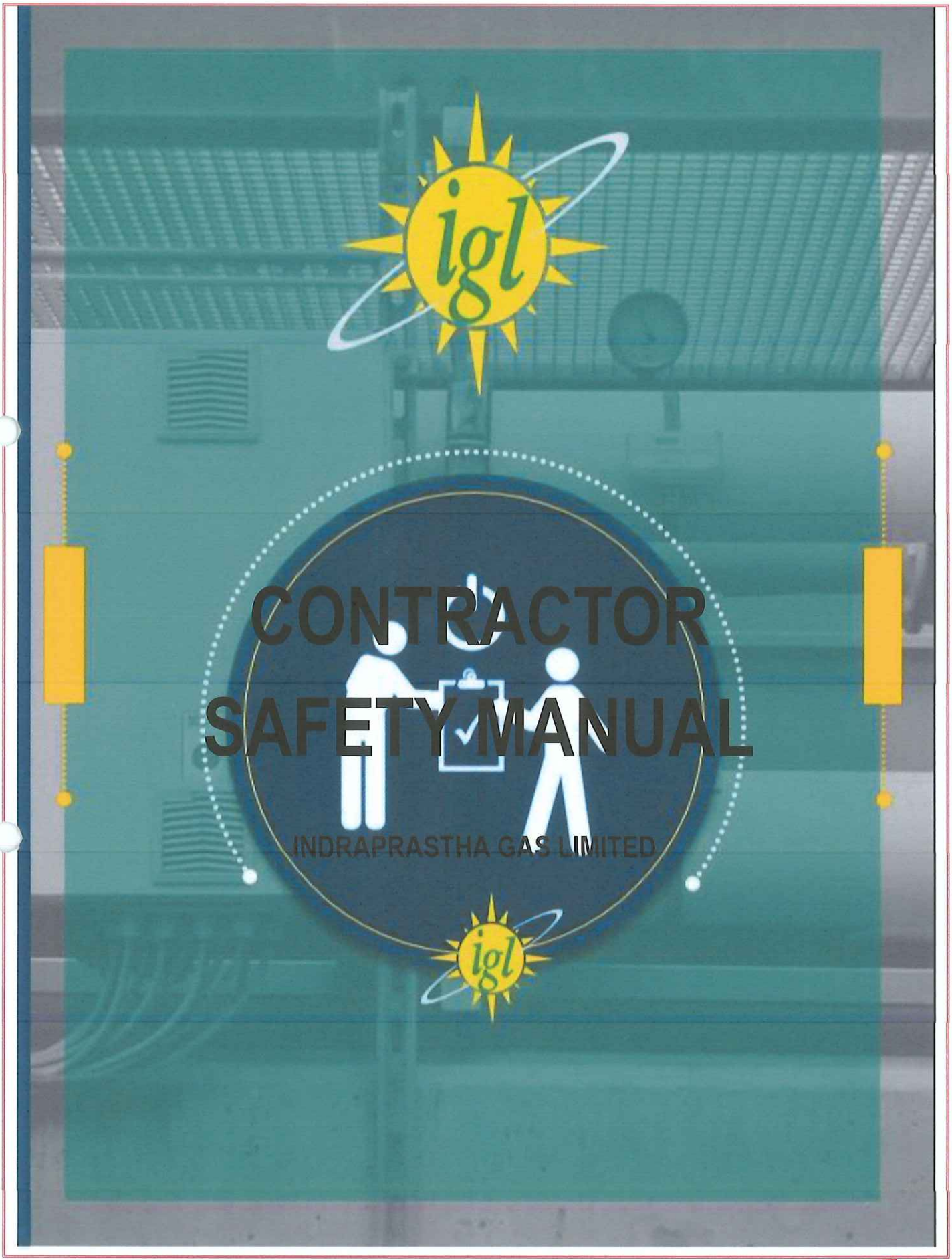


CONTRACTOR SAFETY MANUAL

INDRAPRASTHA GAS LIMITED

CONTROLLED

INDEX

INTRODUCTION

Indraprastha Gas Limited (IGL), incorporated in 1998 for Delhi City Gas Distribution Project in 1999 from GAIL (India) Limited (Formerly Gas Authority of India Limited).

The project was started to lay the network for the distribution of natural gas in the National Capital Territory of Delhi to consumers in the domestic, transport, and commercial sectors. With the backing of strong promoters – GAIL (India) Ltd. and Bharat Petroleum Corporation Ltd. (BPCL) – IGL plans to provide natural gas in the entire capital region.

The two main business objectives of IGL are -

- To provide safe, convenient and reliable natural gas supply to its customers in the domestic and commercial sectors.

- To provide a cleaner, environment-friendly alternative as automotive fuel to residents of the areas of NCT of Delhi; districts Gautam Budh Nagar, Ghaziabad, Hapur, Muzaffarnagar, Shamli, uncovered parts of Meerut & Kanpur, Fatehpur and Hamirpur in Uttar Pradesh; districts Rewari, Gurugram, Karnal and Kaithal in Haryana; and, district Ajmer, Pali & Rajsamand in Rajasthan. This will considerably bring down the alarmingly high levels of pollution.

Mission Statement of IGL: Committed to provide safe, reliable and clean energy solutions to improve quality of life and enhance stakeholders' value.

Vision Statement of IGL: India's leading clean energy solution provider through customer centricity, innovative technology and diversification, with international presence.

We at IGL believe that HEALTH, SAFETY & ENVIORNMENT are inherent part of business. Company is making its best efforts to provide a safe and accident-free environment for its employees', customers & society. Apart from providing an environment friendly fuel to the customers, the Company uses best international practices in laying its infrastructure. The Company makes its best efforts to educate the customers to handle the fuel. Needless to say, that IGL is committed to eliminate air pollution and the beginning has been made in the NCT of Delhi.

The Company makes a systematic approach to promote Health, Safety & Environment in and around. The Company follows Safety Management System as HSE Policy, work permit system, personal protection, Fire & Safety Education and, Accident reporting, investigation, Safety Audit and emergency preparedness etc. Safety of our Customers is of prime concern to us for which we follow specific system approach.

IGL strives to maintain a safe and healthy workplace for our Partners and Contractors. IGL is committed to protect health and safety of everybody involved with company's activities and protects the environment in a sustainable manner. Hence Health, Safety, and Environmental considerations are recognized as critical and integral to our core processes and our day-to-day activities. All Contractors must report any unsafe act/ condition or

environmental conditions which has or could have an adverse impact to human health or the environment. Contractors are to ensure the health and safety of their workers and any person likely to be affected by the workers actions. Contractors have the right to know about hazards and the means used to control or eliminate the hazards. Contractors have the right to participate in workplace safety activities and to refuse to work in an unsafe or environmentally detrimental condition.

This document provides all Contractors with the minimum Health, Safety and Environmental (HSE) standards required while working on and/or adjacent to Company premises. Non-compliance of HSE standards is treated the same as non-compliance with any contract provision, and may result in work stoppage or Contractor removal from the premises. Repeated non-compliance may result in Contractor dismissal and contract termination.

IGL requires that Contractors meet all guidelines outlined & Pre-Job Requirements, of this manual prior to commencing any work on Company premises/ Project site. As a part of this commitment, IGL ensures that contractors are aware of its policies, standards and requires the contactors to comply with IGL standards. It is the responsibility of the main contractors to ensure that all their sub-contractors fully comply with IGL HSE requirements.

Contractor is responsible for complying with applicable Indian, State and local HSE regulations. Contractor must also comply with the requirements listed in the Contractor Safety Manual and any site-specific and/or business unit policies and procedures that are applicable in the scope of Work. It is the Contractor's continuing and absolute responsibility for all aspects of Contractor safety on their jobsites during the execution of work. Contractors are important wing of IGL & it is necessary that they know HSE norms and ensure healthy safety practices in IGL.

1. OBJECTIVE

- To establish and communicate IGL HSE's expectations to its stakeholders/contractors.
- To encourage the contractor to align their HSE practices to meet the IGL HSE standards.
- To reduce the actual and potential risks from contractor activities this is essential to improve the overall IGL HSE performance.

The purpose of this standard is to establish, implement and execute a practical, sound and effective program for the prevention of incidents that cause or may cause injury to person or damage to property. These safety requirements have been designed to assist all Contractors, their supervisors and workmen to identify, evaluate, and subsequently adopt control measures in various activities or conditions to reduce the possibility of any undesired incident within their respective areas of contract responsibility.

