

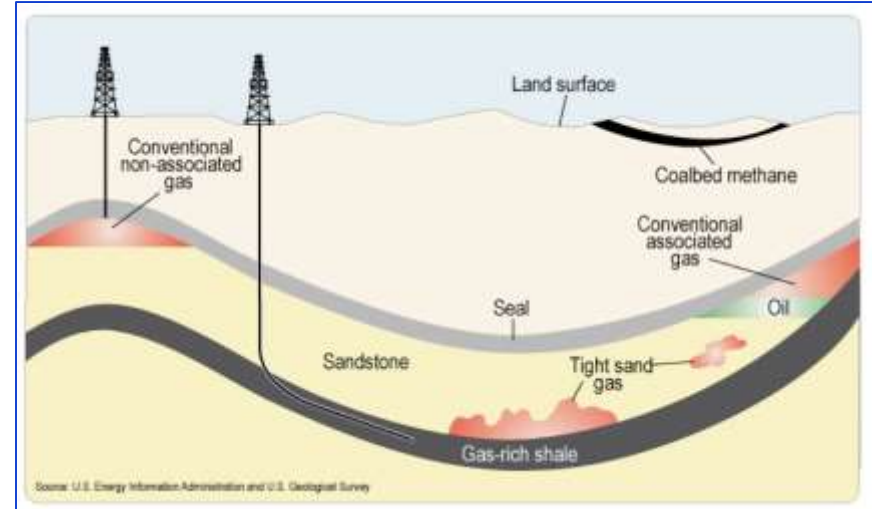
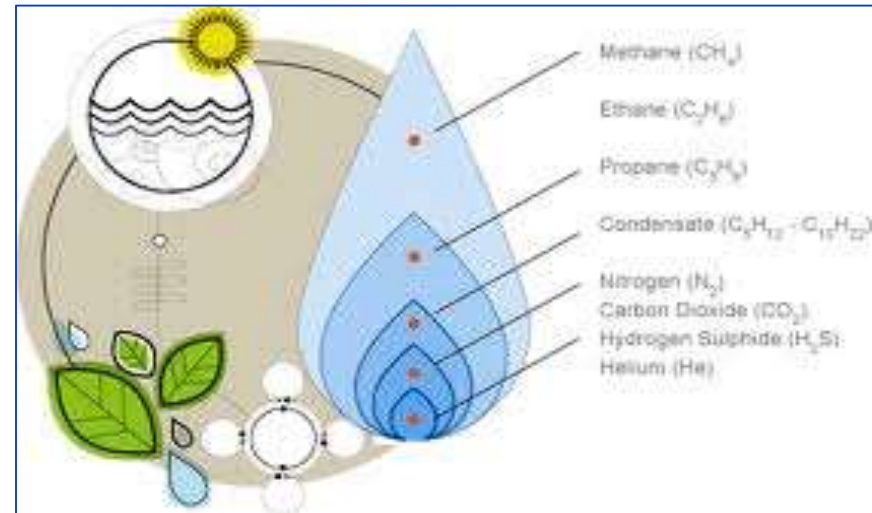


Safety Practices for City Gas Distribution (CGD)

