TECHNICAL SEMINAR 2017

# Gas Installation – Major Design Considerations

City Gas Pte Ltd

Commercial & Industrial Sales Division

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# CONTENT


1 VENTILATION SHAFT AND DUCTING

2 PROHIBITED AND PROTECTED AREAS

3 PIPE PROTECTION


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# VENTILATION SHAFT AND DUCTING

**Purpose**

- Ventilation shafts and ducting are used to convey piped gas to separate from any protected or unventilated areas.
- The shafts and ducting should be adequately ventilated to the atmosphere by ventilation openings. This is to eliminate any accumulation of gas in the event of leakage.
- Town Gas is lighter than air, thus will escape upwards. For this to be effective, an exchange of air must be present.

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# VENTILATION SHAFT AND DUCTING

**SS608 – Clause 5.3 Pipes in gas riser ducts**

The following are essential requirements:

a) Galvanised iron, steel or copper pipes shall be used;

b) Ducts sealed at each floor level shall be provided with vents at the top and bottom of each sealed section, except for ducts in basement areas where the riser ducts shall be continuous ducts;

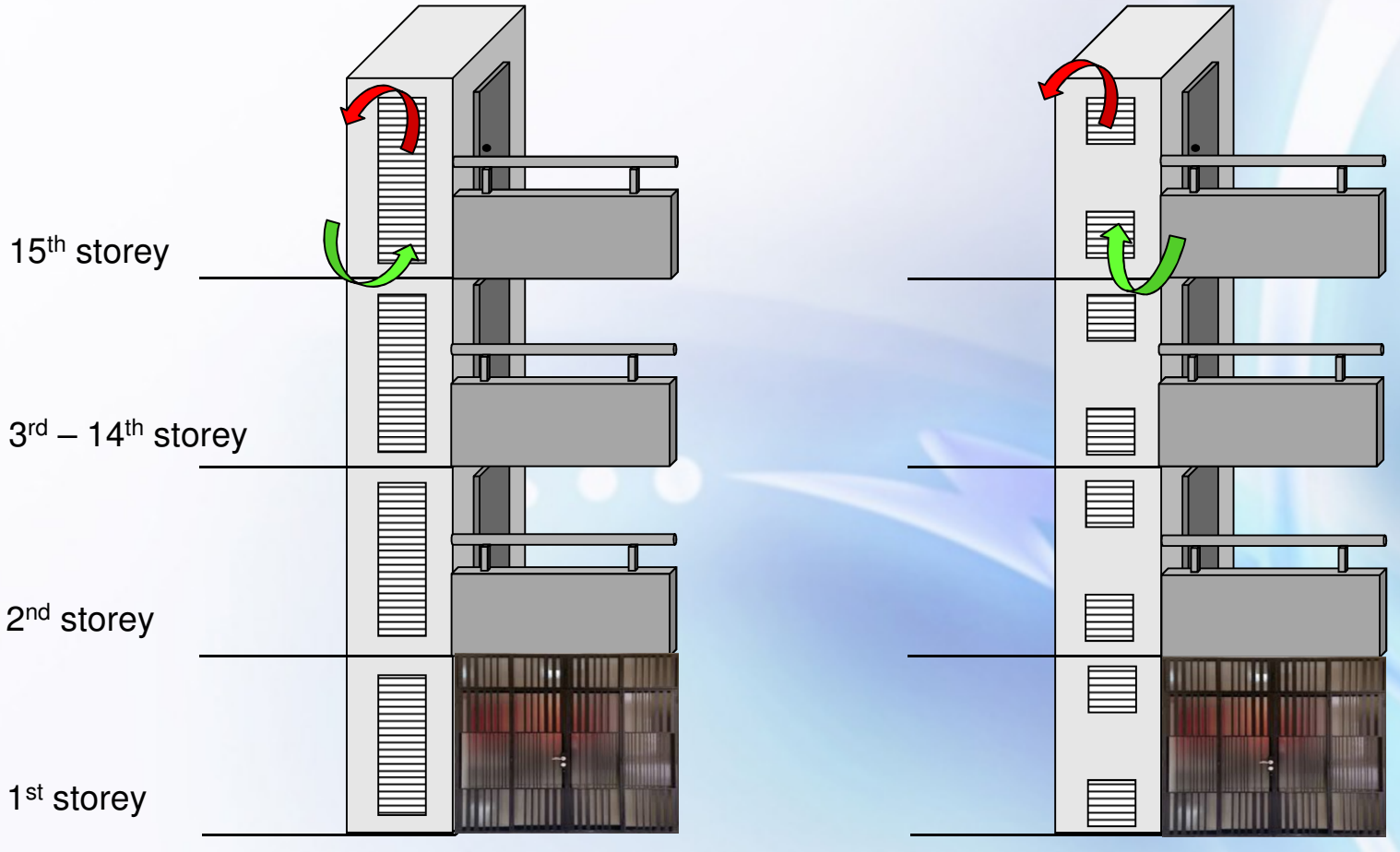
c) Continuous ducts passing through all floors shall be provided with vents at the top and bottom of the continuous duct;

d) Each vent and floor opening in the duct shall have an effective area of 0.05$m^2$ or 1/150 of the cross-sectional area of the duct, whichever is greater.

e) The vents at the top and bottom shall open directly to the outside of the building or to well-ventilated non-prohibited areas;

f) Duckfoot support may be provided to support the riser.

