listed in Annexure-I of this standard shall also be acceptable. CONDITIONS FOR REUSE OF PIPE Reuse of Ductile Iron Pipes Reuse of ductile iron pipes is not permitted. Reuse of Plastic Piping Reuse of plastic pipes is permitted subject to the following. a. b. c. d. original and manufacturing specifications are known and documented. It meets the requirements of new pipes conforming to its manufacturing specifications. The pipe is free from visible defects. 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 maintained Schedule same are -1B i WELDING GENERAL These requirements apply to steel pipe and components only. Notches or laminations on pipe end are not permitted and must be removed by cutting the pipe as a cylinder and re- beveling of pipe end prior to welding. • QUALIFICATION AND PROCEDURES OF WELDERS Welding procedure and welders for welding of gas shall qualified as per API 1104 and shall include toughness testing requirements as applicable for the time INSPECTION OF WELDS All Non Destructive Test (NDT) radiographic examination shall be performed in accordance with the requirements of API 1104 that no root crack shall be permitted. Regardless of operating hoop stress as per 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 REPAIR OR REMOVAL OF DEFECTIVE WELDS

54 THE EXTRAORDINARY- [PART Welding and welders, for station piping shall be qualified as per ASME Boiler and Pressure Vessel (BPV) Code Section IX or API 1104. When qualified under API 1104 are employed for station piping, their qualification shall be based on destructive mechanical as per API 1104. Welds having shall be removed or repaired in with API 1104 or ASME BPV code Section IX as applicable. Welders employed for repairs shall be qualified in with "Qualification and Procedures of Welders". Weld repair areas shall be subjected to additional radiography or ultrasonic testing after repair. Schedule — IC 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 Annexure—I of this standard shall also be acceptable. Valves and Pressure Reducing Devices 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. Valves used in service lines of size NPS 2 and below shall conform to BS EN 331. Flanges Flanges made of cast iron, 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 not permitted except for station piping e.g. CGS, DRS, MRS etc. Fittings other than Valves and Flanges Fittings made of cast iron and 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. Thermoplastic / thermosetting fittings shall not be used in above ground piping system. Thermoplastic fittings to ISO 8085 Part 3 shall be acceptable and shall meet following requirements: a. b. Polyethylene used for resin manufacture of thermoplastic fittings - shall be virgin, cadmium free pigmented compound. Anti-oxidant and UV stabilizers used in PE resin shall not exceed 0.3 and 0.5 percent respectively. Reprocessed- material shall not be used. 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. Heating element shall 55 For piping class 1\$ 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. c. d. e. not be exposed and all coils are embedded into the body of the fittings. Colour of fittings shall be yellow or black. Electro-fusion fittings 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. For fusion fitting upto 63 mm, pipe fixation device shall be an integral part g. h. of the body of the fitting and for size above 63 mm. external alignment clamp shall be used. 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. The fusion jointing shall be carried out as per the procedure outlined in the standard DVS 2202 or equivalent. Carbon steel part of transition fittings used for PE system with Carbon Steel system may have butt weld/plain/flanged ends. EXPANSION AND FLEXIBILITY Requirements When maximum gas temperature expected during operation is below 650C, thermal expansion and stresses in the above ground steel piping shall be evaluated considering pipe temperature of 650C. Special 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). 56- GATEWAY : Schedule - ID 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 flow rates, operating pressures and the environment. CGD network Description A typical CGD Network should comprise of one or more or all of the following: j) 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 piping (MDPE) 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 (MDPE) piping and GI/ copper tubing components. [Now. For future use in description of above network, definition as per ASME B 31.8 shall apply] W) City gate station (CGS): typically comprising of, but limited to, the following facilities: Filters Separators (if required). Metering facilities. Heater (if required) Pressure reduction skid comprising active and monitor combination with a minimum 50% redundancy with stream arrangement, including slam shut valve for over and under pressure protection and creep relief valves (stream redundancy shall not be less than 2+1). equipment Online odorization 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 and 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 (steam protection if redundancy shall not be less than 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 supply