2. SCOPE

The requirement of this manual is applicable to all contractors working within IGL's own, leased, managed, or associated assets / project sites and office premises. Contractors include short term, long term, Civil, Mechanical, Electrical and general etc.to perform any job. All Contractors are required to ensure that they and their employees, Sub contractors, suppliers, vendors, and visitors, while on the job site or even off the job site, comply with the provisions of this standard.

3. HSE POLICY OF IGL

HSE Policy of IGL:

The management accepts the responsibility for Safety, Health & Environment Management of the company. The subject being a line responsibility, every employee has been made responsible and accountable for the protection of Safety, Health & Environment. The policy of company is as follows:

- To give topmost priority to Safety& Health of all the personnel, property and protect environment.
- To follow all applicable Codes, Standards & Safety practices in design, operation, maintenance and modifications to ensure HSE protection.
- All planning, discussions and actions confirm our commitment towards Safety, Health & Environment protection aspects.
- Safety Audit is carried out yearly and findings are documented for follow up actions so as to restore safe conditions.
- Each Employee is fully informed for strict compliance of safety orders/rules issued by the management.
- Health Check-up of each employee is done annually.
- To train all employees in their respective areas of activities.
- Engineer In charges of projects ensure compliance of safety orders/rules & statutory requirements by contractors, transporters, visitors and other agencies related to contracts.
- Emergency drills are conducted every six months.
- Each employee is to abstain from unsafe acts and prevent unsafe conditions.
- It is compulsory for all employees to take active part on safety & health related activities on & off the job. Compliance of safety observations is done in most effective manner.
- To ensure compliance of Work Permit System.
- Use of Personnel Protective Equipment's is compulsory while at work.
- Quality maintained in all areas of activities.
- To adopt such systems and methods so as to ensure continual improvement.

Management ensures that efforts of each employee are directed to contribute for achieving excellence in Safety, Health, Work Environment, Quality and Productivity.

4. CONTRACTOR SELECTION

Selecting a qualified and skilled contractor is a major step toward achieving safe contractor performance. Proper framing of the scope of work, pre-qualification criteria, special contract requirement, experience profile of the contractor and its workmen/ supervisors etc is essential for proper selection of a contractor.

The contractor's safety standard can be judged by the following attributes:

- The contractor's safety commitment, as demonstrated by its own safety programs supported by their top management.
- Experience profile of the contractor, its supervisor and workmen.
- Past safety performance of the contractor as can be evaluated through old data tracking or through documentary evidence submitted by the contractor such as Accident data, Near-Miss data, safety violation during the job, system of safety training, hazard identification and mitigation plan, safety meeting, safety promotion program, safety enforcement and disciplinary action plan, safety standard available with contractor for similar jobs etc.
- Availability of safety equipment/ appliances with the contractor.
- Availability of experienced and qualified safety personnel with the contractor to monitor safety performance during the progress of the job.
- After completion of the work as per contract, performance towards Health, Safety & Environment of the contractor will be evaluated & contractor assessment form will be filled by the Engineer In-charge of IGL as per format prescribed by **IGL's C&P and Store department.** This form may be used in future during selection of contractor for job allocation solely as per the discretion of management.

5. HSE MANAGEMENT SYSTEM

Contractor must have a defined Health, Safety & Environmental Management system in place aligned to IGL requirements and demonstrate that it is implemented effectively. It should typically cover the following elements-

- Leadership & Commitment by higher management.
- HSE Policy
- Organization, Resources & Documentation related to HSE.
- Evaluation & Risk Management.
- Planning & Procedure.
- Implementation & Monitoring.
- Auditing & Review.

The contractor should have a HSE policy backed by their management's commitment to create a safe work environment. The policy should state the intention and methodology of protecting the personnel at work site. Contractor shall demonstrate their HSE commitment in protecting the people, environment and assets by implementing the HSE Management system and various HSE programs that support their HSE Policy.

6. CONTRACTOR'S HSE RESPONSIBILITY

Contractors have a number of health and safety (HSE) responsibilities, which vary depending on the specific project and the contract terms. However, some general HSE responsibilities that contractors typically have include:

- Assessing the risks of the work and taking steps to control them.
- Providing information, instruction, and training to workers on the risks of the work and how to control them.
- Consulting with workers on health and safety matters.
- Managing and supervising the work to ensure that it is carried out safely.
- Cooperating with other contractors and the principal contractor on health and safety matters.
- Complying with all applicable health and safety laws and regulations.

In addition to these general HSE responsibilities, contractors may also have specific responsibilities that are set out in the contract. It is important for contractors to carefully review the contract to understand their specific HSE responsibilities so that contractors can help to ensure the health and safety of all workers..

6.1 SAFETY TRAINING & TOOL BOX TALK :

6.1.1 TRAINING

Before start of any job, all the contractor personnel must be trained in a language they understand before issuing ID card for working at IGL premises & project site. The content of the training program should include the following:

- HSE management system of IGL
- Safety standards and procedures relevant for carrying out jobs.
- Special precaution specific for a particular site / Work based on its hazard perception.
- Hands on training for use of fire extinguisher.
- Use of PPEs in general and any special PPE specific for a particular job.
- Emergency preparedness plans including evacuation plan of IGL.
- Near miss & incident reporting.

This training is meant to make contractor and their employees familiar with existing safety practices of IGL.

Concerned in charge and his respective Contractor to ensure that only) trained manpower shall be deployed at site to ensure NO STC, NO WORK principle.

6.1.2 TOOL BOX TALK:

- Tool box talks are quite effective means of communicating the work place hazards and appropriate controls to the workers.
- It helps in better understanding and ensures proper controls to reduce the risks.
- Contractor supervisor shall deliver the tool box talk in a reasonably peaceful area close to worksite, before start of the activity.
- It should contain the brief work description, probable hazards, controls planned and mitigation measures to be taken.
- Use & benefits of PPE's & safety gears as per the job requirements.
- The duration of the toolbox talk should not exceed 15 minutes.
- A record for each toolbox talk should be maintained by the contractor indicating the topic and number of personnel attended.
- The environment of tool box talk shall be supportive to clear doubt, if any, raised by workmen.
- The Contractor should ensure that Tool Box Talk are conducted on regular basis.

6.1.3 ISSUANCE OF ID (IDENTIFICATION) AND SAFETY TRAINING CARD:

Issue of ID card is more of a security issue than a safety issue. However, this system can also be used effectively for safety interventions. Following may be adapted to use the ID card for safety controls:

- A photo ID card will be issued by the contractors for his supervisors/ workmen. Photo ID card will contain identification marks and can be referred for future administrative controls.
- Any card issued by any training institute to any contract person post attending any safety training shall not be treated as ID (identification) card.
- Contractor to ensure that after having undergone safety trainings, the issued card having details as 'Safety Training given' or separate Safety Training card (e.g. STC Card) have been issued to contractor supervisor, Workmen, staff etc. No contractor and their employees shall be allowed to enter inside the IGL premises or project site for carrying out jobs unless the safety briefing has been given to them and stamping of, ID card / Safety training certificate has been issued to them.
- The validity of such "Safety Training card" shall be maximum 1 year & the next due date for safety training shall be indicated in bold.

6.1.4 GENERAL SAFETY REQUIREMENT- "WORK PERMIT SYSTEM":

Contractor is responsible to make his team aware about the ***Work Permit Policy of IGL*** and ensure sufficient number of trained, qualified and IGL authorized supervisors are available at his disposal to request for the permit to work/safety work permit either through app based safety work permit system or through Hard Copy based safety work permit. IGL reserves the right to issue the permit to work either through mobile application or through the hard copy based safety work permit. For Hard copy based permit proper justification is required. It is the responsibility of the contractor to fulfill all the requirement of the IGL Work Permit Policy. Any non-compliance related to the condition of work permit and policy shall be viewed seriously by IGL and prone to penalty.