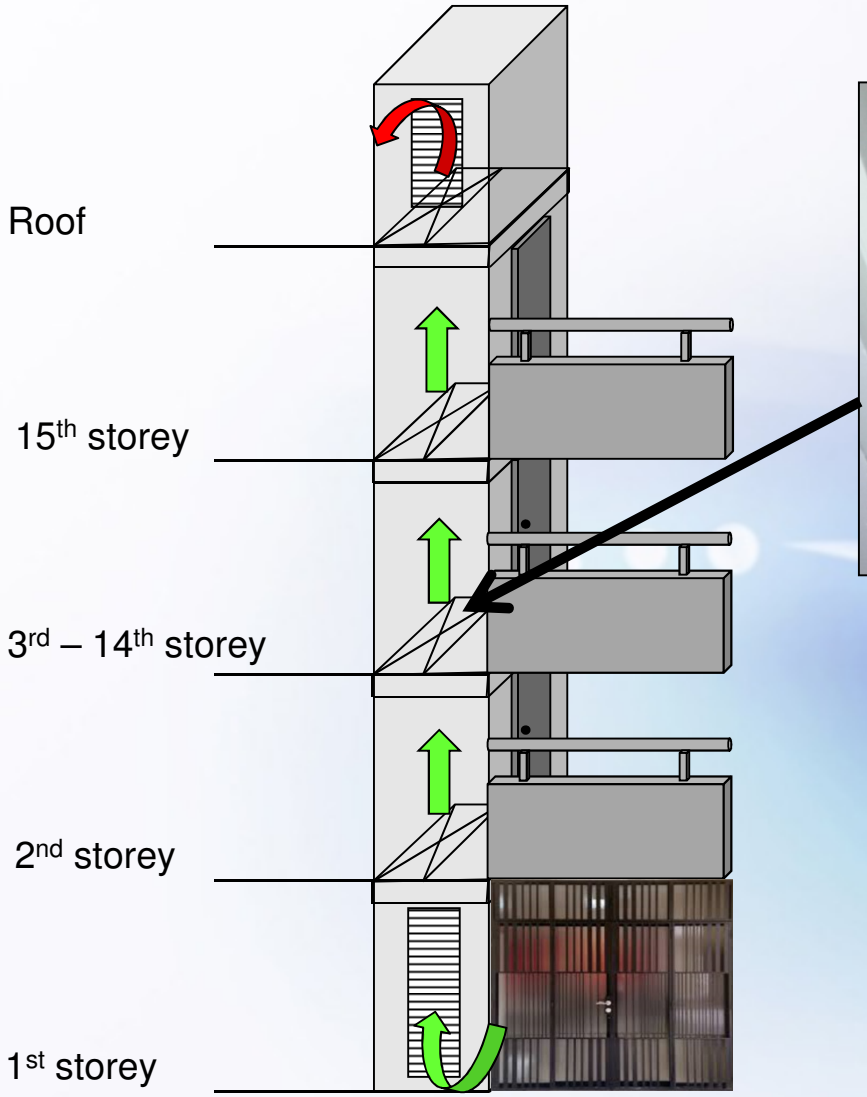
# VENTILATION SHAFT AND DUCTING




Sectional Shaft Ventilation

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# VENTILATION SHAFT AND DUCTING






Floor opening size of a minimum of 0.05m$^2$ (effective free area) is required.

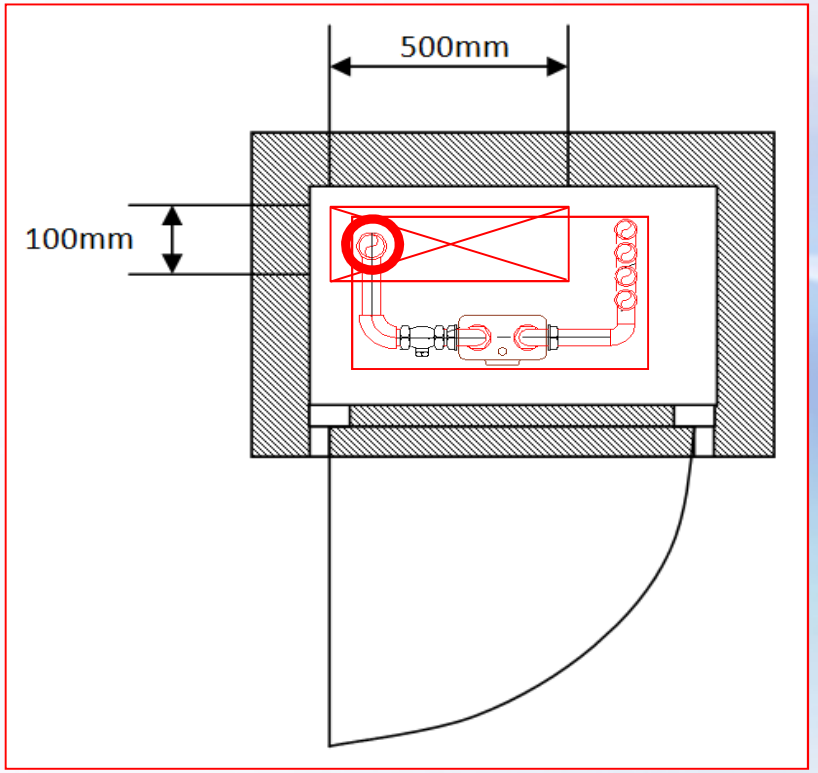
Continuous Shaft Ventilation

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# VENTILATION SHAFT AND DUCTING

- **Effective Ventilation (floor opening)**

Where pipes are to run through the floor opening, the **net floor opening** must not be less than the effective free area, **0.05m²**




Floor opening size = 0.5 x .0.1 = 0.05 m²

Ø80mm pipe area = 0.005 m²

Free Area = 0.05 – 0.005 = 0.045 m²
(less than effective size)

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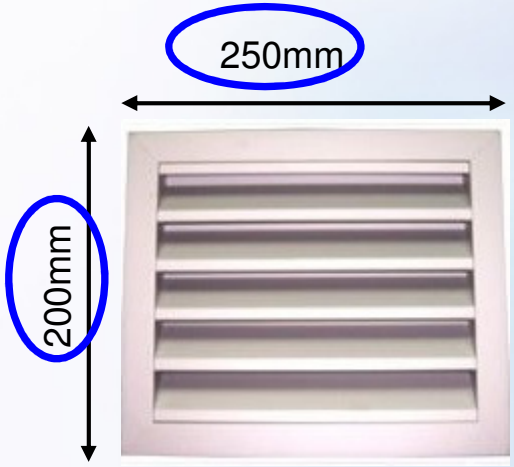
# VENTILATION SHAFT AND DUCTING

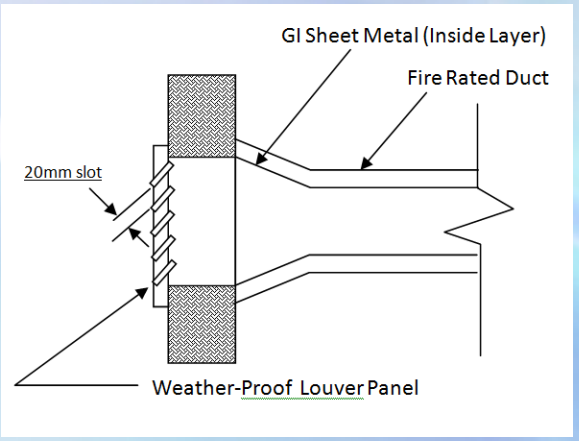
- **Effective Ventilation (ventilation opening)**

**<u>Ventilation openings</u>** inside the gas duct shall have an effective free area of **0.05m$^2$**.

Where a louver panel is used, its panel size (250 x 200) should not be used as the effective free area. The effective free area is determined by calculating the size of slot and then multiplying by the number of slots.

Louver panel shall be non-adjustable type.




Example: 250mm x 200mm louver panel with 50mm frame thickness.
Free area = 20mm (slot size) x 150mm (width) x 5 (no. of slots)
= 0.015m$^2$ (less than effective free area, 0.05m$^2$)

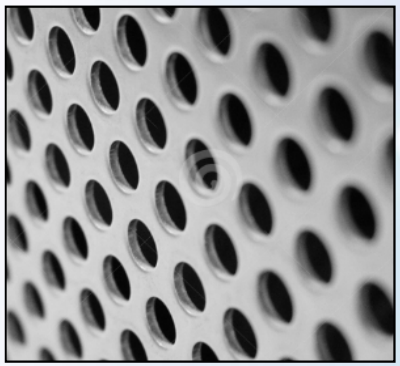
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# VENTILATION SHAFT AND DUCTING

- **Effective Ventilation (ventilation opening)**

**Ventilation openings** inside the gas duct shall have an effective free area of **0.05m$^2$**.

Where a netting panel is used, care must be taken to avoid nettings with small perforation. Dust accumulation is probable and tends to block the ventilation.