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: 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: 3225 GI/08—8 57 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. ii. iii. iv. v. (a) Type and size of equipment. P&IDs Utility requirement. Venting wherever required. Maintenance Operation and philosophy. 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

6	12	3	5	Compound Wall	Control Room / Office Building / Store	Pressure Regulation and I or Metering	Odorant System	Electrical Sub Station
6	6	6	6	6	6	6	6	12
12	12	2	2	2	2	2	2	12
6	15	15	15	GAZETTE OF : DKTRAORDINARY [PART Note : 1				

2. All distances are in meters All distances shall be measured between the nearest points on the perimeter of each facility. 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. Electricity Board As per State recommendation. Property laid out roads around various facilities shall be provided within the installation area for smooth vehicular access. Facility shall be provided with proper boundary wall or 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. Playways 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 during construction isolated 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 or fence shall be minimum five (5) meters. Gas detectors shall be installed at strategic locations covering to detect any gas leakage. In case of 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 an enclosed chamber with provisions for entry of authorized personnel or be a buried hermetically sealed module type with proper cathodic protection. 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 or structure shall not be less than two (2) meters. NOTES: 1

11. III. The consumer, shall be responsible for ensuring separation distance for customer owned IPRS. Customer shall ensure that IPRS Independently Installed Non has been approved by notified third agency before the entity supplies the gas. The consumer shall ensure record is maintained for 3 years, 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 equipment shall be in line with IS - 5571, "Guidelines for selection of

Electrical Equipment for Hazardous Area". Firer 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 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. Lightning 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 r6d 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 buildings 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-connection 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 6.4mm, irrespective of the grade of the pipe material. In all existing cases where thickness of pipe is less than 6.4 mm, Quantitative Risk Assessment shall be carried out and the risk level shall be reduced to ALARP (As low as reasonably possible). Design Factors F and Location Classes Design factor corresponding to Location Class 4 shall only be used. THE GAZETTE OF INDIA : EXTRAORDINARY [PART II SEC. 3. 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 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 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

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) When laying more than one new hydrocarbon pipelines or mains in the same trench, clear separation of 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 to meet statutory requirement, 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 Miter in Steel Pipelines and Mains Miter 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 14th 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 for Safe 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 carry out special design and construction methodologies through experienced personnel/consultant and seek clearance from the Board. Testing and Construction General Provisions Proper communication facilities shall also be arranged for during testing. Testing equipment and 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 81.8 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 numbers of relevant agencies should be available. OTHER MATERIALS Ductile Requirements System 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 Nominal wall thickness of plastic pipe shall be calculated as per following formula: $P = 2S * (t / (D-t)) * 0.32$ Where t Specified outside diameter in mm Design pressure in psig Nominal wall thickness in mm Long term

