

# **PETROLEUM AND NATURAL GAS REGULATORY BOARD**

New Delhi, the 2<sup>nd</sup> September, 2020

## **1. Short title and commencement:**

- (1) These guidelines may be called the Petroleum and Natural Gas Regulatory Board (Gas Supplies to Multi Occupancy Residential Buildings) Guidelines, 2020.
- (2) These shall be effective from the date they are issued by the Petroleum and Natural Gas Regulatory Board.

## **2. Scope:**

- (1) These guidelines provides for the installation of the pipes etc. for supplying natural gas to multi occupancy residential buildings (domestic premises) where natural ventilation is not available, in the tertiary network and up to and including the steel reinforced rubber hose installed inside the kitchen of the domestic customer, and includes the risers and laterals systems to facilitate supply of natural gas to the domestic customers.
- (2) Unless otherwise specified, the latest editions of the standards mentioned herein these guidelines including all addenda and revisions, shall apply. All pressure values mentioned in these specification are in gauge.

## **3. Regulations and Standards:**

- (1) These guidelines follows the general principles detailed in the Institution of Gas Engineers and Managers, UK publication No. IGEM/G/5 – Gas in Multi-Occupancy Buildings, with amendments for the conditions that exist in the areas of the installations where natural ventilation is not available and with reference to the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008.
- (2) Installations shall be approved for occupancy with applicable approvals issued by local authorities.
- (3) Installing risers and pipe work for multi occupancy residential premises is a potential hazardous operation and must be undertaken safely.

## **4. General:**

- (1) The construction of risers, laterals etc. shall be undertaken with the materials procured from vendors approved by local CGD entity or as per the prevalent procedures approved by local CGD entity.
- (2) The pipe-work in the riser shall be of welded steel construction, and the materials shall be ERW GI pipe (heavy class) as per IS 1239 Part 1 standard and wrought steel fittings as per IS 1239 Part 2 standard.

- (3) The jointing method shall be done by welding using wrought steel fittings. The preferred route for constructing or locating the riser should be near the kitchen, and the same shall comply with the requirements of PNGRB T4S Regulations.
- (4) The maximum operating pressure of the riser to building shall be 110 mbar (g). In case of riser regulator, the upstream pressure of the regulator shall be a maximum of 4 bar (g) and the downstream pressure of the regulator shall be a maximum of 110 mbar (g).
- (5) The polyethylene (PE) portion of a service terminates at the crimp fitting approximately 0.3 metres above ground which is protected with anti-rodent HDPE or GI sleeve and RCC crimp guard and thereafter changes to galvanized steel pipe and the Riser Isolation Valve (RIV) is located at height of 1.0 to 1.5 metres from ground level.
- (6) Immediately above the RIV, an equal tee may be fitted to facilitate the pressure testing of the riser.
- (7) In areas susceptible to rats' bites, the PE pipe may be protected with anti-rodent sleeve or tape protection.
- (8) Where the pipe shall be laid over the building Podium or ceiling slab, to gain access to the riser, this may be done either:-
  - i. by laying exposed steel pipe clipped to the roof in the car parking area; or
  - ii. by laying (in the podium) buried PE pipe at depth of at least 375 mm.

## **5. Gas Meter:**

- (1) Gas Meter should normally be located inside the customer's premises (dry balcony or any other appropriate location) with a minimum length of uncontrolled inlet pipe-work inside the premise.
- (2) The gas meter shall not be installed inside a cabinet or below the cooking platform.

Provided that where adequate natural ventilation is not possible or achievable, a detailed risk assessment for the individual installation shall be carried out as per UK publication No. IGEM/G/5 – Gas in Multi-Occupancy Buildings.

- (3) Gas Meter shall not be installed along a route which is used by more than one property as a means of a fire escape that is say a communal fire escape route.
- (4) The gas meter shall be installed at a proper location to facilitate safe and convenient meter reading and maintenance activities in future.

## **6. Meter Control Valve (MCV):**

The meter MCV shall be installed in the premises of each domestic customer and should be easily accessible whenever needed.