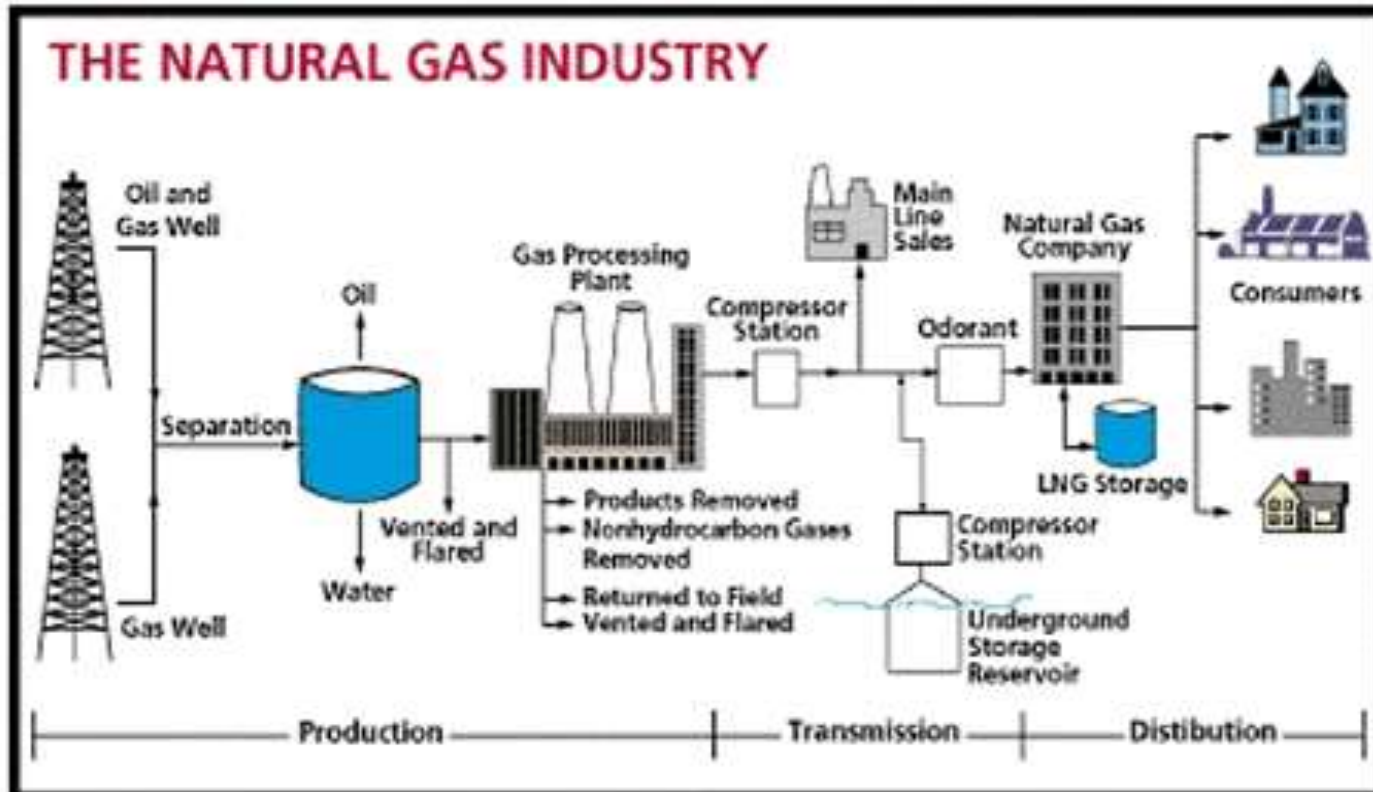
By
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Natural Gas

- Natural gas is a naturally occurring hydrocarbon gas mixture consisting primarily of methane, but commonly includes varying amounts of other higher hydrocarbons and a lesser percentage of carbon dioxide, nitrogen, and hydrogen sulphide.
- It is colourless, shapeless and odourless.
- Natural gas is an energy source often used as a fuel for heating, cooking, and electricity generation.
- It is also used as fuel for vehicles and as a chemical feedstock in the manufacture of plastics and other commercially important organic chemicals.



Natural Gas – Production, Transmission & Distribution



Source: Internet

Framework – Safety in Natural Gas Pipeline in India

Construction, Operation & Maintenance of Natural Gas Pipeline System

PNGRB

(Technical & Safety Standard of CGD Natural Gas Pipelines)

OISD

(Standard 226 – Natural Gas Transmission Pipeline and City Gas Distribution Network)