hydrostatic strength in (psig) determined in accordance with { applicable. pipe specification at temperature equal to 730F, 1000F or 1200F. 6 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) Below 320F(0 degree centigrade) or 2) Above 1200F (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 Thermo lastic i es Design Pressure of Plastic Fitting All fittings used shall be electro fusion type. Other types of fittings are not permitted. All PE fittings shall conform to ISO 8085 —Pan 3. The wall thickness of the fittings shall be more or equal to thé wall thickness of the pipe jointed. Protection from Hazards 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. Nominal Outside Diameter in mm D 16 20 25 32 40 50 63 75 90 110 125 140 160 180 200 3225 GI/08—9 Minimum wall thickness in mm for Standard Dimension Ratio, SDR 17.6 2.3 2.3 2.3 2.3 2.3 2.9 4.3 5.2 6.3 7.1 8.0 9.1 10.3 11.4 13.6 2.3 2.3 2.3 2.3 3.0 3.7 4.7 5.5 6.6 8.1 9.2 10.3 11.8 13.3 14.7 11 23 2.3 3.0 3.0 4.6 5.8 6.8 8.2 10.0 11.4 12.7 14.6 16.4 18.2 9 2.3 3.0 3.6 5.6 7.1 8.4 10.1 12.3 14.0 15.7 17.9 20.1 22.4 66 THE GAZEITE OF INDIA : EXTRAORDINARY [PARTII SEC. Road Bem I Footpath 1 4 2 5 3 7 6 1 1 2 - Elec. 3able (Low Voltage) 3 Telecan Cabb 4 Elec. Cable (High Voltage) 5 Gas Pipeline 6 Water Pipeline I sewage line 7 Other hydrocarbon produd pipelines Figure — Relative Position of Gas Pipeline and Distribution Mains 500 mm ooav•oted Figure 2 (a) - Concrete Slab _ Pee to b' 250 mm Venied bobw S"octød & Figure 2 (b) - Concrete Slab with supports When insisted by the authorities at identified locations, a layer of brick -l 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. Fusion fittings shall have inbuilt positioning provision upto 60 mm and beyond external clamp system. Jointing of plastic piping by but 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. 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. Tesiing Plastic Piping after Construction General Provisions Testing equipments I 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 1200F (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. 67 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 {PRS DPRS and IPRS piping shall be subjecte-a 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 Up to 138 mbarg 2 si From 138 mbarg to 4.14 barg (2to 60 Above 4.14 barg Min. Test Pressure 3.45 barg (50 psig) 1.5 times Design Pressure 1.5 times Design Pressure Test medium Air Air Min. Test Duration 2 hours 2 hours 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 Control and Limiting of Gas Pressure in High Pressure Steel, Ductile iron, Cast Iron or Plastic 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 THE GAZETTE OF INDIA : EXTRAORDINARY [PART valves or weight-loaded relief valves or spring loaded diaphragm type relief valve. DPRS/IPRS shall normally be equipped with minimum 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 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. Control and limiting of pressure of gas delivered to domestic, small commercial, and small industrial consumers from high — pressure distribution system. 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, 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' REGULATORS METERS AND Location for Customers' • Meter 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 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 additional to physical constraints, 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 69 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. 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 I-Jée 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. THE GAZETTE OF INDIA : EXTRAORDINARY [PART 11—SFC. 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 Ser,dice 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 be by use of electro fusion fittings only. Direct connection of fugaivanized iron or copper service lines Ito 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. 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 conriected to gas tine 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 1.5 meters. Both ends of the hose shall be firmly clamped on the nozzle by metallic clamps. Schedule OPERATING AND MAINTENANCE PROCEDURES The present standard covers the City Gas Installations, Distribution, Design, Commissioning and Operation in general. and Maintenance The Operation Procedures prescribed herein under are for general guidelines to be implemented as per the . provbions 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, odorisatibn and pressure reduction (including heating the gas, if required) and managing the regulating station, field regulators and gas metering for all kind of customers such as damestic, commercial and industrial. The gas measuring billing including energy balance shall be part of the operation. The safety, health and environment including complianæ 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 patolling to contain third patty 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. 2