Small perforation panels

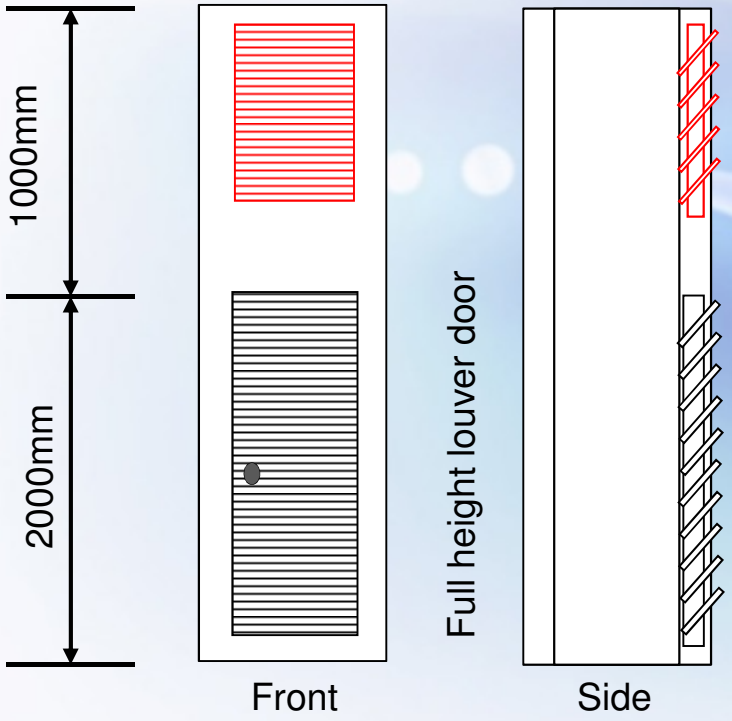
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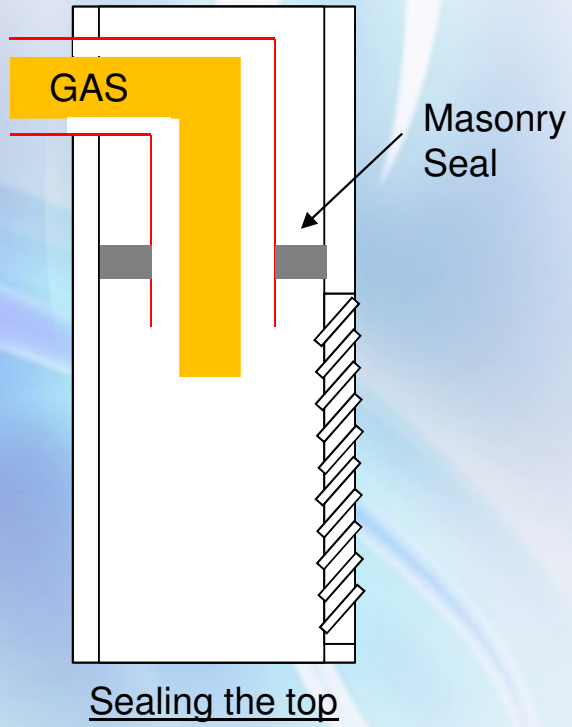
# VENTILATION SHAFT AND DUCTING

- **Location of Ventilation Opening**

High level vent opening shall be situated as close to the soffit of the ceiling level to ensure that any gas leakage within gas duct able to disperse immediately to external.

For example:



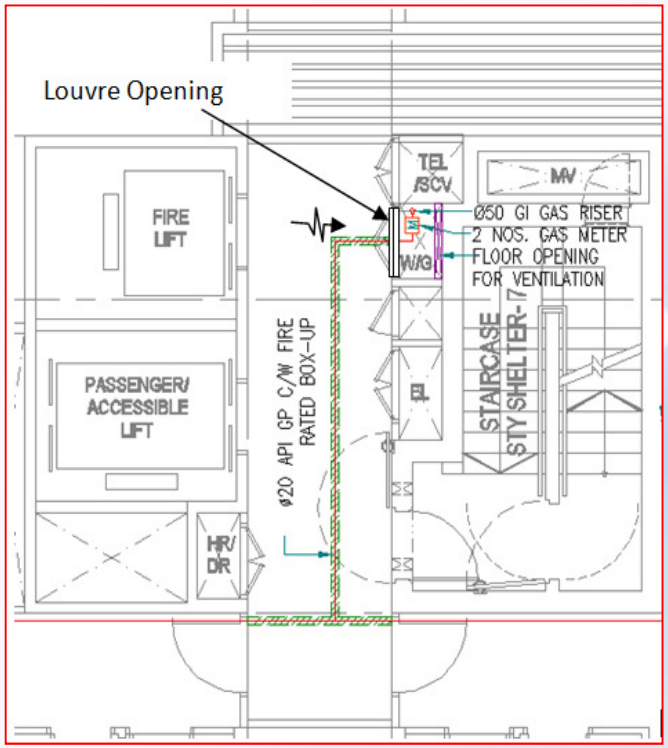




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# VENTILATION SHAFT AND DUCTING

- **Location of Ventilation Opening**

Ventilation opening shall lead to open area and not in areas such as protected corridor, smoke stop lobbies, fire fighting lobbies or near to any fresh air supply.