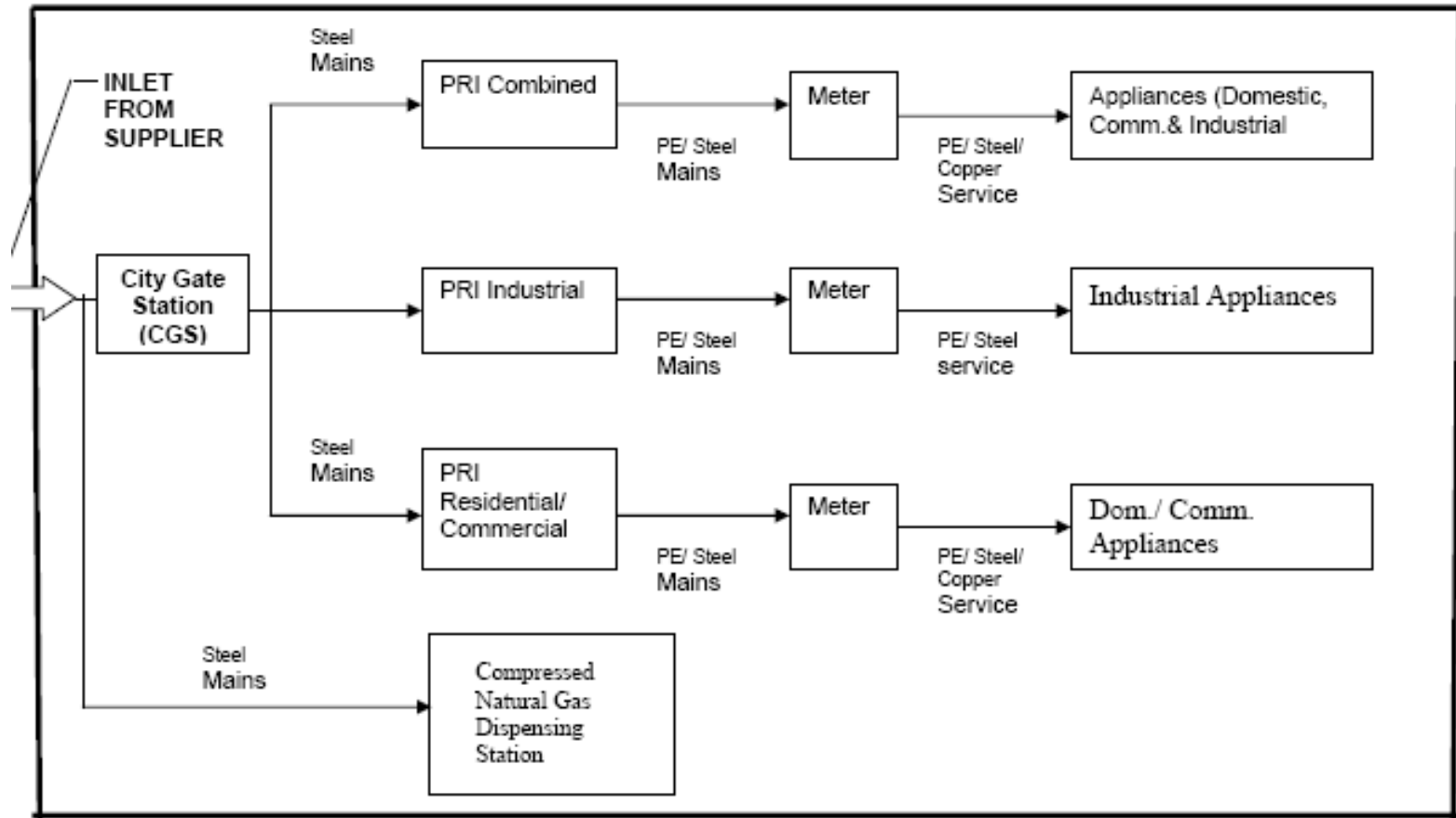
ASME 31.8

(Gas Transmission and Distribution Piping Systems)