3. Operating and Maintenance Procedures affecting the safety • of gas transmission and distribution facilities.External Corrosion Control Odorisation OPERATING AND MAINTENANCE PROCEDURES AFFECTING THE SAFETY OF GAS TRANSMISSION 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 the HSE each activities of 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. Plan Management Disaster 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. 72 THE GAZEITE OF INDIA : EXTRAORDINARY [PART 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:tb comply. Of particular relevance are the details of consents / permits / authorization or licenses required for an and from whom and how it is oMained. Additional practices iike 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 considera the impact of, changes to pipeline systems and their integrity. Management of Ghange 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 capturjhg the entire intention • of underground gas network and customer database. This system shall include details of the entire pipe network. All the pipelines laid Shail be identified in GIS through geo-referenced co-ordinates. All failures in the pipelines shall be mapped in GIS for investigations. The system shall irclude the following features:- A) Entire network view ability on one platform to manage the huge database. B) All neuork extensions and expansions 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 bāse 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 shalt 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 ali 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 I 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 should cover main including components, their identification number. Limits of operating paramēters (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. Personat 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 Ghall provide for an Emergency Control Room, manned round the -clock and equipped with effective communication system and vehicles fitted emergency communication facilities, . equipment, fire extinguishers, with aid gas 73 for avoiding recurrence in the format placed at Enclosure-I of Schedule -IE. The entities shalt 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 sha'll 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 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 Disaster Management administration, authorities, Mutual aid, Factory inspectorate etc) and clearly elaborate on their role in case of an incident. Accident I 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 affecting 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 3225 G 1 and emergency instructions. other safety 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, and maintenance operation procedures. Hands on experience on operation of emergency and manual shut down systems. Effective isolation of any gas leak. Safety regulations and accident prevention. THE GAZETTE OF INDIA : EXTRAORDINARY 74 [PART 11—SEC. 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 I 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 comprehensive public undertake a 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 taken to minimize failures. Prevention of Accidental Ignition Site Specific Risk Assessment should be carried out before commencing any repair activities. . The outcome of such 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 (s) safe to carryout 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 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 consumer premises, pipeline within 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 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. Any one or combination of methods described in ASME B 31.8, Appendix M 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. Requirements for Disconnecting, and Distribution Facilities Abandoning, Reinstalling Abandoning, disconnecting, or *reinstalling distribution facilities shall be as per ASME B31.8. Any activity associated with abandoning, disconnecting, or reinstating 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. Only repair method allowed is use of full encirclement split sleeves which shall be in accordance with ASME B 31.8. 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. 76 THE GAZETTE OF INDIA : EXTRAORDINARY Surveillance [PART II—SFC. inspection and 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 dual service. Conversion of existing steel pipelines, previously used for service other than natural gas, for use in CGD Networks is not permitted. 