6.2 WORKSITE SAFETY:

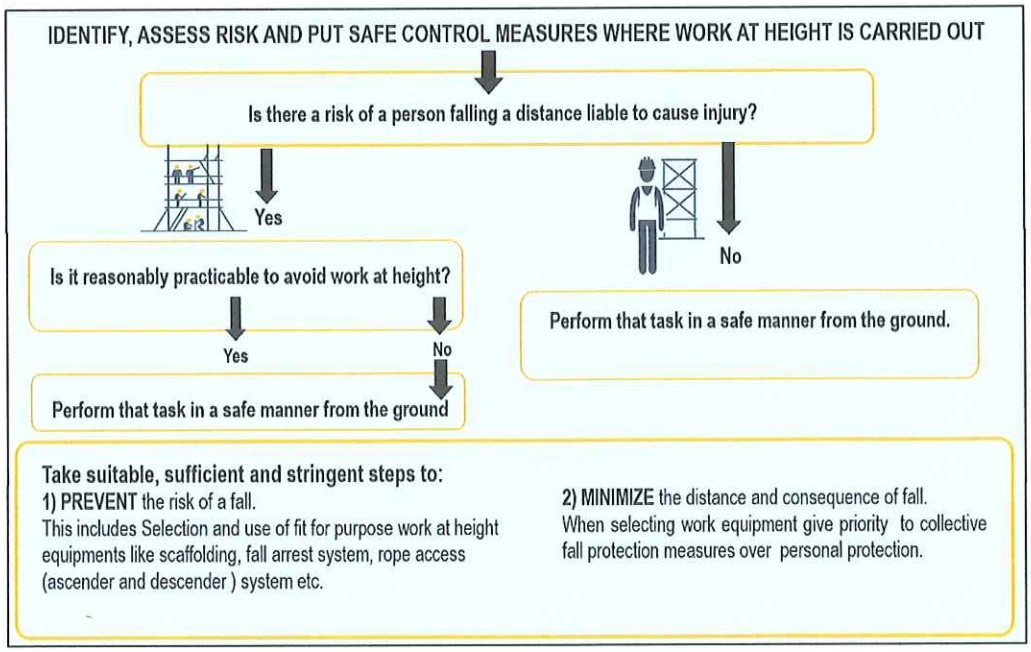
- It is the responsibility of each Contractor or his authorized / nominated representative to inspect each work area at the beginning of each shift, and periodically thereafter, to ensure safe working conditions are maintained.
- Contractor must provide good illumination for work to proceed safely.
- Contractor must ensure protection from severe weather conditions. (Extreme wind, lighting storms, extreme heat, extreme cold etc...).
- The Contractor needs to evaluate /consider the environmental extremes of the project, such as the ability of their workers to work in areas of excessive cold or heat.
- Based on that evaluation the Contractor must implement the appropriate procedures to provide a safe a work environment.

6.3 WORK CLOTHING:

- Every contractor will provide to his worker & supervisor, minimum two nos. Cotton Coverall, one safety helmet & one safety shoe every year for working at IGL job site.
- Where hazards exist due to moving parts on machinery or equipment, clothing and hair must be maintained to avoid entanglement.
- Special work clothing must be worn where exposure to fire, extreme heat or cold, corrosive chemicals, electrical hazards, body impacts, cuts from handled materials or other specialized hazards are possible. See the premises or business unit's site-specific requirements for any additional needs, such as Fire-Resistant Clothing (FRC). The Contractor is required to supply special work clothing, ensure it is in good condition and properly worn, when and where required.

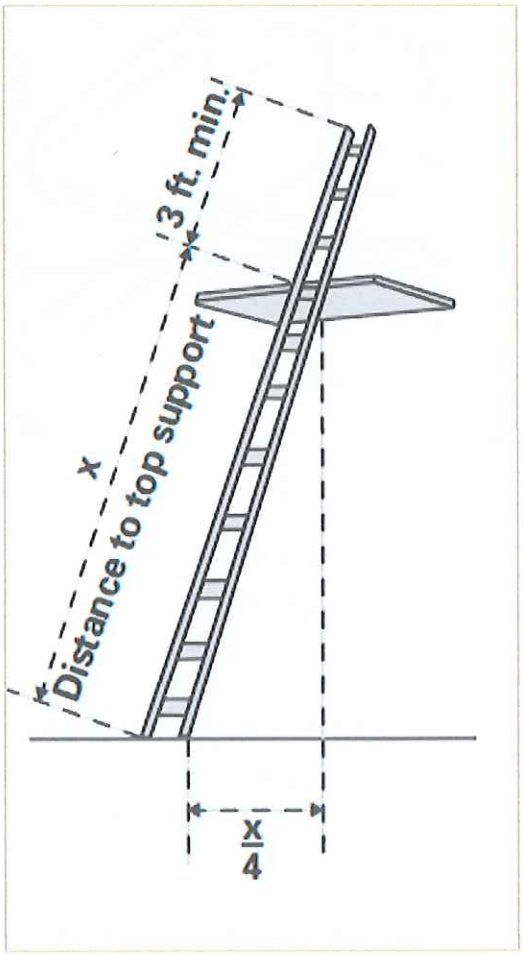
6.4 SAFETY WHILE WORK AT HEIGHT:

Work at height is considered as working above 2 meters i.e., activities wherein there is a threat to the person getting injured due to fall from height. Below given site risk assessment must be done beforehand for any proposed work at height job:



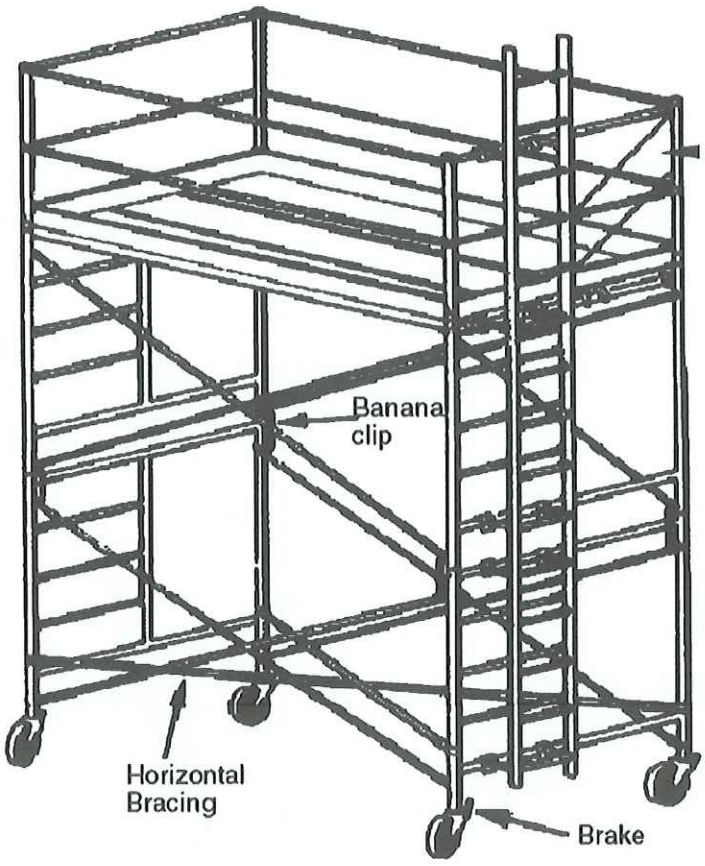
6.4.1 PORTABLE LADDER SAFETY: Falls from portable ladders (A type, straight, and extension) are one of the leading causes of occupational fatalities and injuries.

- Avoid electrical hazards! – Look for overhead power lines before handling a ladder. Never use a metal ladder near power lines or exposed energized electrical equipment.
- Always inspect the ladder prior to using it. If the ladder is damaged, it must be removed from service and tagged until repaired or discarded.
- Always maintain a 3-point (two hands and a foot, or two feet and a hand) contact on the ladder when climbing. Keep your body near the middle of the step and always face the ladder while climbing (see diagram).
- Only use ladders and appropriate accessories (ladder levelers, jacks or hooks) for their designed purposes. Ladder used at worksite should be capable to carry their intended load.
- Ladders must be free of from slippery material on the rungs, steps or feet. Slip-resistant shoes, lashing or other effective means shall be used to avoid danger of slipping.
- Use a ladder only on a stable and level surface, unless it has been secured (top or bottom) to prevent displacement.



- Do not place a ladder on boxes, barrels or other unstable bases to obtain additional height.
- Do not move or shift a ladder while a person or equipment is on the ladder.

- An extension or straight ladder used to access an elevated surface must extend at least 3 feet above the point of support (see diagram).



- Do not stand on the three top rungs of a straight, single or extension ladder.
- The proper angle for setting up a ladder is to place its base a quarter of the working length of the ladder from the wall or other vertical surface i.e.A ratio of 1:4 in distance of resting points in bottom and top ladder points shall be maintained for stability (see diagram).
- A ladder placed in any location where it can be displaced by other work activities must be secured to prevent displacement or a barricade must be erected to keep traffic away from the ladder.
- Be sure that all locks on an extension ladder are properly engaged.
- Do not exceed the maximum load rating of a ladder. Be aware of the ladder's load rating and of the weight it is supporting, including the weight of any tools or equipment.