## **7. Planning and Design of the Riser:**

- (1) Risers and laterals shall be designed to run by the safest route, taking into consideration potential meter positions, design regulations and access for future maintenance.
- (2) The riser and laterals shall be constructed in a safe manner by using the least number of fittings, minimum pipe and considering future maintenance requirements.
- (3) Risers and laterals shall be laid a minimum of 300 mm from any electrical equipment or installations. Further, where the pipe is required to cross over a cable, it shall be done at right angles and a gap of 25 mm between the pipe and the cable shall be maintained. Consideration should be given to wrapping the pipe with electrical insulation tape or PVC sleeve for protection against electrical short circuiting.
- (4) The welded pipe-work should be designed and installed in ventilated utilities shaft or duct or areas that has access at each floor level. The access entry shall allow a person to have easy and unrestricted access to the pipe-work to facilitate ease of operations and maintenance of the same. The access to the pipe-work should normally be outside the flat or property.
- (5) Risers and laterals shall not be laid directly inside individual's premises, unless it has a purpose to build and designed ventilated shaft.
- (6) The shaft shall not be capable of being converted into an inhabitable room by the flat owner.
- (7) Any shaft and other like devises., containing a riser or lateral shall not be covered in the top and shall be ventilated directly to outside air.
- (8) Safe access to the riser shall be available for future maintenance and repair. In the case of a continuous shaft, a concrete slab or similar flooring shall be provided for access for maintenance at each floor.
- (9) The riser and lateral piping system shall be designed and evaluated to ensure that the stresses along the entire lengths of the riser and lateral system (including the stresses at supports, clamps, etc.) are within the acceptable limits, and no undue stresses are developed in the riser and lateral piping system due to the expansion or contraction or swaying or settlement of the building and the piping system attached thereof. The effects of environmental (thermal, wind, etc. at higher elevations of the building) and other associated factors like change in temperature over the entire year, solar gain in the riser, etc. should also be taken into consideration in the detailed designing of the PNG riser and lateral system.

## **8. General guidelines of Stress Analysis:**

(1) In case the height of the building is more than 40 metres, then stress analysis of riser and lateral piping systems shall be carried out as per the prevalent procedures approved by local CGD entity, and the following should be taken into consideration, namely :

- i. Pressure, Self-Weight, Building Settlement and seismic effect (as per building design data, the onus of which shall be with the builder for the entire life of the building);
- ii. Difference in installation temperature should be taken as 20 °C and the design temperature shall be taken as 65 °C for calculating the stresses due to thermal expansion and contraction. Considering a design life of 40 years and one thermal cycle per day, number of thermal stress cycles for safe design should be  $40 \times 365 = 14600$  i.e. 15000 (approx.). Stress range reduction factor should correspond to this and expansion stress range should be correspondingly reduced by a factor of approximately 0.8;
- iii. Pipe displacement due to building sway in +X, -X, +Z and -Z directions (as per data from civil engineering design of the building). Sway table providing displacement of pipe at various floor levels shall be provided for review and cross-check of input files of stress analysis; and
- iv. Pipe vibration due to building vibration caused by seismicity (as per seismic-class and spectrum data used in civil engineering design of the building).

(2) The pipeline must be safe under the following load cases, namely:-

- i. Combined Loads Pressure, Self-weight, Building Settlement, Thermal expansion and Pipe displacement with direction +X;
- ii. Combined Loads Pressure, Self-weight, Building Settlement, Thermal expansion and Pipe displacement with direction -X;
- iii. Combined Loads Pressure, Self-weight, Building Settlement, Thermal expansion and Pipe displacement with direction +Z;
- iv. Combined Loads Pressure, Self-weight, Building Settlement, Thermal expansion and Pipe displacement with direction -Z; and
- v. Combined Loads Pressure, Self-weight, Building Settlement, Thermal expansion and Seismic effect.

## **9. Laterals.**

(1) For welded risers, the tee joint on the riser shall be of socket welded type and the joints on laterals can be of threaded type. The lateral pipework shall be connected

with riser through welded joint and other end of lateral pipe can be of threaded type. Rest all joints in laterals piping can be of threaded type. The ERW GI pipe used for lateral shall be of heavy class as per IS 1239 Part 1 standard and the fittings in the laterals shall be wrought steel fittings (as per IS 1239 Part 2 standard) or malleable cast iron fittings (as per IS 1879 standard).

- (2) For multi occupancy buildings having height of more than 40 metres, stress analysis should be carried out and suitable mechanisms should be incorporated in the design of the riser and lateral system to allow for thermal expansion or contraction of risers, and shall ensure that the stresses in the piping system are within the acceptable limits.