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 maintenance records including certification Material dimension, metallurgy, destructive and records, non-destructive testing performance and functional test reports Welding records including PQR, WPS and welder qualification records Commissioning reports Non-conformance I deviation records Calibration records of Inspection, Measuring, Metering and Test equipment Audit compliance reports Statutory clearances Approved drawings Documents HAZOP I Risk Assessment reports and compliance to recommendations of such reports All operation and maintenance manuals [3(i)] Location Time Witnessed by 77 Enclosure-I of Schedule-IE Re ortin Format Type-i •Near Miss Incident Operat or Head x x Type-II Without Loss of Production, Supply or Human Me 1.1 Operator Head x x Type-III Type-IV With Loss of Production, Supply or Details Incident of Action Taken Reporting Authority Internal Investigating Authority External Investigation Report to PNGRB Human ufe Shift ruc Head 4.1 HSE Officer Head Type-V Explosion /Fire/Gas Leakage/other emergencies involving public Section I/C Head of Station A1 To be filled in/reported X Not required to be reported (*) Shall also include the history of Type-i & Type-II incidents THE GAZETTE OF INDIA : EXTRAORDINARY [PART II—SFC. 78 Schedule CORROSION CONTROL EXTERNAL CORROSION CONTROL New Installation/Buried Steel Facilities Coating Requirements, fulfill following Coatings shall 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 VMIere insulating devices are installed to provide electrical isolation of pipeline systems 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 V%ere 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. a thermit welding process is not- deemed suitable, consideration shall be given to other methods of installation. Electrical Interference Electrical interference due to 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 [3(i)] 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 transmiqision line sub-stations, structures, generating stations or other facilities that hava high short circUit current-carrying grounding networks. Vvhere a buried pipeline or main is close to grounding facilities, remedial measures may be necessary to contro!• 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. nihen 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. i"hen 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 altemating 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 ihterference and • lighting problems. Existing Installations Cathodically Protected Pipeline Systems Temporarily out of Setvice Cathodic Protection systems shall be maintained on any pipeline. or main temporarily out of senice. Temporary Cathodic Protection System considered necessary; a temporary Cathodic Protection system with sacrificial anodes shall be instatfed to ensure adequate protection of pipeline dr mains from extemal 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 shali preferably be installed simultaneously keeping pace with the pipeline or main laying/installation work and shall be monitored periodically. RECORDS CGD Network Company shali also maintain following records / documeöts related to corrosion control: Cathodic documents Protection Design Soil Resistivity Sutvey Report Electrical Interference Report Inspection and maintenance reports Mäterial certification including dimension, metallurgy, petfomance and functional repon Material test repons Approved drawings/documents 80 ODOURISATION THE OF : EXTRAORDINARY Schedule MISCELLANEOUS SEC. Natural gas supplied through CGD Network shall have a distinct odaur, strong enough to detect its presence in case of leakage. A pre — determined qUantity, equivalent to a max 12.5 ppm Ethyl Mercaptan, of any other odorant shall be dosed into the gas stream. 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 odour 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 like sodium 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 mercaptan 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. ASTM A 395 - Valves having shell (body, cover and/or end flanges) bonnet, 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 5571, "Guide for selection of Electrical Equipment for Hazardous Area IS .3u3 — For earthing of all electrical equipment, systems, structures and fencing, etc. ts•.2309 - 9573 - for Lightning protection Steel braided Hose ANNEXURE - I List of Specifications of Piping Materials used PIP API ASTM A106 ASTM A333 CGD Network Specification for Line pipe Seamless Carbon Steel Pipe for High Temperature Service Seamless and Welded Steel Pipe for Low-Temperature Service Galvanized Iron Pipe ts 1239 (Part-I) Valve API ASME B16.34 BS 5352 BS 5351 BS 1873 Flanges and Blanks ASME B16.5 ASME 816.36 MSS SP44 API 590 Fltngs ASME B16.9 MSS SP-75 MSS SP 97 Steel Tubes, Tubular and Other Wrot4ht Steel Fittings - Specification - Part : Steel Tubes Pipeline Valves Valves