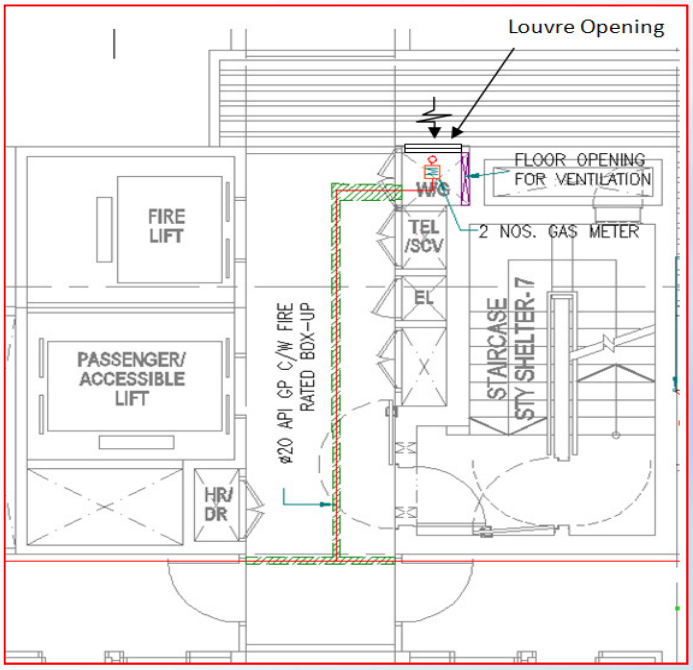
Ventilation opening non-compliance

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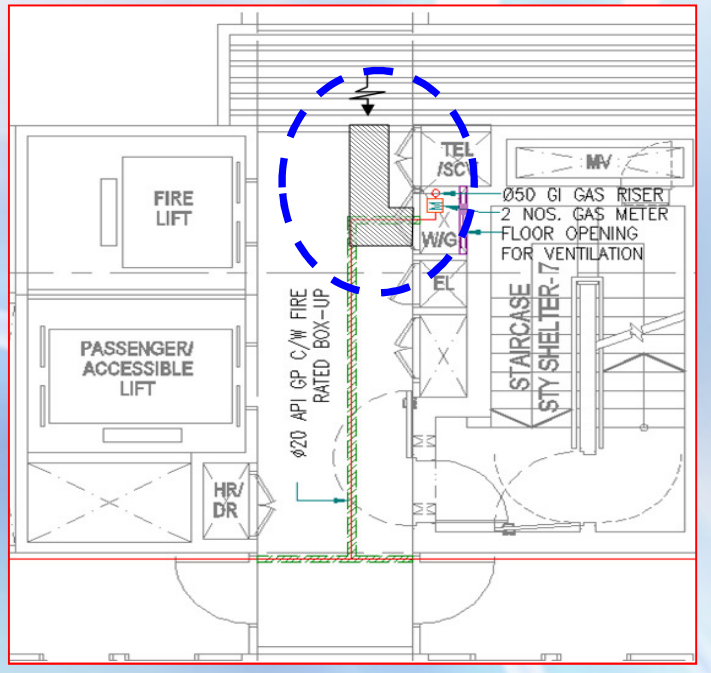
# VENTILATION SHAFT AND DUCTING

- **Location of Ventilation Opening**

Where possible, the gas duct shall design to locate next to an external wall to enable a direct ventilation opening to external.




Direct venting with louvre opening



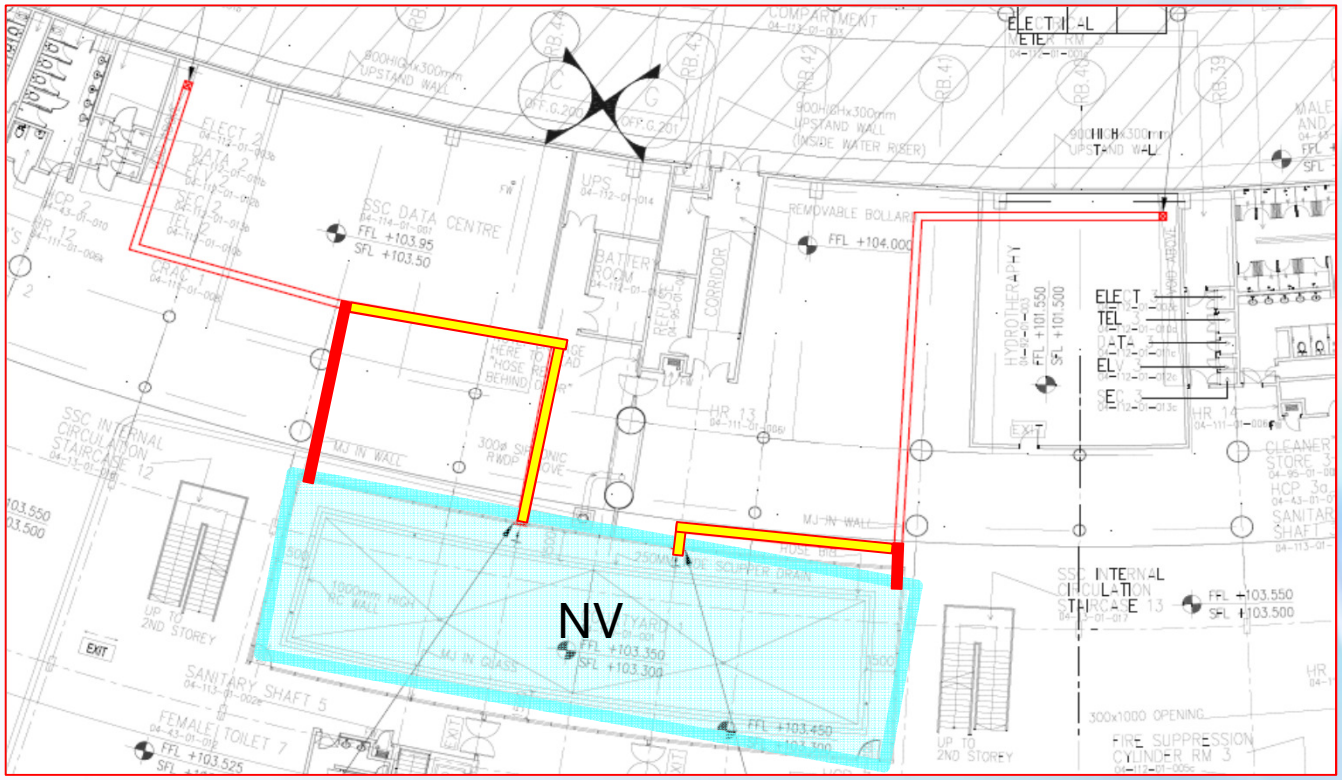

Ventilation through vent duct

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# VENTILATION SHAFT AND DUCTING

- **Location of Ventilation Opening**

Where direct ventilation opening to external is not impossible, vent ducts shall be directed to the external in the shortest possible route.




Lengthy ventilation ducts

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# PROHIBITED AND PROTECTED AREAS

**Purpose**

- Avoid areas designated for Emergency Use eg. escape routes, smoke-stop lobbies
- Avoid areas housing Critical Services eg. fire-fighting, air-handling equipment
- Gas safety consideration eg. bedroom
- Gas pipe protection consideration eg. under building foundation

# PROHIBITED AND PROTECTED AREAS

**SS608 – Clause 3.31 Protected areas**

Protected areas include fire-fighting lobbies, rescue and command centers, smoke stop lobbies, fire pump rooms, fire-fighting water tank rooms, sprinkler control valve rooms, fire-fighting riser ducts, areas of refuge, protected corridors and protected staircases.

**SS608 – Clause 5.5.5 Pipes passing across rooms and compartments: Protected areas**

The following are essential requirements:

a) Galvanised iron, steel or copper pipes shall be used;

b) Except for steel pipes with welded joints, galvanized iron and copper pipes shall have no joints;

c) The pipes shall be inserted within a masonry duct or a duct made of approved fire rated material and with at least one end of the duct vented to a naturally ventilated space.