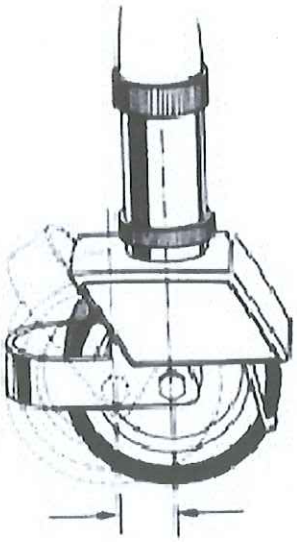
SCAFFOLD SAFETY - MOBILE SCAFFOLDING FOR TEMPORARY WORK:

- Scaffolds shall be braced by cross bracing or diagonal braces or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square & align vertical members so that the erected scaffold always plumb, square & rigid. All brace connections shall be made square.
- Platforms shall be tightly decked for full width of the scaffold and scaffold boards shall be secured against displacement. Platforms shall be provided with guard rail.
- The force necessary to move the mobile scaffolding shall be applied near or as close to the base as practicable and provision shall be made to stabilize the tower during movement from one location to another. Scaffold shall only be moved on level floors free from obstructions and openings.

- The wheels or casters shall be provided with rubber or similar resilient tires.
- Workmen shall not be allowed to ride on the mobile scaffold.
- All materials shall be removed before mobile scaffold is moved.
- The mobile scaffold in use shall rest upon a suitable footing and shall stand plumb. The casters or wheels shall be locked to prevent any movement.
- Mobile scaffold shall also confirm to the applicable provision of tube & coupler scaffolding.
- Special care should be taken while working with ladder & scaffold near electrical lines.
- Care shall be taken to see that no part of scaffold struck by moving equipment's & no materials shall be dumped against it. Area should be barricaded while working near moving vehicle.
- Scaffold should be designed to carry intended load.

6.4.2 SAFETY DURING G.I. PIPING INSTALLATION & MAINTENANCE WORK:

- For working at height at IGL worksites (G.I pipe installation & maintenance) each contractor shall provide the fit for purpose rope access system *(complete set having anchorage, rescue, self-rescue, ascending, descending, positioning at height mechanism, full body harness, two life line ropes wherein one shall be used for ascending and descending and other as* ***second line of protection*** *for fall arrest)* to each of its team to ensure safe and sound execution of work at height jobs.

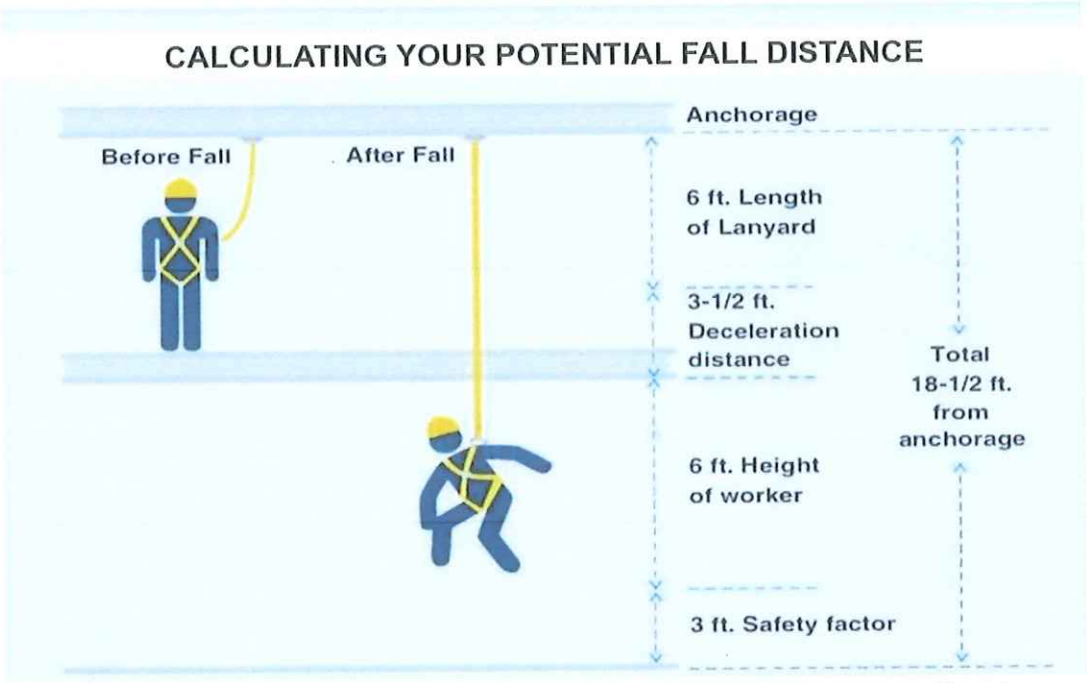


Castor wheel with brake

- Such rope access system with all its associated accessories (Full body safety harness, associated ropes and rope grabber /grip, karabiner with locking mechanism, safety lanyard with shock /energy absorber, life line ropes and rope protectors etc.) shall be manufactured and approved in accordance with relevant ASME code / EN norms / NFPA codes/ IS codes /ANSI norms /OSHA norms. Copy of the certificates to be submitted to IGL.
- Contractor to ensure that such rope access system with all its aforementioned associated accessories shall be tested as per the frequency set by OEM. Copy of such test certificates to be produced and shown at the worksite to IGL line incharge, IGL F&S representative's authorised representatives of IGL (PMC & TPI and Contractual Fireman) on as and when required basis.

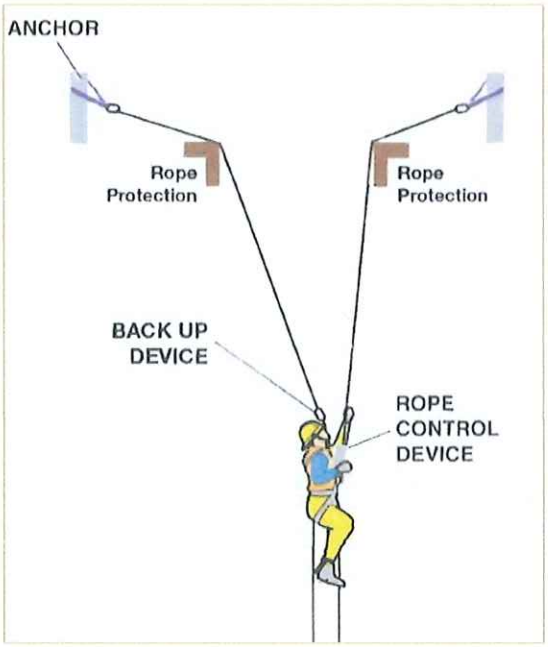
- Contractor shall ensure that the workmen are medically & physically fit on using the rope access system and all its associated accessories. Medical Certificate
- Contractor shall ensure to obtain valid hot work permit from IGL line incharge for working at height.
- All the safety gears & equipment's must be visually checked by supervisor at site before using it.
- If any damage/cracks found rope access system or in its associated accessories, the same must be discarded at once by the contractor to avoid misuse /reuse at site.

Note: The rope access system and all its aforementioned accessories shall be of some internationally reputed and branded manufactures e.g. PETZL/ KARAM/3M/DBI-SALA etc.



Typical Schematic of Working at height more than 2 meters above ground level.

Note: Working at height shall consider use of Energy absorber which is used in conjunction with lanyard with due consideration given to safety factor. In case of fall it reduces the impact energy passed on to worker considerably by absorbing part of energy.



Typical schematic of controlled descent on a working rope fall arrest safety device on a separate safety rope.

Typical schematic of lead climbing with use of double lanyard fall arrest system technique in RF tower.