Flanged, Threaded and Welding End Sped(cationfor steel wedge gate, globe and &teck valves 50 mm and smaller for the petroleum, petrochemical and allied industries Specification for steel ball valves for the petroleum, petrochemical and allied industries - Smatt Floating ball valve Specification for Steel globe and globe stop and check. valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries Steel pipe flanges and fanged fittings - Size upto 24" NB. Orifice Flarv Steel Flanges Steel Line Blanks Factory-Made Wrotoht Steel Butt welding Fittings S*ification for High Test, Wrought* Butt Fittings Integrally Reinforæd Forged Branch Outlet Fittings - Welding, Threaded and Butt welding Ends IS 1239 (PART-2) Steel Tubes, Tubular and Other Wrought Steel Fittings - S*cification - Part 1 : Mild Steel Tubular and other wrought steel pipe fittings Stud Botts Nuts ASTM A194 ASTM A193 3225 GI/08—11. Standard Specification for Carbon and Alloy Steel Nuts for Botts for High Pressure or High Temperature Service, or both.' Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and 0th* Special Purpose Applications ASTü A153 ASME B18.2.1 ASME B18.2.2 Gaskeo ASME B16.20 Coppr Tubes BS EN 1057 .Copper FWngs ORDINARY Standard Spedfcadm for Zinc Coüg (H*Dip) on Iroh and Steel Hardware Square and Hex Bolts and Screws, Serips Square Hex Nuts Spird-wound metal gaskets and metal jacketed gaskets for use with raised face and dat face flanges. Copper and copper alloys. Seamless, rund copper tubæ for water and gas in sanitary ard heäng apl—tions BS EN 1254 PART 1 Copper and-copper alloys. Plumbing fittings. Fittings ,wqth ends for Pipe tso 4437 IS 14885 Plastic Valves ASME 816.40 EN 10204 EN 15554 Plastic atings tso -8085-3 EN - 1555-3 capillary sol&ring or capillary brazing to copper tubes Buried polyethylene (PE) pipes for the supply of gaseous fuels -- Metric series Specifications Specifications for polyethylene pipes supply of Gaseous Fuels Manually• -Operated Gas Shutoffs and Valves in • Gas Distributim Systems Excess flow check valve Plastic piping system for supply of gaseous fuels polyethylene — Part 4 Intemational Standard for thermoplastic mtngs European standard for plastic pwng system for supply of gaseous fuels — Polyethylene (PE) Pan -3 : fittings ISOITC-138/SC4 N 521 & 523 — 1990 Thermoplastic fitting procurement requirements High Pnsure SS Tubing and Fittings ASTM A269 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service BrassBall Valves (Up To 2") BS EN 331 Brass Fltngs IS 319 Manually operated ball valves and closed bottom taper plGg valves for gas installations in buildings. Free Cutting

Leaded Brass Bars, Rods and Sections — Specification ANNEXURE - List of Specifications for Equipment used In CGD Network Pressure SafeW Equipment' (Regulators, Slam Shut Valves and Creep Relief Valves) EN 334 EN 14382 API 526 Filters Gas pressure regulators for inlet pressures up to 100 bar Safety devices for gas pressure regulating stations and installations - Gas safety shut-off devices for inlet pressures up to 100 bar Flanged Steel Pressure Relief Valves ASME Section VIII Boiler and Pressure Vessel Code Measuring 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 Gas by Multi-path Ultrasonic Meters OIML R6 / OIML R31 Diaphragm gas meters BS 1359 1 BS 4161 Diaphragm gas meters EN 12480 Gas meters - Rotary displacement gas meters Rotary piston gas meters. and turbine gas meters OIML R32 AGA Report No. 7 Measurement of Gas by Turbine EN 12261 Gas meters - Turbine gas meters Measuring Equipment BS EN 837-1 BS EN 837-2 BS EN 837-3 Pressure gauges - Part 1: Bourdon tube pressure gauges; dimensions, metrology, requirements and testing Pressure Gauges -- Part 2: Selection and Installation Recommendations for Pressure Pressure gauges - Part 3: Diaphragm and capsule pressure gauges; dimensions, metrology, requirements testing Electro fusion machine for Joining PE pipe and fittings EN 55014 ENI- 50081-1 EN - 50082-1 EN - 61000-3 EN - 60335-1 EN - 60335-245 ISO- 12176-2 THE OF : EXTRAORDINARY 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 to 115mm long and shall be reverse bend tested in accordance with procedure and figure given hereinafter. WRO The reverse bend test shall be carried out a Radius (R) and width (A) of mandrel shall be for any combination of diameter, wall thickness and Minimum values of shall be as follows: Grade Steel API 5L Gr. B API 5L API 5L API 5L X-52 API 5L X-60 Min 'e' value 0.1425 0.1375 0.1325 0.1275 0.1225 grade with the formula. $1.4(D-t) \leq (D-2t) - 1.4(t-t)$ where, D t 1.4 Outside diameter of pipe Wall thickness of pipe Peaking factor Strain The mandrel is to be plugged into the specimen, with the 'N' end in with mandrel, to such a depth that the angle of engagement between . mandrel and specimen reaches 600 (see if the combination of diameter and wall