# PROHIBITED AND PROTECTED AREAS

**SS608 – Clause 5.11 Prohibited areas**

Gas installations shall not be permitted in the following areas:

a) Under building foundation;

b) In the ground, under apron or concrete flooring within building unless in compliance with 5.2;

c) In bedroom unless in compliance with 5.5.1;

d) In a common area where bedroom and kitchen are together such as in studio apartment and dormitory, unless there is a full height wall separating the sleeping area from the kitchen and the kitchen area is naturally ventilated;

e) Within lift shafts of buildings;

f) In compartments or ducts dedicated for electrical switchgears, telecommunication services, transformers or non-gas powered generators, unless the gas pipe is located within a metal sleeve or a masonry duct or duct constructed of other approved fire-rated materials;

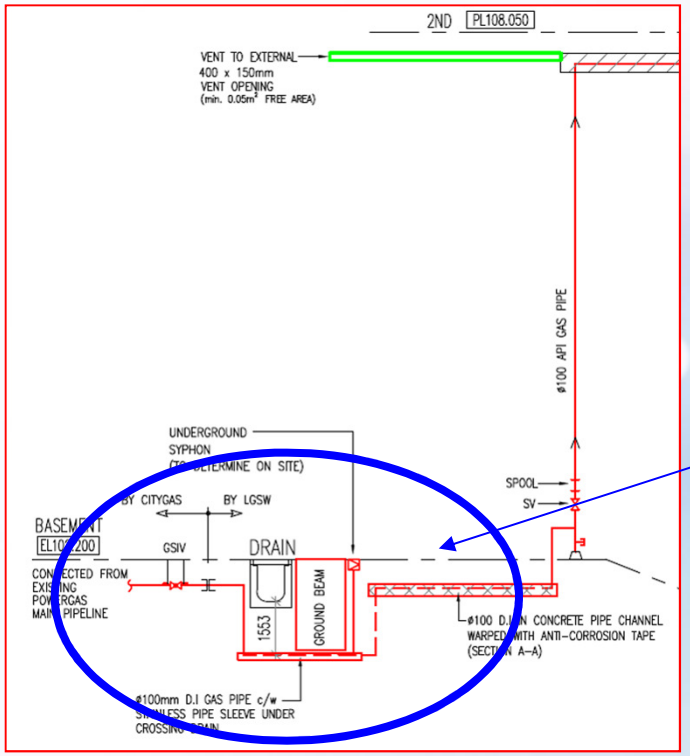
g) In refrigeration chambers, cold rooms, air handling rooms and ventilation or air-conditioning ducts; and

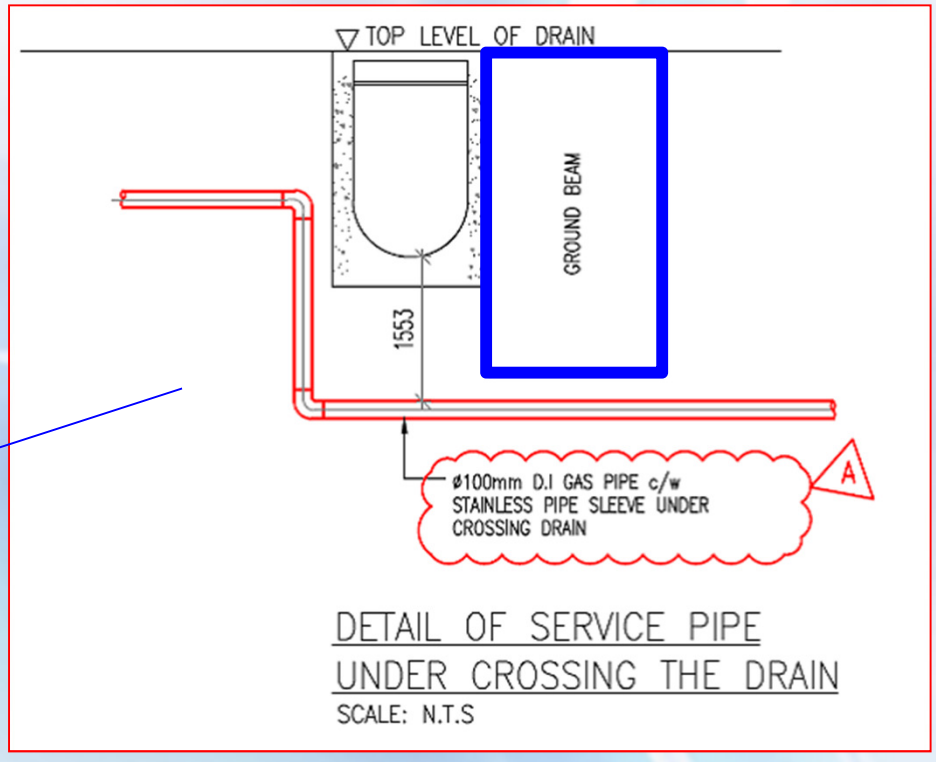
h) In fire-fighting lobbies, fire command centres, smoke stop lobbies, fire-fighting system equipment rooms, fire-fighting riser ducts, areas of refuge, exit passage and exit staircases, unless the gas pipe is located within a masonry duct with proper venting. For gas pipe installed in the fire-fighting lobbies or smoke stop lobbies, duct constructed of other approved fire-rated materials with proper venting is allowed.

# PROHIBITED AND PROTECTED AREAS

- **Prohibited Areas**

All gas pipes shall steer away from these areas.