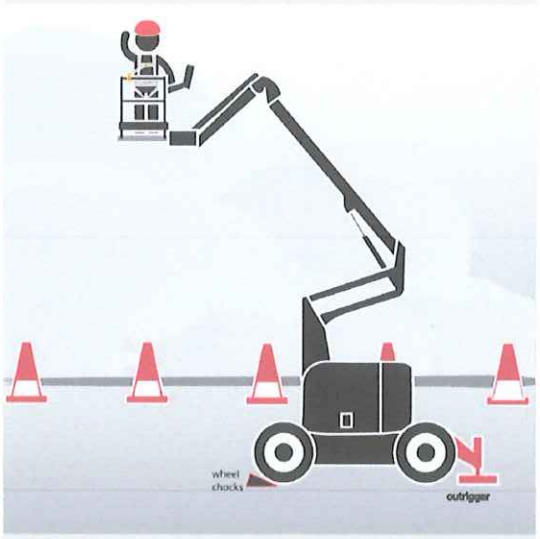
PIC 6.6.3

6.4.3 ROOF WORK:

- All roof-work operations should be pre-planned and properly supervised.
- Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- Work on roofs shall not be carried on in inclement weather conditions that has potential to threaten the safety of workers.
- While working on roof there shall be provision of to achieve the necessary restriction on travel will be:
  - → A suitable waist belt or harness.
  - → A rope or lanyard.
  - → A reliable anchor point.
  - → The rope or lanyard should be adjusted for length, so that once connected it is impossible for the individual to reach the edge, thus removing the risk of a fall.
  - → A typical arrangement may referred as depicted in the below above (PIC 6.6.3)

Depending on the requirement and as per the decision taken by IGL's employees contractor shall be ready to use a fit for purpose Mobile Man lift arrangement to perform the working at height task with suitable arrangement of fall restraint and arrest system as depicted in the below picture:

6.4.4 SAFETY WHILE USING BOOM LIFT OR MOBILE ELEVATED PLATFORMS.



- Keep the Base and Circumference Clear. It is crucial to ensure the entire circumference of the boom lift is clear of any objects or people while it is in use, to avoid serious injury to anyone standing below.
- Ensure Operators are licensed and trained to operate Mobile elevated platforms
- Ensure the lanyard is fully secured to the bucket. Whilst it's rare that an operator will fall from the platform, a slight bump from another piece of equipment or object can throw an operator off-balance.
- Don't Exceed the Load Capacity of the Boom lifts. Keep in mind, the weight limitations also include the operators, tools and other materials on the platform.

- Maintain a safe distance away from power lines. It is recommended that a distance of at least 10 feet (3 metres) between the power lines and the lift is always maintained. Power lines should also always be treated as though they are live wires, even if they appear insulated or you have been told they are down. It is better to take the cautious and safe approach.
- Personal protective equipment like protective and high visual clothing, hard hats, goggles, and rubber soled shoes. This type of clothing helps protect operators from injury and unknown hazards.

6.5 GENERAL SAFETY PRACTICE HOT WORK (ELECTRIC ARC/GAS WELDING AND CUTTING):

- IS 818 (latest edition) Code of practices for Safety & Health requirements in Electric & Gas welding & cutting operations shall be followed.
- IS 3016 (latest edition) Code of practices for fire precautions in welding and cutting operations shall be followed.
- Welders shall be qualified in line with API 1104, or section IX of the ASME Boiler and Pressure Vessel Code. Requirements in ASME Boiler & Pressure Vessel Code, Section IIC and Section V or API 1104 shall apply for filler materials and non- destructive examination of welds. Welder re-qualification shall be required if the welder has not performed any welding for the welding process qualified for the past 6 months. (As per OISD 226).
- No such work shall be allowed without valid Safety Work Permit.
- Ensure 100% compliance with all 09 life Saving Rules of IGL.
- Ensure 100% compliance will all the conditions of Work Permit.
- Ensure use of appropriate PPEs while working e.g. Safety Shoes, Safety Helmet, Hand Gloves, Cotton apron, Welding suit, respiratory protection etc.
- Worker shall be protected from radiant energy eye hazards by safety goggles /spectacles, cup goggles, helmets, hand shields or face shields with filter lenses.
- Evaluate nearby activities conditions that could be affected by hot work.
- Remove other combustible material wherever possible.
- Wherever required the surface should be wet down and covered with damp sand, fire blanket or with running water hose.
- Always consider use of non-sparking tools.
- Ensure shield against spark (inside, outside of equipment) e.g. Fire Blanket as needed,
- Only cable free from any repair and joints connected to the welding electrode holder shall be used.
- Ensure proper grounding/ earthing of all machines including welding machine.
- Flashback arrestor provided in gas cutting set on both (torch and cylinder) side.
- Ensure hose used for gas cutting/ heating set is damage free and clamped to avoid leakage.
- Ensure fire equipment provided and in the ready to operate condition by trained manpower.
- Ensure explosive atmosphere in the work area is eliminated. "Zero LEL" reading achieved in the hand held explosive meter (gas detector) before start of work and continuous monitoring of atmosphere is done by taking gas detector reading throughout the job.
- Only after achieving "ZERO LEL" reading in hand held explosive meter, hot work should be started. To ensure the same proper documentation having signatures of both contractor supervisors and IGL representative(s) should be done.

- Wherever deemed necessary, ensure proper ventilation for worker protection in welding, cutting and heating activity through local exhaust system or mechanical ventilation in order to maintain vapors, fumes and smoke below a hazardous level.
- For hot tapping ensure continues/sufficient flow in gas line.
- Ensure availability of –
  - → 01No.First aid box.
  - → Nearest Hospital Emergency number.
  - → Vehicle for transportation of any injured

6.5.1 WELDING & CUTTING:

- Only authorized employees are to perform welding and cutting operations.
- Do not perform welding, cutting, or hot work on used drums, barrels, tanks, containers, or inside confined spaces prior to venting and testing the atmosphere. Purge, inert, and clean, as necessary, to ensure that the work can be done safely.
- Inspect all welding and cutting equipment before use. Remove defective equipment from service and tag it.
- Protect or remove combustible material from any welding and cutting area.
- A fire watch must be maintained for at least 30 minutes after completing cutting or welding in coal handling areas as well as other areas.
- Use non-combustible material to cover openings when cutting or welding over grated flooring.
- Suspend welding cables and hoses overhead or arrange them so they will not cause a hazard.
- When welding or cutting, shirt collars must be fastened and sleeves rolled down and fastened. Wear trousers without cuffs, along with footwear/PPEs designed for industrial work exposures.
- Approved eye protection and other appropriate PPEs must be worn in conjunction with industrial safety glasses when performing welding and cutting operations. A stand by fire extinguisher shall be provided at the work place.

6.5.2 ELECTRIC ARC WELDING AND CUTTING:

- Ground the non-current carrying metal parts of electrically driven welding machines.
- Neither terminal of the welding generator is to be bonded / grounded to the frame of the welding machine.
- Do not use pipelines, which are pressurized or contain flammable gases / liquid, or conduits carrying electrical conductors for a welding ground return circuit.
- Welders are not to handle the electrode holders from two different machines at the same time.
- Do not coil or loop welding cable around parts of your body while it is energized.
- Electrode holders must not be dipped in liquids to cool them.
- Wearing rings, metal wristbands or other jewellery while welding is prohibited.
- Special precautions must be taken when welding on wet or damp surfaces. See your supervisor for protective requirements.
- Do not use welding leads that have a splice within 10 feet of the electrode holder.
- Use appropriate PPEs while working.

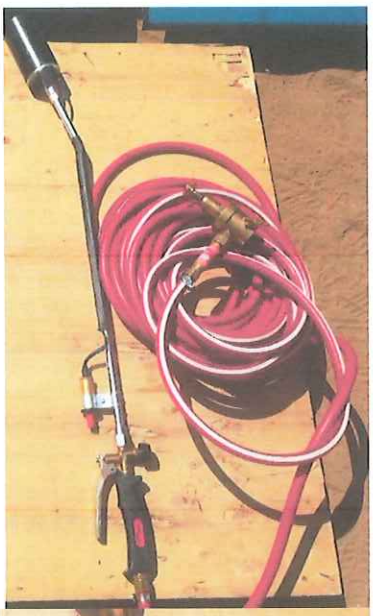
Typical Arrangement of Welding Machine at Site.

6.5.3 GAS CUTTING:

- Keep compressed gas cylinders beyond the range of sparks, hot slag, or flame. Keep two buckets of water or a running water hose at the job site.
- Close the torch valves and shut off the gas supply whenever work is suspended. Bleed the torch before disconnecting gauges.
- Remove the torch and hose from confined spaces whenever work is suspended during lunch breaks and at the end of the shift. When torch and hose removal is not practical, the cylinder valves must be closed, the regulators backed off, and the torch turned off to prevent any gas flow.
- Use only appropriate tools to ignite torches. Do not use open flames or matches.
- Do not take compressed gas cylinders into confined spaces.
- Both the oxygen and fuel gas lines must be equipped with flash back preventers (reverse flow check valves / non-return valves) at their connections to the torch.
- A fire watch must be maintained for at least 30 minutes after completing cutting or welding operations.
- Use appropriate PPEs while working.
- Oxygen has no smell, but whilst not inflammable itself, it promotes & accentuates rapid combustion, hence it can be highly dangerous, particularly in confined spaces, where it may not dissipate quickly, because the addition of only a small amount of oxygen to the normal atmosphere can create a violent risk from any stray spark or welding flame.
- Acetylene is highly flammable and with air, forms an explosive mixture which can be set off by any spark, flame or heat in the vicinity. It is therefore essential that all joints, especially on the gas cylinder, are tight; that the hoses themselves are in good condition and all the valves are turned off on completion of work.
- Liquefied Petroleum Gas (LPG) is a mixture of Butane & Propane. It is highly inflammable and heavier than air. It flows along floors & tends to settle in low spots, such as basements and pits. Thus, should be kept in mind to avoid accidental ignition or suffocation hazards.