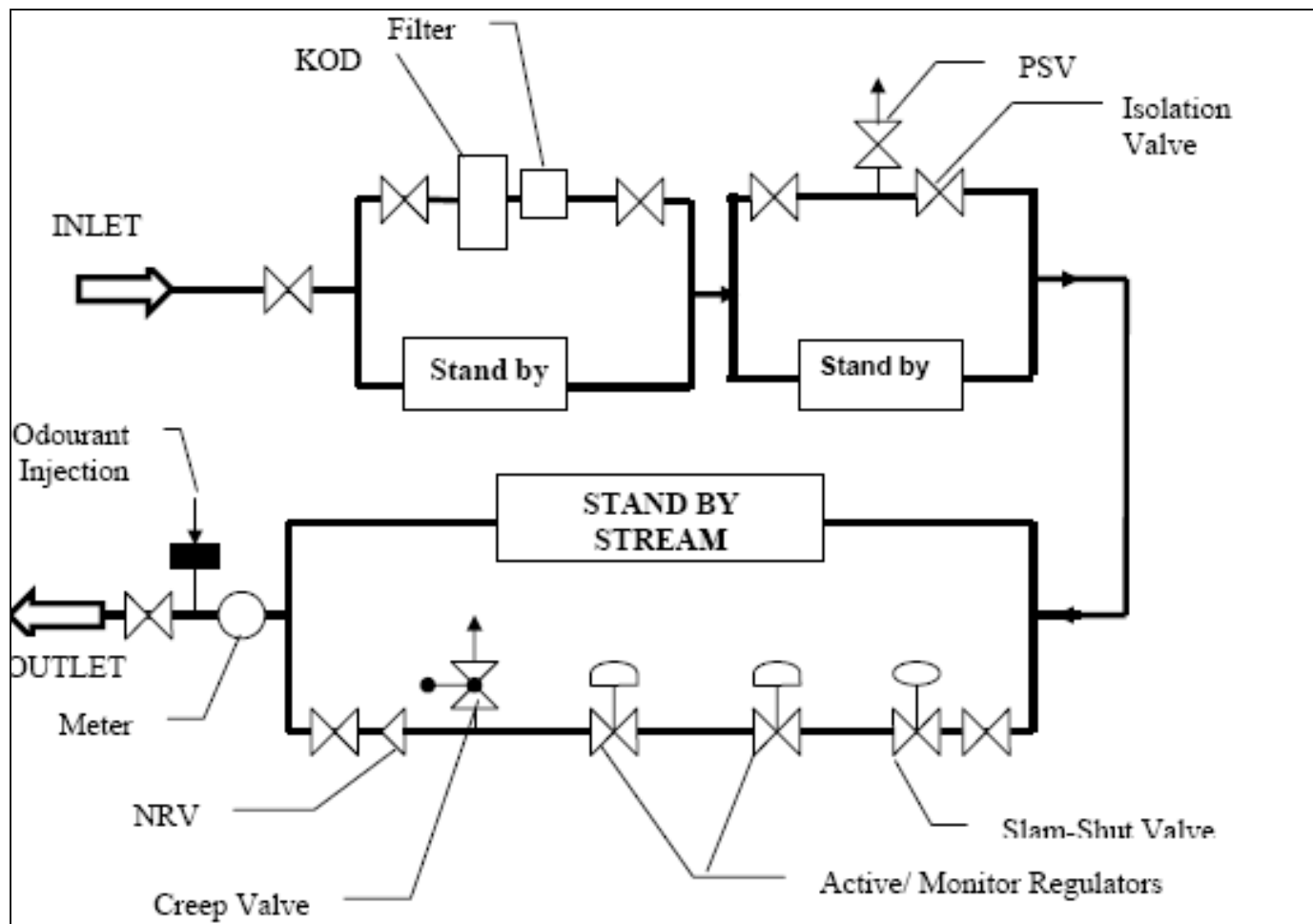
Others Statutory Acts and Regulations

- **Guidelines for Environmental Clearance– 1981**
- **The Environment (Protection) Act -1986**
- **Water (Prevention & Control of Pollution) Act 1974**
- **Air (Prevention & Control of Pollution) Act 1981**
- **The Petroleum and Mineral Pipelines (Acquisition of Right of Users in Land) Amended Act, 2011**
- **Manufacture ,Storage & Import of Hazardous Chemical Rules-1989**
- **National Highway Act, 1956**
- **Railway Act , 1989**
- **The Factories Act, 1948**
- **Indian Electricity Act, 1910 / CEA Regulations, 2010**

Typical PNG Distribution System



Typical City Gate Station (CGS)