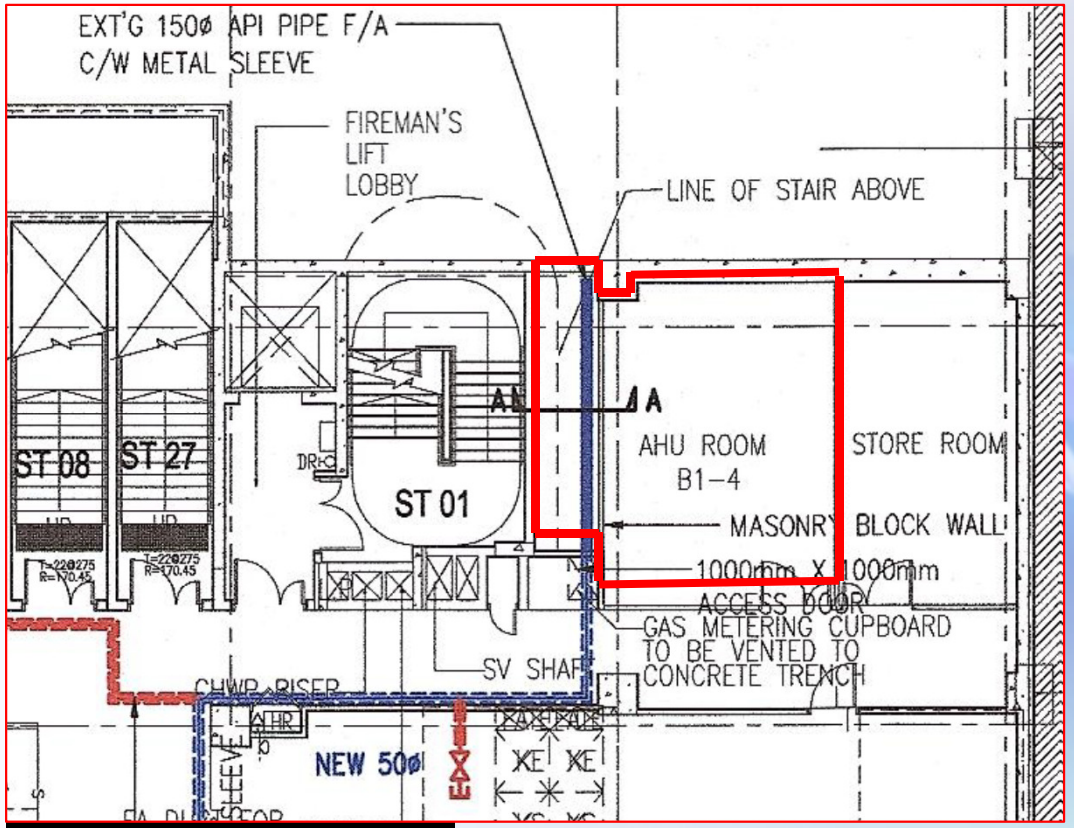

Under building foundation

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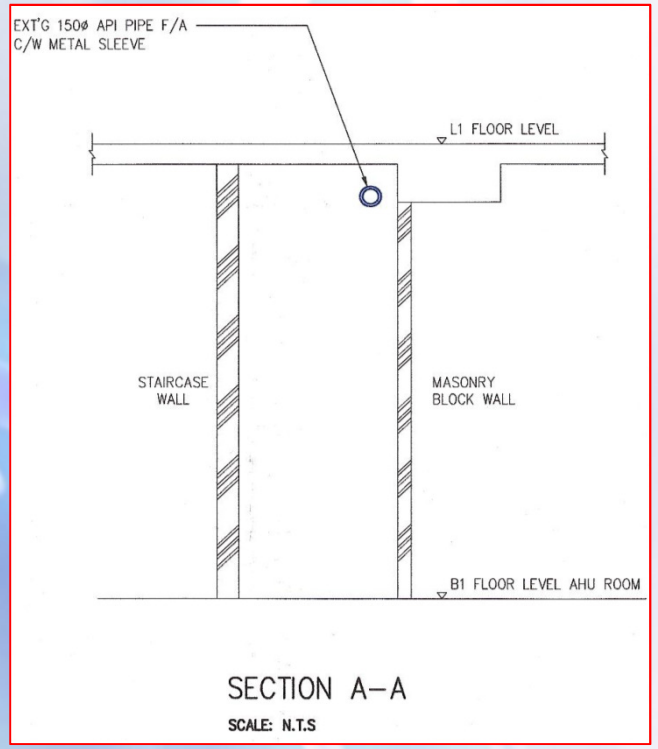
# PROHIBITED AND PROTECTED AREAS

- **Prohibited Areas**

All gas pipes shall steer away from these areas.




Air handling room



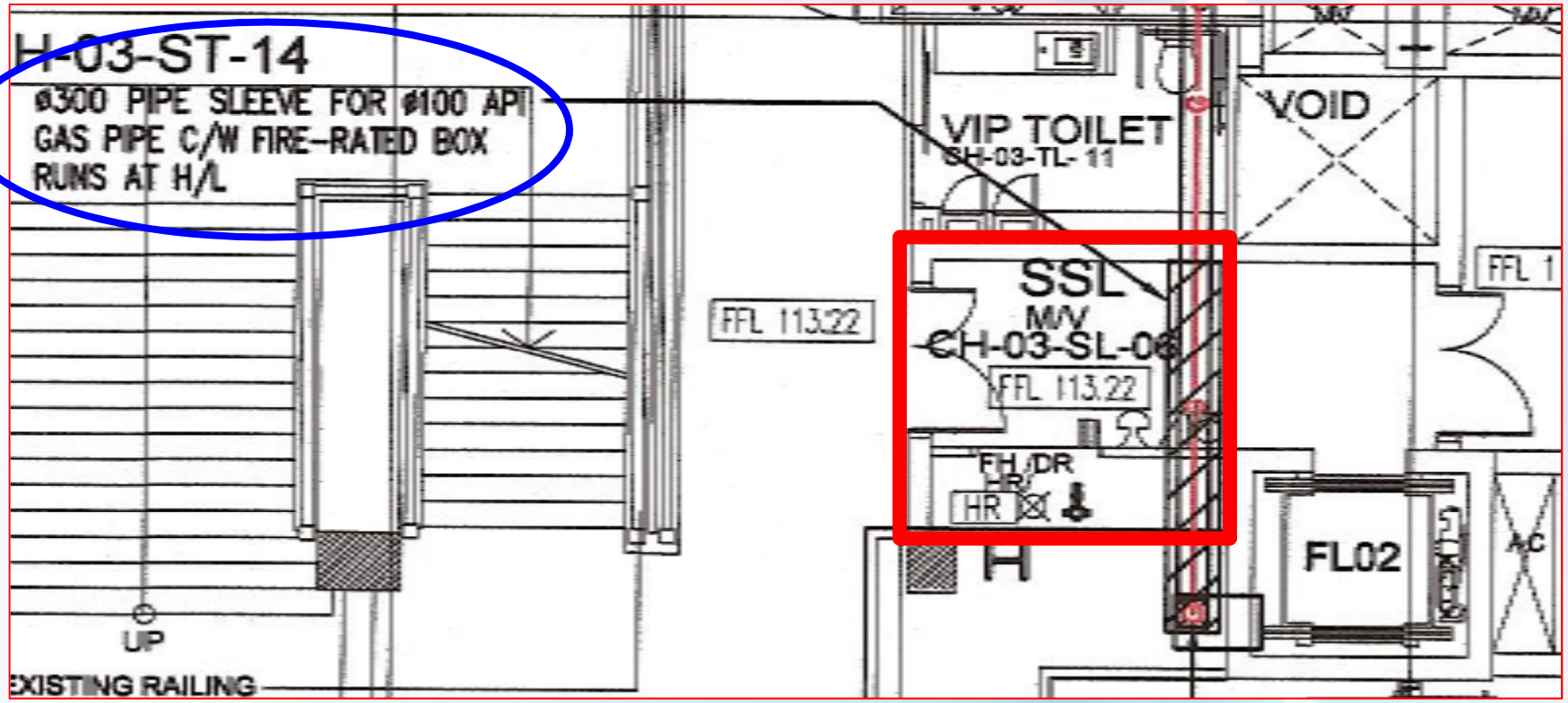

Separation wall

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# PROHIBITED AND PROTECTED AREAS