- Only industrial LPG cylinders shall be allowed for gas cutting as well as other operations e.g. pipeline coating etc.
- Acetylene cylinders are filled with a porous substance such as charcoal or kapok substances, which is soaked with acetone. Because of their design they should always be stored upright. The pressure in the cylinder is 250psi. Copper pipe must not be used for connecting hoses together, as copper & acetylene can form copper acetylides, which are sensitive explosive. Acetylene should not be used to cut silver also. Color code of Acetylene cylinder is maroon.
- Oxygen is supplied in cylinders pressurized to 2200psi & painted in black color.
- All cylinders shall be protected against excessive rise in temperature.
- Cylinders stored in the open shall be screened against the continuous direct rays of the sun.
- A serious accident may easily result if oxygen is used as a substitute for compressed air. Oxygen shall not be used in pneumatic tools, to blow out pipelines, to dust clothing or work, to create pressure or for ventilation.

- Oxygen cylinder & its parts should be free from grease, oil or any combustible materials.



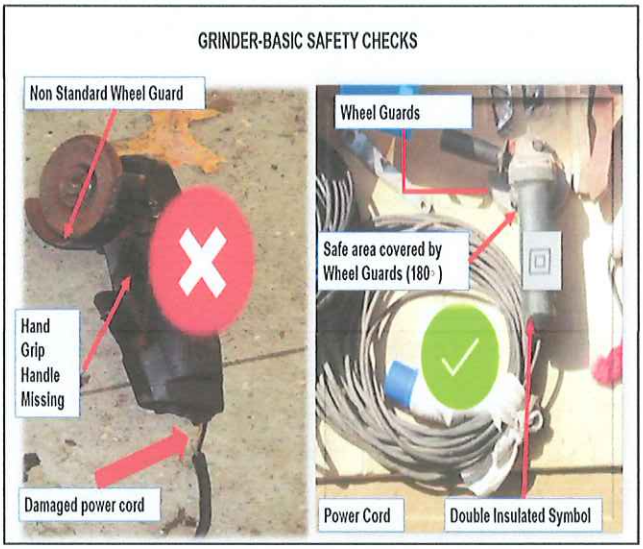
- Fuel-gas cylinders shall be handled carefully, (rough handling, knocks or falls are liable to damage the cylinder, valve or safety device and cause leakage). Suitably designed equipment (trolley with chain for tying the cylinder) shall be used for transporting gas cylinders.
- Fuel- gas cylinder should be placed away from source of ignition.
- Regulators or automatic reducing valve shall be used only for the gas at pressure for which they are intended.

- Always double stage regulators shall be used with flash back arrestors.
- During gas cutting, all necessary PPEs should be worn.
- Blowpipe shall be shut off when not in use.
- Lighted blowpipe shall not be left on a bench or the floor as the force of flame may cause it to move.
- Work piece shall be clamped and not held by hand.
- Hoses shall be kept away from the working area to prevent contact with flames, heat, sparks or hot spatter.
- Hose shall be checked for any damage before taking into operations.
- Firefighting equipment should be kept nearby to use in case of fire.
- Before use conduct, check for leak from cylinders by using leak detecting spray or solution suitable for use with oxy/fuel systems. Do not use soapy water or solutions containing grease or oils on oxygen systems.
- Never check gas leaks with a naked flame.
- Immediately repair or replace leaking components.

- Leaking hoses should not be repaired, but they can be shortened to remove a damaged section. Refit hose tails using crimp clips designed for that task. Screw tightened crimps (jubilee clips) are not recommended. There is a risk of leaks due to overtightening or under tightening them.

6.5.4 GRINDING OPERATION:

- Do not use a bench or floor stand grinder when any of the following conditions exist:
  - Guards are not installed.
  - Grinder not securely anchored.
  - Excess wear is evident on the grinding wheel.
  - Wheel is chipped, cracked, out of round, or otherwise defective.
- Do not use portable grinders without guards.
- Before mounting a grinding wheel on a grinder, check the operating speed marked on the grinder and the rated safe speed of the grinder wheel. Grinding wheels are not to be mounted on grinders that operate in excess of the rated safe speed of the grinding wheel.
- Adjusting the work rest or tongue guard while the grinding wheel is in motion is prohibited.
- Inspect grinding wheel and discs on portable grinders before use for any cracks, damage, or wheels out of round or balance. Where any defect is evident, the wheel or disc must be removed from service immediately.
- Check the grinding wheel mounting flanges for equal sizes and correct diameters. Flanges are to be at least one-fourth diameter of the wheel diameter.



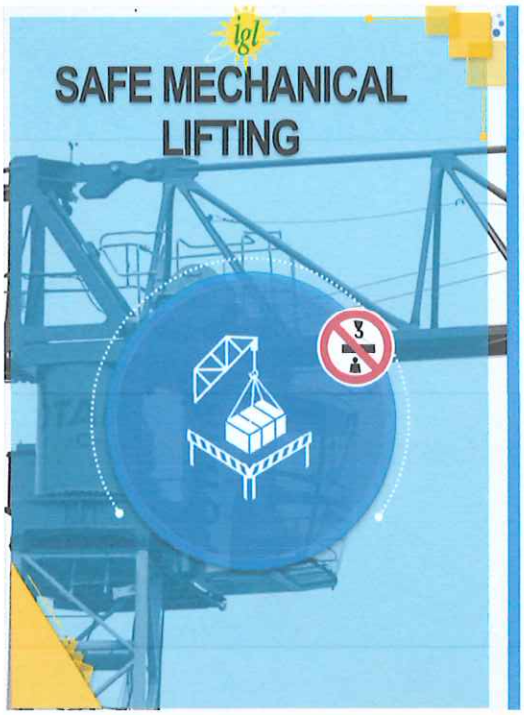
- Do not stand directly in front of any grinder when first starting it up.
- Allow the wheel to develop its full speed before beginning work.
- Never force the stock into the wheel of a fixed grinder or a portable grinder into the work to the point where the motor slows noticeably or the work becomes excessively hot.
- Ensure that the wheel is properly dressed at all times.
- Do not grind on the side of the wheel unless the wheel is specifically designed for this purpose.
- Store grinding wheels in a safe place designated for that purpose.
- Machines must be shut off when unattended. Stop switch shall be checked before using the hand grinder.
- Use appropriate PPEs while working.

6.6 GENERAL PORTABLE TOOL(S) SAFETY:

- Many incidents result from improper use of tools and use of defective tools and equipment. Employees should use only those tools and equipment, which are in good condition and should use only for the purpose for which they were designed. Where proper and safe tools are not available for the work at hand, the employee shall report the fact to the Supervisor.
- Tools, which develop defects while in use, should be removed from service, tagged and not used again until placed in good condition.
- Impact tools such as chisels, drill, hammers and wedges with mushroomed heads should not be used until they have been reconditioned.

- Hammers, axes, shovels and similar tools should not be used if handles are loose, cracked or splintered.
- Defective wrenches such as open-end and adjustable wrenches with spread jaws, or pipe wrenches with dull teeth, should not be used, as they are likely to slip.
- Pipe or other extensions should not be used on a wrench handle to increase the leverage unless the wrench is specifically designed for such an extension.
- Portable electric tools with metal body should be equipped with 3-wire cord having the ground wire permanently connected to the tool frame and means for grounding the other end. Connectivity of metal body to the earthing pin shall be ensured with multi-meter during annual inspection. Supply to metal body hand tools shall be provide only through ELCB. Use of multi-meter should be done for checking of presence of electric supply/voltage instead of tester. Multi-meter selector switch should be in desired position while in use. The wheels, which are properly labelled only, shall be used. Instruction given on the wheel must be followed.
- Grinding wheel shall never be used after its expiry date.
- Abrasive wheels shall carefully be inspected and shall not be used, if they are damaged any way.
- Wheel Guard shall be in position and fixed securely before starting the cutting- off or grinding operation. Grinding machine shall never be used without wheel guard.
- All the electrical/supply cables of the portable tools shall be joint free.
- Wheel guard shall be oriented such that it prevents operator getting hit by broken pieces of wheel.
- PPEs required are Face Shield with safety goggle, Ear muffs, hand gloves, dust mask, leather apron or safety clothes, head cover, foot wear.