Natural Gas Transmission – Failure Categorization

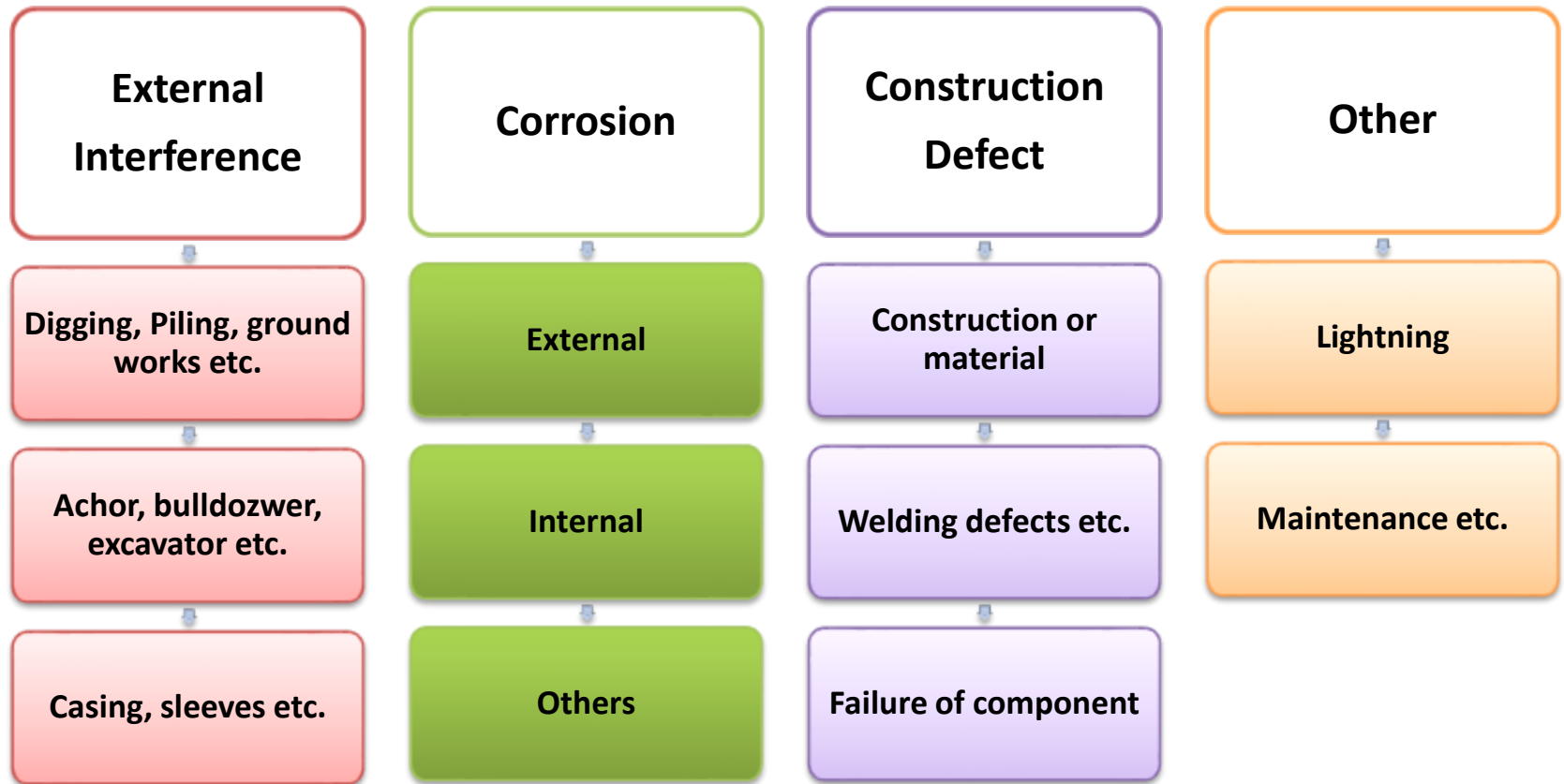
Characteristics of the Pipeline Failure:

- **Pinhole/Crack:** the diameter of the hole is smaller than or equal to 2 cm.
- **Hole:** the diameter of the hole is larger than 2 cm and smaller than or equal to the diameter of the pipe.
- **Rupture:** the diameter of the hole is larger than the pipeline diameter.

The Initial Causes of Incident:

- **External Interference**
- **Corrosion**
- **Construction Defect/Material Failure**
- **Hot Tap made by Error**
- **Ground Movement**
- **Other and unknown**

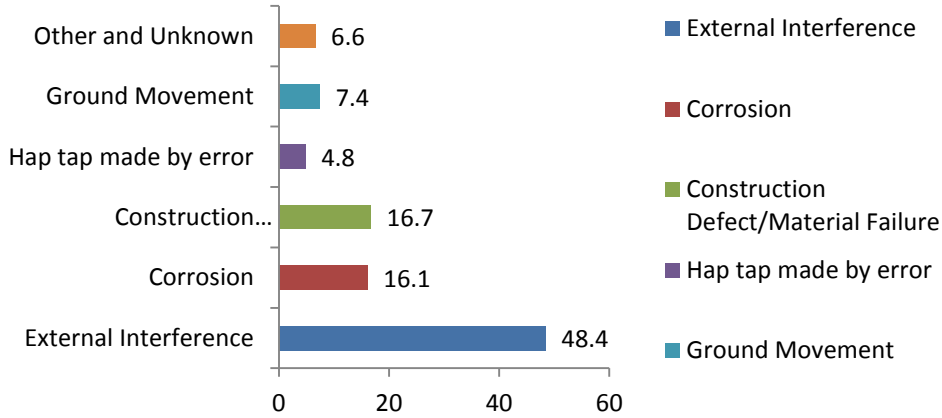
Natural Gas Transmission – Primary Failure Reason