- **Protected Areas**

Where possible, gas pipes should avoid from these areas




Smoke-stop lobby, fire-fighting riser duct

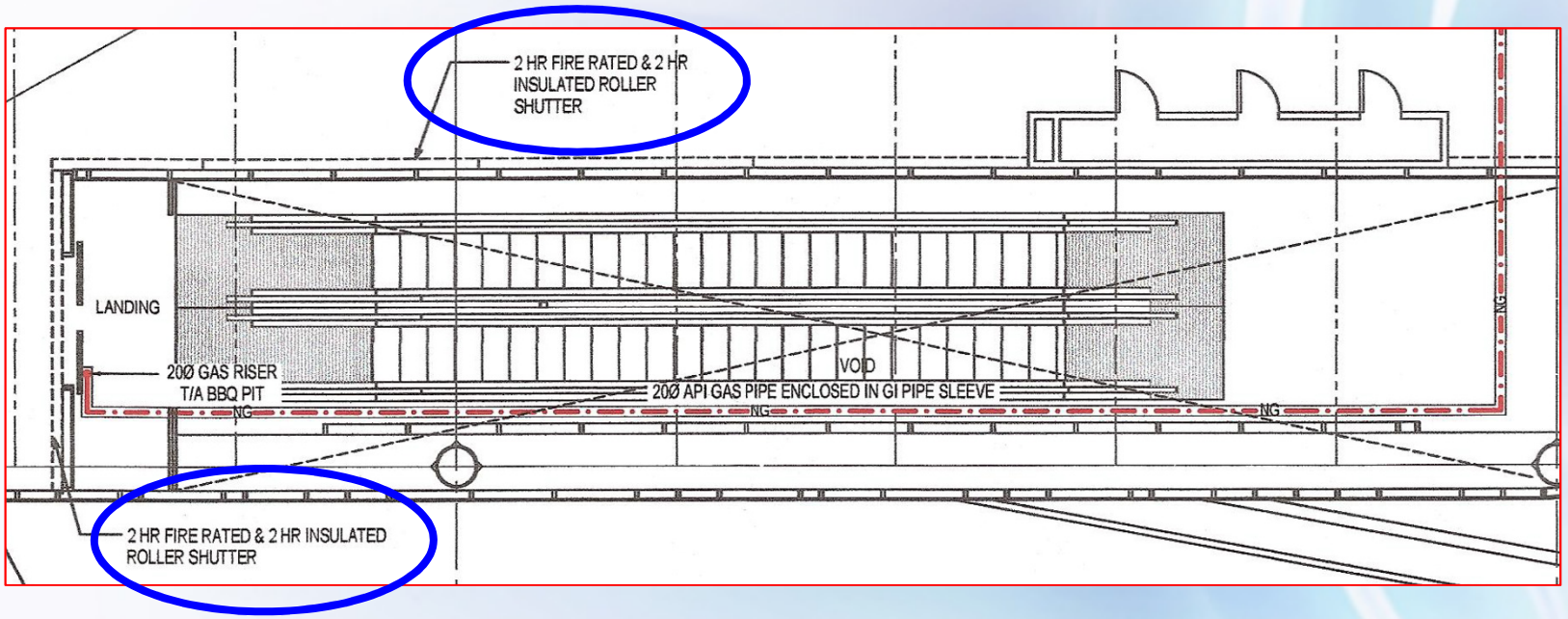
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# PROHIBITED AND PROTECTED AREAS

- **Unlabeled or Unclear Zones**

Where gas pipes pass through rooms or spaces, these zones have to be clearly labelled in the drawings.

Where zones are unclear, whether they are protected areas eg. exit passages, advice should be sought from SCDF.




Unlabeled or unclear zone

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# PIPE PROTECTION

**Purpose**

- To limit chances of corrosion.
- To reduce risk of any physical damage.

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# PIPE PROTECTION

**SS608 – Clause 4 Design**

The following are essential requirements:

l) The gas pipes shall be sufficiently supported and protected against physical damage.

n) Polyethylene pipes rising above ground level shall be protected against sunlight by metal; GRP (glass reinforced plastics) or uPVC sleeves. The annulus between the pipes and sleeves shall be sealed with cement mortar.



PE pipe at HDB block with sleeve



Pipe in carpark

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# PIPE PROTECTION

**SS608 – Clause 5.1 Pipes buried in open ground**

The following are essential requirements:

a) Ductile iron, polyethylene, galvanized iron and steel pipes shall be used;

b) Ductile iron pipes and fittings shall be fitted with zinc anode caps at the bolts;

c) Polyethylene pipes and fittings shall have passive electronic markers placed at the bends and tees and at approximately 35m apart along straight pipes. Additionally, a layer of concrete slabs, or PVC marker tapes with the work “GAS” clearly marked at approximately 1m intervals, shall be placed at approximately 300mm above the polyethylene pipes;

d) Galvanised iron pipes and malleable iron pipe fittings shall be suitably primed, coated with anti-corrosion paint and wrapped with anti-corrosion tapes.

e) Steel pipes shall be hot-dip galvanized, suitably primed, coated with anti-corrosion paint and wrapped with anti-corrosion tapes.

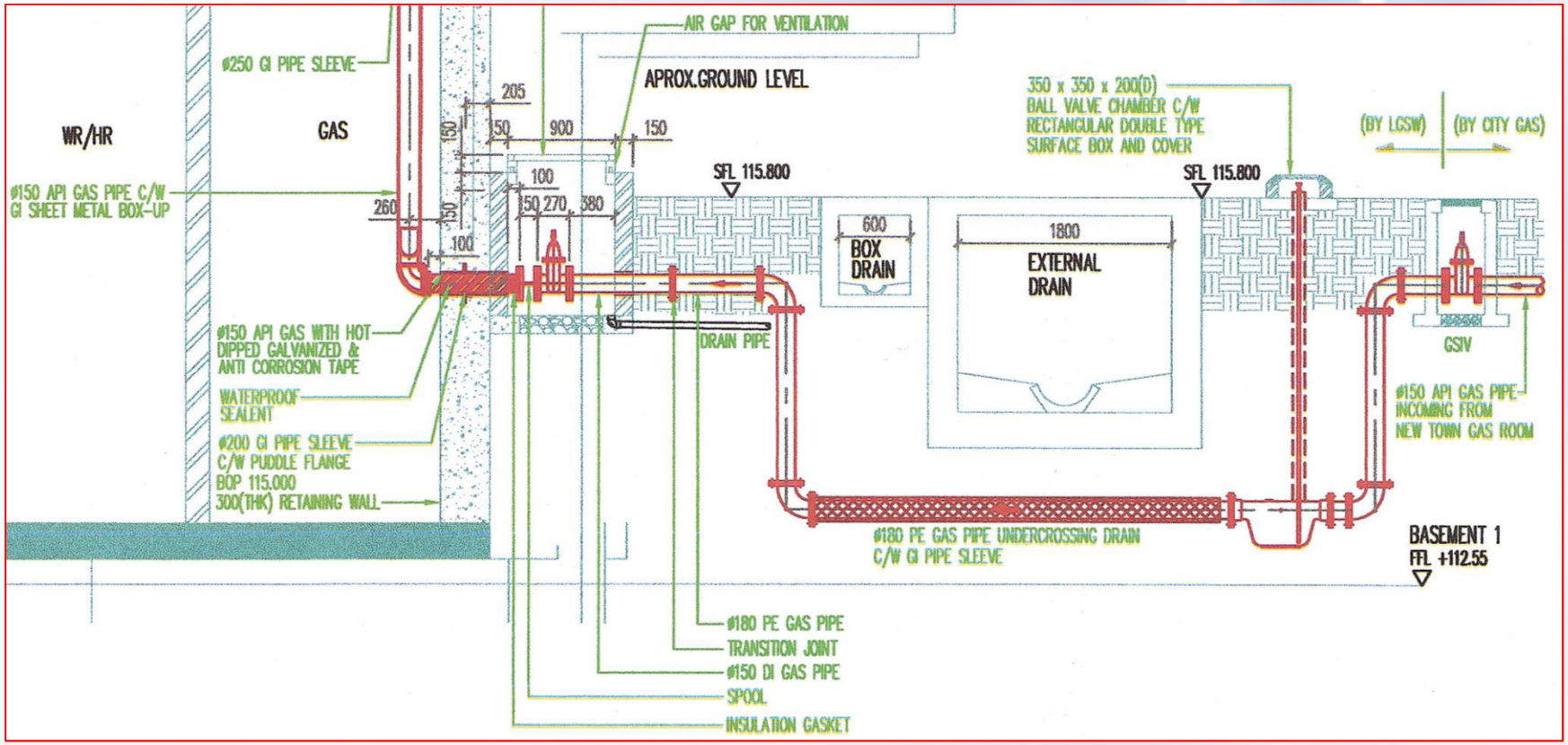
f) The minimum depth of cover for buried pipes shall be 500mm. Where there is likelihood of vehicular load over the pipes, the minimum depth of cover shall be 1m. Where the minimum cover cannot be achieved, specific protection shall be provided to protect the pipes against damage.

g) Reinstatement shall be carried out in accordance with the requirements of the relevant authority where applicable.