6.7 SAFETY WHILE WORKING WITH MECHANICAL LIFTING MACHINERY:



EXPECTED ACTIONS: IGL contractor shall plan lifting operations and control the area and shall ensure that:

- ✓ The equipment and load have been inspected and are fit for purpose.
- ✓ Competent and qualified person operate lifting equipment and machine.
- ✓ barriers and exclusion zones have been established and obeyed by all at all time.
- ✓ Nobody shall walk under a suspended Load.

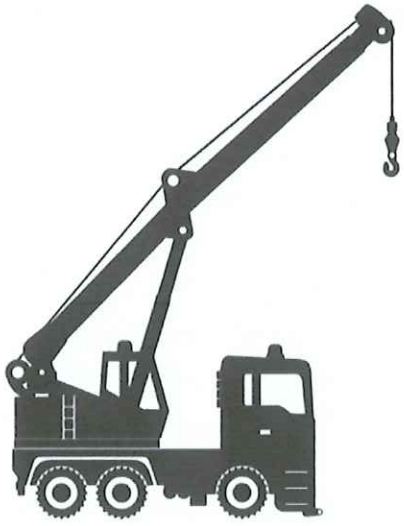
EXPLANATION:

- ✓ IGL contractor shall ensure Lifting operations are planned and performed by competent personnel using certified equipment.
- ✓ IGL contractor shall ensure to protect people around suspended loads and any mechanical lifting operation, access should be controlled through physical barriers and exclusion zones.
- ✓ When mechanically lifting people (e.g. manriding, man baskets, personnel transfer, mobile elevated work platform), contractor should provide lifting equipment which is designed and certified specifically for lifting people.

6.7.1 SAFETY IN CRANE OPERATIONS:

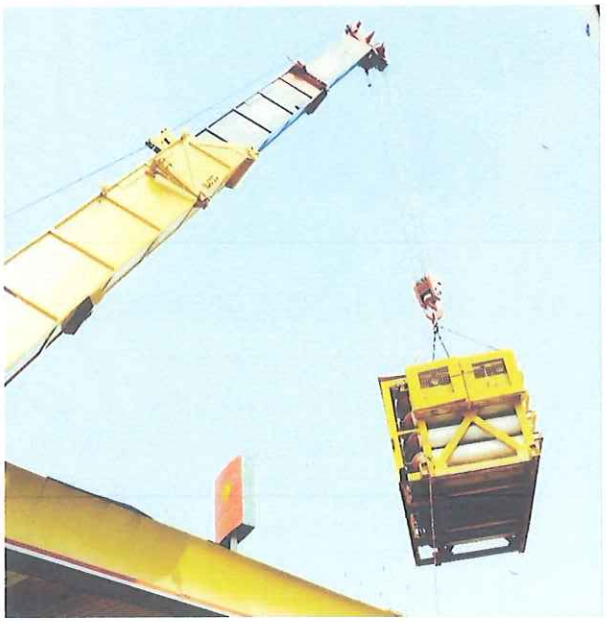
Some basic and common safety rules:

- Know your machine in details (SWL of crane, Boom length, suitability of the crane about the lifting job).
- No operator should be assigned to a job until he completes the following minimum requirements:
  - ➢ He has been properly trained to operate the machine assigned to him.
  - ➢ He has read and understood the operator's manual for machine.
  - ➢ He has the knowledge about the job requirements, any dangers condition which may arise and emergency procedure.
  - ➢ He has essential personal protective equipment and know how to use it.
  - Maintain safe job condition and working procedure. Examine the work site for restricted traffic patterns, obstructive views, congestion etc.



6.7.2 Document required for Crane Operations:

- R.C. Book (R.T.O. Registration) - Hydra and Tyre Mounted Crane.
- Valid Fitness Certificate from R.T.O. -Hydra and Tyre Mounted Crane.
- Valid Insurance Policy For all Cranes.
- Driver's valid license from R.T.O.
- Hydra – HMV.
- Tyre Mounted Crane – HGV.
- Crawler Crane – HGV. Valid P.U.C. Certificate of the crane
- Original Test certificate of crane by Manufacturer.
- Crane Manufacturer's Operating & Maintenance Manual.
- Load Chart of the Crane in original by Manufacturer's.
- Valid Third-Party Load test certificate of crane by Competent Person as per Factories Act / State Factories Rules.



6.7.3 THOROUGH EXAMINATIONS AND INSPECTIONS OF LIFTING DEVICES

- Specify the Safe Working Load, prior to first use.
- All other lifting Equipment must undergo a thorough examination. Lifting machines testing frequency by third party is 1 year whereas lifting tackles are tested after every 6 months and issued with a certificate.
- Lifting accessories / attachments must be visually inspected on each occasion before use.

Categorization of Lifting Operations

- Lifting operations are categorized as routine operations if they involve the following:
  - EOT Cranes operations.
  - Regular shop floor material movement
  - Fork-lift trucks in a warehouse
  - Construction site hoist
  - Mobile elevated work platform (MEWP) used for general maintenance
  - A vehicle tail lift

6.7.4 BAN ON CERTAIN PICK AND CARRY HYDRA CRANE: Old generation hydra cranes are banned at most of the sites because they offer poor visibility to operator in front as operators cabin lies in line to boom axis whereas in new generation hydra cranes, operator's cabin lies away from boom axis. Many of accidents have been observed at sites due to this flaw in cranes.

OLD GENERATION HYDRA | NEW GENERATION HYDRA

Taking as lesson learnt case of some other industry especially one of our parent organization BPCL wherein several instances/ accidents in the past involving Hydra crane has led BPCL to take decision to discontinue the use of Hydra Cranes due to safety reasons for lifting and shifting of materials, equipments, cable drums, pipelines etc. from one location to the other and has instead permitted use of Cranes of specified models having rear mounted boom and out rigger supports reasons.

In view of the above some of the models but not limited to having the above mentioned features are mentioned as below for reference which can be permitted to be used in IGL work sites:

S.No.	MANUFACTURE	MODELS
1	ESCORTS CONSTRUCTION EQUIPMENT (ECEL)	TRX Series-K10; F15:TRX 2319;MAC
2	ACTION CONSTRUCTION LTD (ACE)	FX120; FX10;15XWE;15 XWF;RHINO 110PC

6.7.5 Risk Assessment of Lifting Plans

A risk assessment must be prepared by contractor for all lifting operations.

For routine lifting operations an initial risk assessment and lifting plan is required but need not be repeated i.e., generic risk assessments and lifting plans may be used. However, they must be subject to regular documented reviews (at least annually) to ensure that they are still valid. Every lifting operation is planned and controlled by the concerned supervisor who ensures that safe procedures are undertaken. Factors to be considered when planning lifting operation include the following:

a) Identification of lifting operations to be performed and load characteristics; determine the load characteristics e.g., weight, center of gravity, stability, and physical size.

b) Making ample allowances for unknown factors, and determine the available capacity of the equipment being used. In cases where the assessment of load weight is difficult, safe load indicators of weighing devices must be fitted. It is equally important to rig the load so that it is stable. Unless the center of gravity of the load is below the hook, the load will shift.

6.7.6 Hire of Lifting Equipment and Services

The following precautions must be taken while hiring equipment for lifting operations

1. All mobile cranes and lifting equipment brought onto Site must have valid test certificates to demonstrate they have been inspected before being allowed to operate on site.
2. If lifting equipment of services are to be hired / purchased, responsibilities for supply of equipment, personnel and documentation must be agreed in the contract.

6.7.7 Responsibility

While working at IGL sites, the overall responsibility of carrying out the safe lifting operation lies on vendor/ contractor.