thickness of arc radius of mandrel is such that of engagement does not reach 600, the mandrel shall be plugged into the 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 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 hardness between base material and any reading taken in the Heat Affected Zone (HAZ) shall be less than 80 points Vickers specimen shall be made as indicated in figure given herein in accordance with ASTM E-32. The maximum difference in Base Pressure 10D LIN Heat treated Zone Base Locations when measured to be out of THE GAZE OF E.T.L.J.A. EXTRAORL IPAQ 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-I) — 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 15 mm BORE GRADE MEDIUM CLASS) HEAVY 'C' CLASS O.D. mm 21.8 . Min. 21.0 THICKNESS mm 2.6 for B Class and 3.2 for C Class NOMINAL WEIGHT 1.21 for B Class / meter and 1.44 for C Class Note : 25 mm MEDIUM CLASS) or HEAVY CLASS) 34.2 33.3 3.2 for B Class and 40 c i Glass 2.41 for B Class and 93 for C Glass 50 mm MEDIUM CLASS) HEAVY 'C' CLASS 60.8 59.7 3.6 for B class 4.5 for C Glass 5:03 for B for C Glass 80 mm MEDIUM CLASS) or HEAVY CC' CLASS) 89.5 88.0 4 for B Class and 4.8 for .C Glass 8.36 for B class and 9*90 Ér C Glass *Maximum tolerance on thickness (-) 10%, Tolerance on weight for single tube $\pm 10\%$ and for quantities per load of 10 tones, $\pm 7.5\%$ 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-I) - 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 gm/m². The zinc coating on external and internal surface shall be adherent, smooth and free from such 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 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 metre with the following information (i) Manufacturer's name or trade mark, (ii) Class of — 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 : (i) Copper Tubing For a copper service in domestic natural gas installations, materials supplied shall be in accordance with BS EN 1057:1996. It has replaced the copper tube standard BS 2871 Part 1. BS EN 1057 ensures the quality of the copper product by specifying the pipe in terms of its chemical composition, mechanical properties e.g. tensile strength, hardness, elongation etc., dimension and tolerance, surface quality, freedom from defects and suitability for pipe bending. Copper pipe work shall be jointed by soldering or brazing, using mechanical compression or capillary type fittings. Fittings for use in joining copper tube shall be as per BS EN Parts 1 and 2. Fittings for capillary soldering and brazing are specified in Part 1 and compression fittings are specified in Part 2. Soldering utilizes filler metals with melting points at temperatures up to 4500°C. Filler metals shall be as per BS EN 29453:1994 - Solder alloys - compositions and forms. Solders for use with copper tube and fittings generally melt within the temperature range 180°C to 2500°C. Compression fittings shall comply with BS 864 Part 2 or BS 2051 Part 1. For capillary fittings: 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, IS 8000 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 gas system, protection against lightning conductors shall be considered. A copper gas line shall never be used as a ground for an electrical system. [F. No. S-Admn/1/8/2007-V01.1], RATAN P. WATAL, Secy. Printed by the Manager, Govt. of India Press, Ring Road, Mayapuri, New Delhi-110064 and Published by the Controller of Publications, Delhi-110054. REGD. The Gazette of India, 1930 PART II—Section 3—Sub-section (i) 2, s, 1930 NEW DELHI, AUGUST 27, 2006 BHADRA S, 1930 27 •R, 2m8 2006 19) 61 t f i q q, 2008 I (2) 1. 2006 (q) q r e i 3225. GI/2008 2 (q) (7) (\$0 (e) (3) (g) (or) THE GAZETTE OF INDIA: EXTRAORDINARY [PART 34 t t ä r g r 3 i • a z i 7 at ERT RMT, are (Nf3•q««) t t a y r a r v t r z « t 100 (7 (49 Oar t a - r a t [T T 11--a c s 3 i] 3 (g.) 5. 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EXIRAORDINARY t, t (q o r 2 + 1 a t r O f r) l (v i t) a q T - a a r «, g a r «, q « q r - X Q T, t a r t: - a o r q t r « a r q a a f, i i i . . • ä i a t 15 1. 2. 3 v - Ä Q ' R, 3 R - a 31 * r 12 300 q r - q r, 3 V f i U T, q r 3 T a • r t, 3 F z r • (9 q t 3 R v w) 3 k z a • r 3 t R 16 L THE 3 q n « r, O m 5572 * + 5571 3' g « o r, 3043 250 2309 4.8 552, % 3, - 0555 556 ' # F t r R a t g a r I - # s « 1600 3 200 2 3 3 i • R 7 i 00 a - i f 3 31 a • r 17 6.4 M r 6.4 4 0.40 3225 G (F) Q t r t * r e t (2) Ä ä z r (t) n r ä a r a a v r a 37 * r R q • r 18 1 2. G A æ 1 T E O F N D I A : E X T P . A O R D I N A R Y 7 T a (a T) q r a • r a e r e q ' a i t : q a a r a t a v r a t r - (1) 131 (T) n r a r, g o r r t r 110 0.72 0.72 0.60 0.60 0.72 0.72 0.72 0.72 0.72 0.72 0.80 0.50 0.72 0.50 0.60 0.50 0.60 0.60 0.60 0.50 0.60 0.60 0.60 0.50 0.60 0.60 0.60 0.60

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