# PIPE PROTECTION

- **Reduce use of steel pipes**

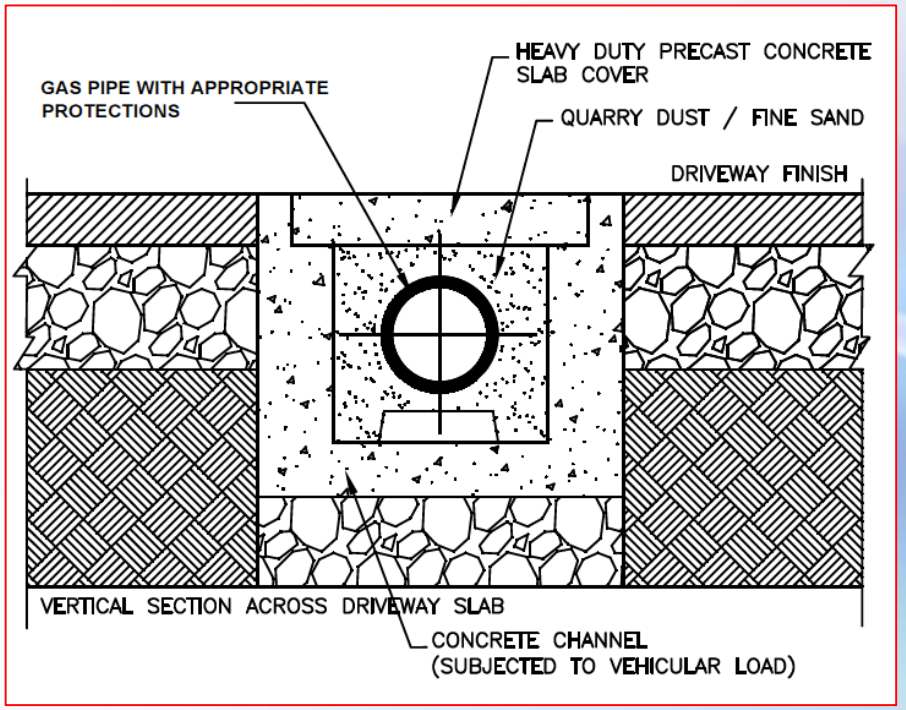
Where possible, minimize the use of steel pipes buried underground to lower the risk of corrosion.
If buried steel pipe is unavoidable, then pipe shall be protected adequately accordingly to SS608 Clause 6.7(g).
For underground entry, valve chamber shall preferably be located abutting the basement wall to protect the steel pipe against corrosion.



# PIPE PROTECTION

- **Minimum depth of cover**

Provide protection for buried pipes where minimum depth of cover cannot be achieved.



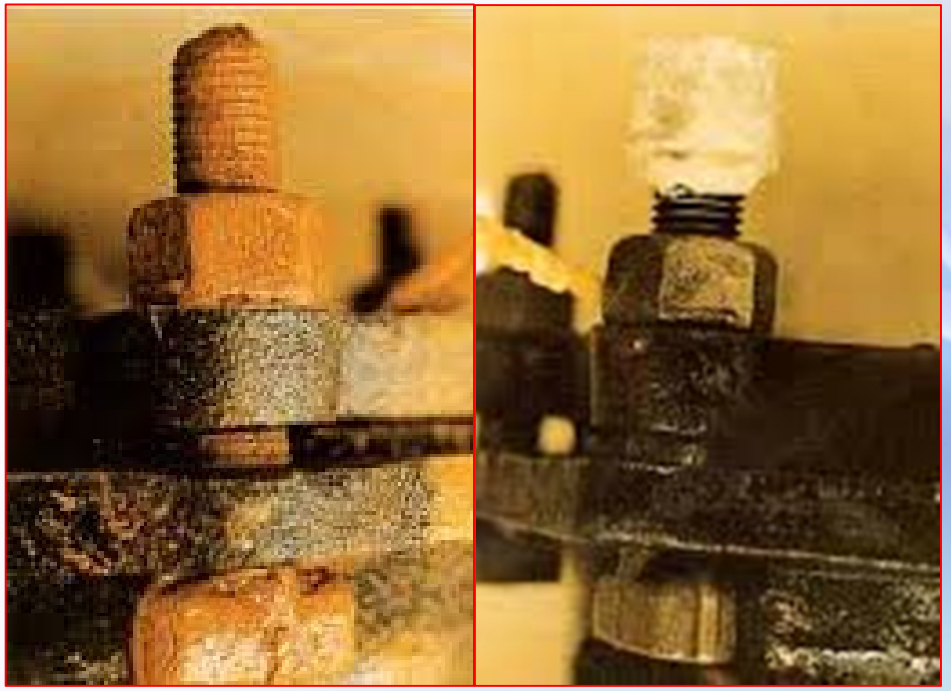

Concrete channel for gas pipe

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# PIPE PROTECTION

- **Cathodic protection to Ductile Iron installation**

Zinc anode caps shall be fitted to the bolts of ductile iron pipe joints as a sacrificial material for corrosion to take place.



Corrosion of bolts




Zinc anode bolt caps

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# PIPE PROTECTION

**SS608 – Clause 7 Installation**

The following are essential requirements:

j) All gas pipes except those within dwelling units shall be painted canary yellow to colour code BS 381C colour number 309 or identified by yellow bands in conspicuous locations. The word “GAS” together with an arrow signage showing the direction of the flow of gas shall be indicated on the gas pipes at intervals of not more than 3m.




Gas pipe labelling




Gas duct labelling

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# PIPE PROTECTION

**City Gas Handbook – Flexible Tubing**

Guidelines added in the Handbook on the usage of flexible tubing. For instance,

- It shall not be subjected to excessive heat by direct exposure or by contact with hot surfaces.
- It shall be installed in a manner that there is no mechanical damage, i.e. abrasion from furniture drawers or doors in kitchen work stations.





Flexible tubing installation

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# SUMMARY

1 VENTILATION SHAFT AND DUCTING

2 PROHIBITED AND PROTECTED AREAS

3 PIPE PROTECTION

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CITYGAS

THANK YOU

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