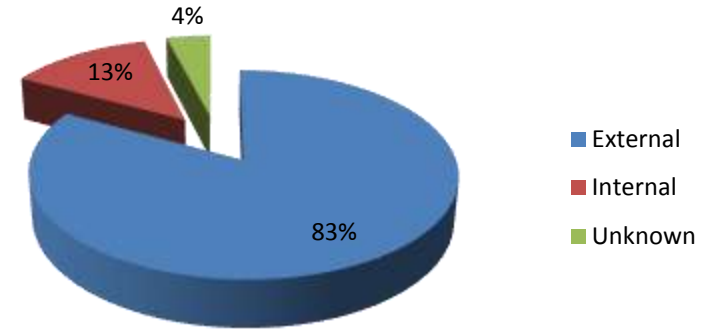
Source: EGIG Report

Statistics of Gas Transmission Pipeline Incident - EGIG

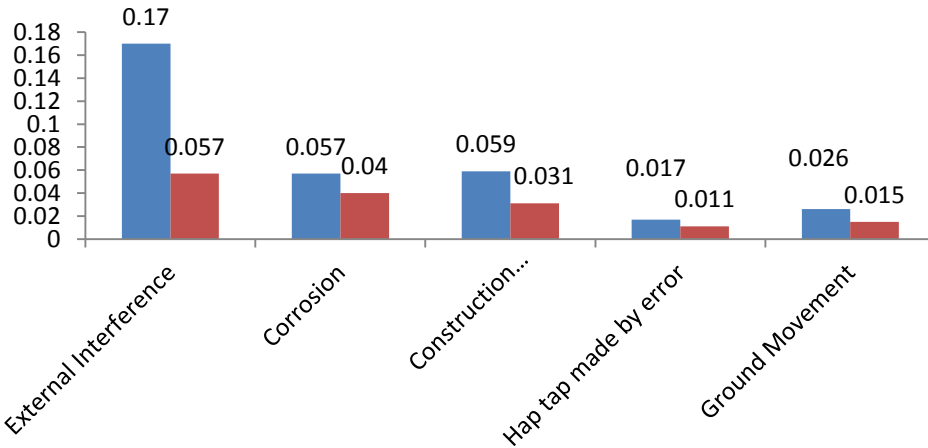
Primary Failure Cause Distribution (%)



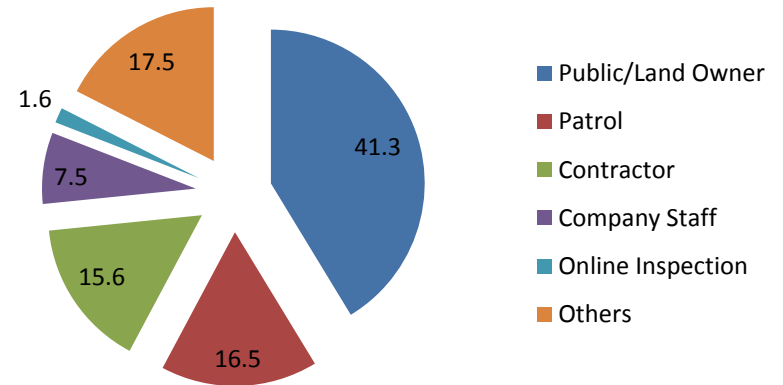
Corrosion Distribution (%)



■ Primary Failure Frequency (1970-2011) per 1000 KM/Yr.
 ■ Primary Failure Frequency of 5 Year Moving Average per 1000 KM/Yr.