## **10. Ventilation**

- (1) Adequate ventilation shall be provided to the Petroleum Natural Gas (PNG) system in the premises of the building or customer to prevent any potential gas leaks from accumulating in the atmosphere to unsafe levels.
- (2) Riser ducts or shafts shall be well ventilated.
- (3) In exceptional cases, wherein adequate natural ventilation is not possible or achievable, a detailed risk assessment for the installation shall be carried out by the builder or society or customer for the entire life of the building as per UK publication No. IGEM/G/5 – Gas in Multi-Occupancy Buildings. The onus and efficacy of functioning of any auxiliary systems provided by the builder or society or customer like gas leak detectors, flame proof forced draft fan, solenoid valves (to shut off supply), audio alarms, etc. and its linkages (if any) to Building Management Systems (BMS), etc. shall be demonstrated by the builder or society and addressed appropriately in the risk assessment and the functioning (during the entire life cycle of the system) of the same shall solely be the responsibility of the builder or society or individual customer.
- (4) The overall responsibility of safety should be with authorised CGD entity and in case of any incident, the CGD entity shall carry out an investigation of the incident to identify the shortcomings or lapses, root cause of incident, suggestions or remedial measures to prevent recurrence and fix responsibility. No by-pass of the gas solenoid valve shall be provided.
- (5) The gas detectors shall comply with BS EN 60079-29-1 standard or equivalent and these shall be installed in accordance with BS EN 60079-29-2 standard or equivalent.
- (6) The gas detectors (Ex-D, IIA and IIB, IP 65 protection, approved by ATEX or PESO or CMRI) shall be highly sensitive (duly calibrated by the customer initially as well as periodically) and shall be installed at appropriate locations along the pipeline system in the premises of the customer, and these shall be interlocked with the shut off valve located at the inlet of the piping system in the premises of the customer. In any case, a minimum of 2 Nos. of gas detectors shall be installed by the customer. The gas detectors shall be supplemented with hooters which shall be installed at strategic locations to warn all the concerned about the gas leakage. Emergency Shut Down (ESD) devices shall be provided

by the customer at strategic locations to facilitate shut down of the supply of gas in the event of any exigencies. Customer shall also ensure that these ESDs are operable (24 x 7) even in the event of power failure, that is to say by providing back-up power supply to such critical devices.

- (7) The auxiliary systems mentioned in the foregoing provisions, shall be monitored or controlled round the clock (24 x 7) by a centralized BMS , which shall be operated and maintained by competent agencies who shall be managed by the builder or society for the entire life of the premises. The responsibility of the operation, maintenance and functioning of the equipment shall always be with the builder or society, and the CGD entity shall be indemnified for any untoward consequences resulting out of the malfunctioning or alteration or modification of any of such systems or equipment carried out by the builder or society without the approval of CGD entity. Commissioning shall be undertaken only when CGD entity is indemnified (as described in the foregoing provisions ) by Authorized Signatory of the Customer.
- (8) A fire rated door shall be provided at each level for accessibility in case of any emergency.
- (9) The onus of safety, integrity and the efficiency of the operability the BMS in its entirety, and each of its components thereof shall be with the builder or society or customer for the entire life of the building, and the same shall initially be demonstrated to the CGD entity at a frequency of not more than 6 months.

#### **11. Risk Assessment.**

- (1) A risk assessment shall be undertaken for the entire building and the results are to be recorded. Connections should be given as per CGD entity's policies. A systematic approach is required to minimize the risk. The risk assessment shall include the following elements, namely:-
  - i. Hazard Identification;
  - ii. Hazard reduction, including the application of inherent safety principles;
  - iii. Evaluation of failure modes;
  - iv. Evaluation of release frequency;
  - v. Evaluation of release consequences;
  - vi. Risk mitigation, consideration of risk reduction options; and
  - vii. An assessment of the significance of the risk.

**Note: For details,** the UK publication No. IGEN/G/5 – Gas in Multi-Occupancy Buildings shall be referred.

#### **12. Pipes Passing Through Walls:**

Pipe passing through walls should be in accordance with PNGRB T4S Regulations.