Incident Distribution on Detection

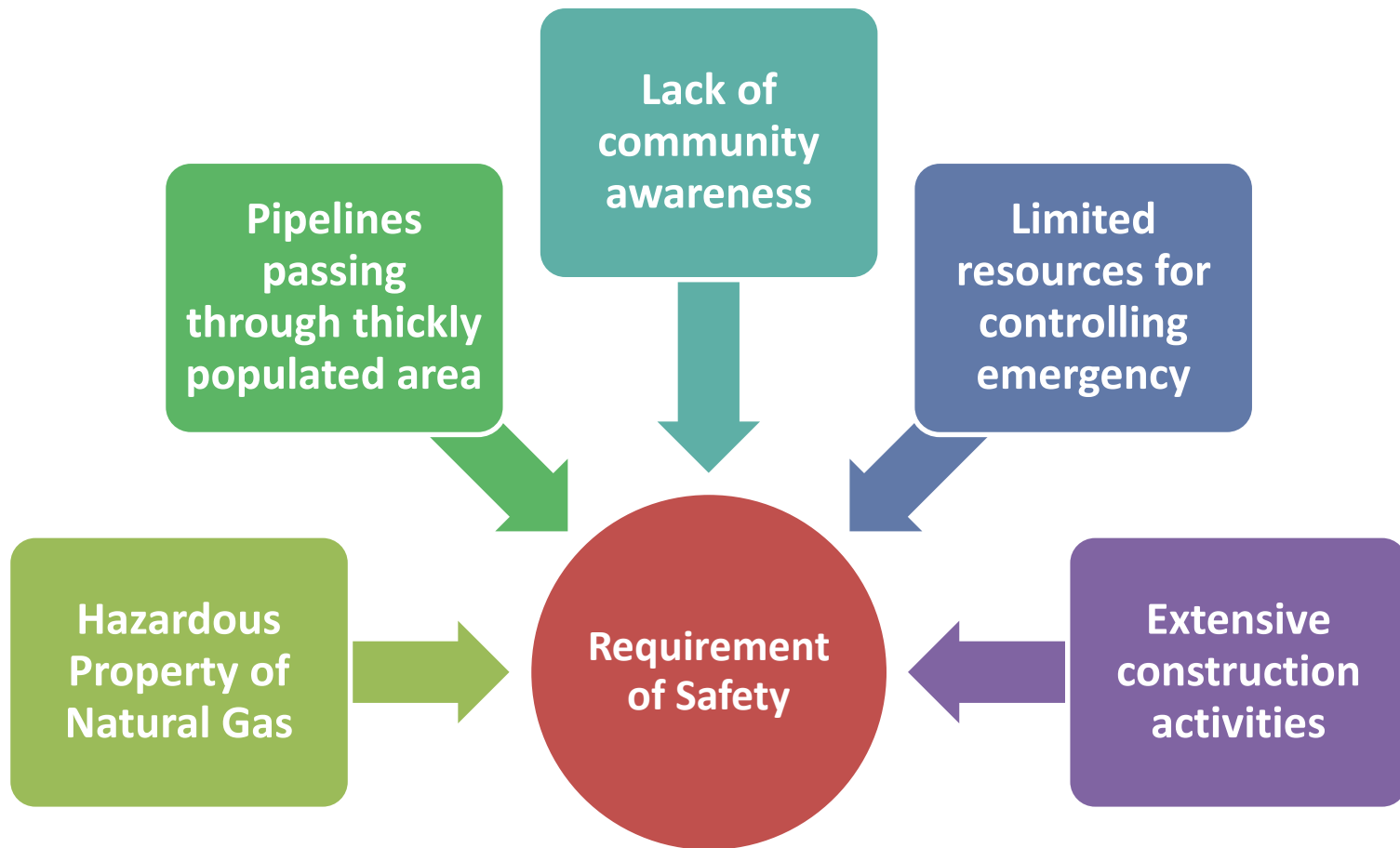


Source: EGIG Report

Radiation Hazards of Natural Gas

Radiation Level (kW/m ²)	Observed Effect
37.5	Sufficient to cause damage to process equipment
25	Minimum energy required to ignite wood at indefinitely long exposures (non-piloted)
12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing
9.5	Pain threshold reached after 8s; second degree burns after 20s
4	Sufficient to cause pain to personnel if unable to reach cover within 20s; however blistering of the skin (second degree burns) is likely; 0: lethality
1.6	Will cause no discomfort for long exposure

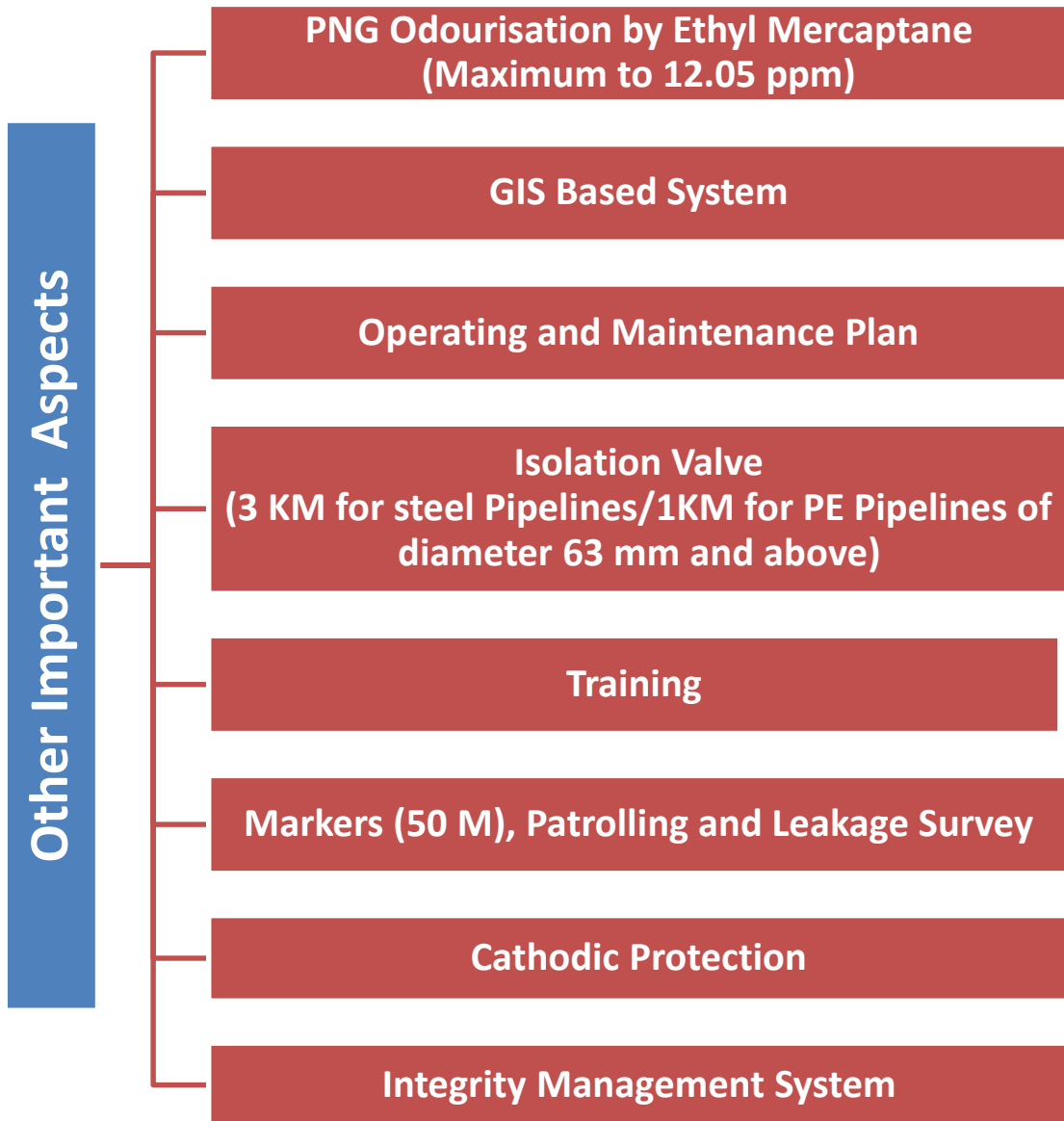
Requirement of Safety - CGD NG Pipeline



HSE Management- CGD NG Pipeline



Safety in CGD NG Pipeline



Integrity Management System

- A comprehensive and structured framework for assessment of :
 - CGD Network Condition
 - Likely threats
 - Risk assessment
 - Mitigation actions

Integrity Management System

- 1. Integrity Management Plan
- 2. Performance Evaluation of IMP
- 3. Communication Plan
- 4. Management of Change
- 5. Quality Control

- **Risk Assessment :**
- C P System and C P Adequacy Survey
- Periodic analysis to determine the level of risks to assets
- Risk analysis and assessment for all asset related incidents and findings
- A Risk register of known risks and their risk rating

Thrust Area – CGD Network

Possibility of Failures will be decreased

Establishing and Maintaining Best Practices of :

Inbuilt Safety Measures , GIS based system, Operational Safety, Physical Safety, Regular Patrolling, Risk Analysis & mitigation measures, Community Awareness, Structured Safety Management System etc.

Possibility of Failures will be drastically increased

Non Structured Safety Management System, Lack of Operational Safety and Inbuilt Safety measures, lack of Risk assessment and mitigation plans etc.

The integrity of Natural Gas Pipeline System is achieved through continuous efforts at all stages to ensure that pipeline is designed, commissioned, operated and maintained as per stipulated guidelines and best practices, besides following codes.

Thanks