#### **13. Pressure Testing:**

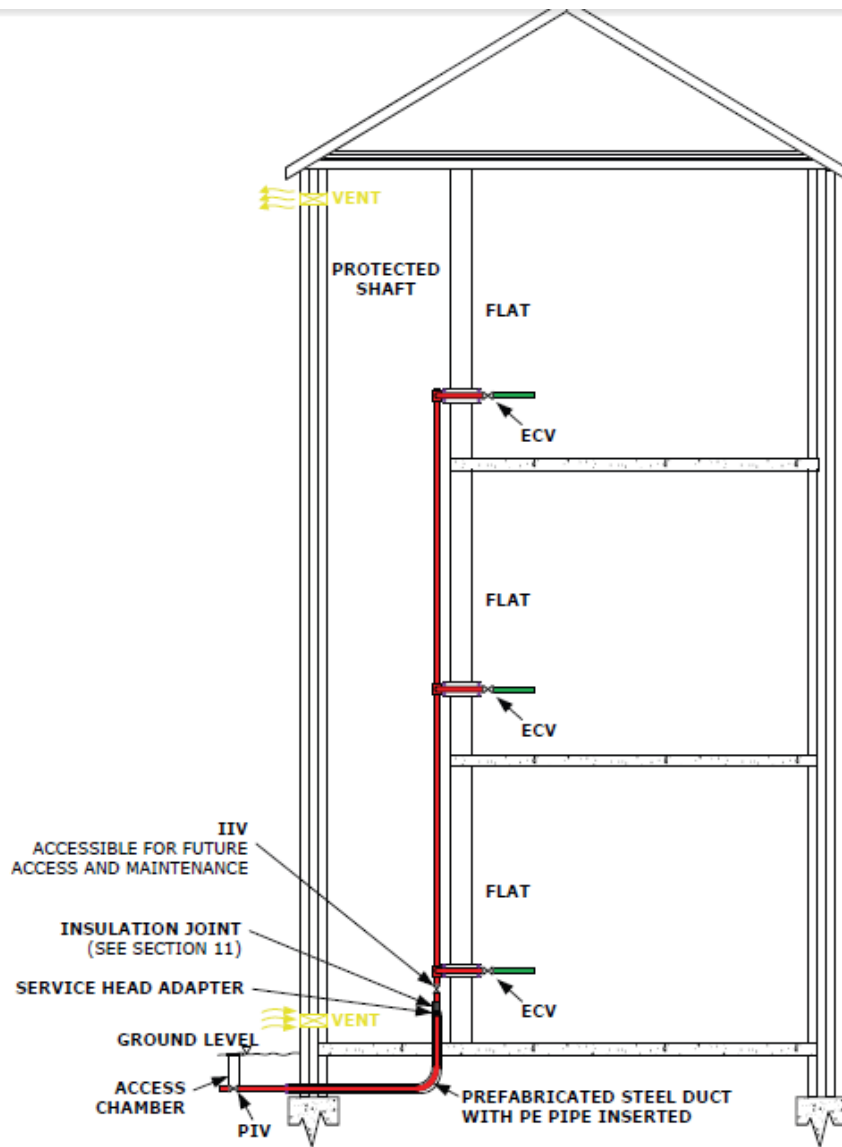
Pressure testing should be in accordance with PNGRB T4S Regulations.

#### **14. Pipe coatings:**

- (1) All risers and laterals pipes shall be painted yellow to signify that they are carrying gas, regardless of whether the pipe is enclosed or exposed.
- (2) Pipe coatings should be in accordance with PNGRB T4S Regulations.
- (3) Usage of SS tubes and fittings in risers and laterals system may be employed, subject to approval from PNGRB.

**15. Records:**

- (1) A sketch or written instruction of the design route and construction must be provided to the installer prior to installation.
- (2) A sketch or drawing of the completed work must be supplied by the builder or contractor to CGD entity prior to commissioning. The drawing should be entered into the Document Management system of the CGD entity.
- (3) The drawings provided below are to be referred in conjunction with PNGRB T4S regulations.



**Internal riser passing through the shaft**

**Note:**

**ECV:** Emergency Control Valve, similar to Meter Control Valve (or MCV).

**IIV:** Inlet Isolation Valve, similar to Riser Isolation Valve (or RIV).

**PIV:** Pipeline Isolation Valve, similar to the valve installed in service regulator module assembly or PE stop-off valve assembly installed in the PE mains, to enable isolation of the building.

**Insulation joint:** Refer Section 11 of IGEM/G/5 standard for applicability.

**Service head adapter:** Transition fitting from PE pipeline to ERW GI pipeline.