6.7.8 General Steps for Safe lifting Operation:

- An Equipment or Crane Pre-use Form shall be filled before taking crane into use.
- All cranes and man-lifts must have the loading table and the operation manual readily available.
- No damaged or defective equipment must be operated.
- The construction, operation and maintenance of equipment and accessories must comply with the technical standards established by the manufacturer.
- The standard signalling system for movement of cranes will be used. Any signalling shall be carried out by the rigger.
- Crane operators shall only obey the orders of one rigger, who shall wear clothes etc., which distinguish him from the rest of workers (reflective vest). In case of emergency, the stop signal can be given by any person and must be obeyed immediately.
- If any doubt exists about the interpretation of a signal, it should be interpreted as a stop signal.
- When slings with hooks tied around the load are used, make sure that the cable pulls into, not out of, the hook.
- The work area must be visually inspected to detect potential hazards before moving the crane.
- The load must be lifted gradually to avoid a sudden strong jerk of cable and slings.
- Ensure that no people are in the area of influence of the crane before moving the load.
- Never allow people to stand below a suspended load and never swing a load out over people.
- Never leave the crane cab while the motor is running or a load is suspended.
- Any crane job involving the movement of loads at heights must be indicated with signs on the ground and on its four sides. For this purpose, signs or barriers must be placed warning about the possibility of objects falling to the ground.
- Every mobile crane must be fitted with an alarm device to warn people that it is moving or turning.
- Operators must not use the control limits to stop the lifting operation under normal operating conditions. These controls are exclusively intended to serve as a safety feature.
- Safety devices, if any, must never be disconnected to exceed allowable limits.

- A crane must never be operated if the safety switches are not working.
- A crane must never be operated if the cable has been improperly rolled over the drum. There must be at least three cable turns over the drum or winch at all times.
- A crane must never be loaded above its load capacity. Use the loading table. Operators must know the load weight and the crane limitations.
- Passengers are not allowed in any place on the crane. Operators must not allow anybody to climb onto the hooks or loads.
- Slings and cables must be carefully inspected before being used by the rigger. If they are defective, they must be cut and immediately removed to ensure nobody uses them again.
- The rigger must make sure that no materials, tools, etc. have been left on top of the load to be lifted.
- Loads must never be lifted if there is a loose hook, as it could hit the operator's cabin or become tangled with the crane's jib.
- No crane or hoisting equipment must be operated if the hook has no safety pin /latch.
- Loads more than 12 feet long, such as pipes and similar loads, must be lifted with a two-legged sling for better balance.
- Loads must not rotate, move or seat violently because the load, boom, cables or the crane structure could be damaged. This can also cause violent releases of splinters which can harm the personnel involved in this activity.
- Hooks must not be painted, welded, sharpened, heated or repaired, so that fissures can be detected.
- If any unsafe condition is detected in the crane, stop work immediately, place a danger/ warning tag on the crane controls and advise the supervisor.
- If more than one crane is needed for joint maneuvering, then the work must be carefully planned with skilled personnel.
- Before starting the lifting operation, the operator must make sure that the load is aligned vertically to avoid imbalance that could affect the equipment and the load.
- Movement control buttons must be clearly marked, indicating the direction of crane movement.
- Hoisting equipment must be fitted with safety limit switches, both for moving equipment and for maximum lifting level.
- In electrically-driven lifting equipment, special care must be taken to make sure that cables do not become trapped by the lifting action. All necessary protective devices must be available, including grounding.
- No hoisting activity shall be carried out during an electric storm or severe weather.
- Before moving a crane under high-tension lines, the route must have been previously inspected by the Supervisor to avoid coming into contact with any part of the crane, or triggering an electric induction process.
- Do not use a crane to pull or move a load horizontally since this equipment is designed to lift loads.
- The crane must never be used in strong winds or storms or other inclement weather.
- Always use wheel chocks under tires and hydraulic jacks before lifting the load, as it will avoid movement of the vehicle if there is a sudden jerking of the load.
- The operator must not lose sight of the load at any time; if he/she cannot see the load, then he/she will need a rigger to guide the operation.
- The stabilizing brakes must never be used as hand brakes.

- Safe distances to high-tension lines must be kept, as follows:

Minimum Distance criteria from Over head Power Lines as per 3.1.5/ IS:7293	
Power	Distance
≤ 11kv	1.40 m
≤ 33kv	3.60 m
≤ 132kv	4.70 m
≤ 275kv	5.70 m
≤ 400kv	6.50 m

- In the event that the crane is working on soft ground, place supporting plates under each jack, with an area of at least three times that of the jack plate. These supports will be made of wood in a single piece, at least two (2) inches thick.
- The hydraulic jack must never be operated when the load is suspended.
- When the crane is no longer used, the jib must always be left in a folded position. If this is not possible it must be mechanically fixed to the platform.
- The crane must never be installed on a vehicle that is not appropriate for such installation (pick-up trucks, dump trucks, etc.).
- Fencing (Guard) of rotating, moving and other dangerous parts of machinery shall not be removed while the machinery is in use or in motion and when removed, it shall be replaced as soon as practicable and in any case before the machinery is again brought into use.
- Electric power shall be shut off and relevant fuses removed when repairs are carried out to any electric machinery.
- Where the machinery in use is mobile type and during the course of operation it has to shift its location frequently, one 10 kg stored pressure type Dry chemical powder fire extinguisher shall be carried on the machine at a suitable position on the machinery so as to ensure its easy availability.
- Only competent and reliable persons shall be employed as drivers of earth moving and lifting machinery or as rigger to give signals to the driver.
- The Operators/ Drivers shall possess valid License.
- All the documents related to vehicle & legal document should be available with operator & shall be presented when asked by IGL representative.
- The driver shall not leave his cabin while the engine or motor is running or the load is suspended, and in no case, shall the machinery be left unattended, even for short periods, until all loads are removed.
- The driver/ operator and rigger shall have good vision and undergo the medical test for vision at least in every two years.
- Hydra should be used only for lifting purpose; it must not be used to carry the load for shifting activity.

TYPICAL PRE -MOBILIZATION AUDIT OF LIFTING MACHINERY				
INDRAPRATHA GAS LIMITED				
Date				
Contractor Name				
IGL DOER DEPARTMENT (STORE, CNG (O&M/PROJECT), PNG (O&M/PROJECT)				
Activity				Location
Hydra / Crane/Tools/tackles				
Hiring Agency:				
Reg No		Id No		**Observations:**
Registration Certificate				
Comp Insurance				
Driving License				
Comp Certificate				
Medical Fitness				
Test Certificates & Form-12 of machine and tackles				
Indicators				
Load	**Radius**	**Angle**	**Boom Length**	
Side Indicators		**Brake Light**	Head Lamp	
Reverse Alarm				
Operators Check list		OK	NOT OK	
Load Chart in Cabin				
10kg DCP Fire Ext				
Anti2 Block device				
Hoist Limit switch				
Safety Devices				
Tyre Condition				
Insp Due date on both side of Boom (mm-yy)				
Seat Belt				
Parking Brake				
Hydraulic breaks				
Hook block with Safety Latch				
SWL on Hook				
SWL on Boom				**Action Taken**
Mech Boom swing lock				
First Aid Kit				
Maintenance Records				
Competent Riggers				
Banksman				

Rigging Plan			
Tool Box Talks			
HIRA Work Sheets			**Recommendations**
Site Barricades			**OBSERVE AND COMPLY IGL's 9 LIFE SAVING RULES ALL THE TIME.**
Protective Equipment's			
Hard Hats (ISI Mark)	Hand Gloves	Dust Mask	
Safety Shoes	Goggles	Body Harness	
Fluorescent Jackets	Ear Plug	Leather Jacket	
Blasting Hood			
Any Other PPE required			

	IGLDOER DEPARTMENT REPRESENTATIVE	**Contractor**	**PMC (If required)**
Name			
Signature			

TYPICAL LIFTING AND ERECTION WORK PLAN AND RISK ASSESSMENT FOR LOADING AND UNLOADING ACTIVITY:

PART A : GENERAL DETAILS		
Job No.	Date: -	
Name of the Agency /Contractor): -		
Location: -		
Lifting Elevation	From:	To:
MATERIAL DESCRIPTION		
Name: -	Total Weight-	Dimensions: -
LIFTING EQUIPMENT DETAILS: -	No. of Crane / Farana/Hydra / Winch Machine: -	Capacity (SWL)
	Load Distribution of Each Crane / Farana / Hydra / Pick and Carry /Winch:	

WORKING RADIUS- CAPACITY OF CRANE / FARANA/ Pick and Carry Crane:

Crane / Farana/ Pick and Carry	**Boom Length**	**Min Radius**	**Max Radius**	**SWL**

RIGGING TEAM DETAILS: -

Sr.No.	**Job Role**	**Name**
1	Crane Operator:	
2	Rigging Foreman: -	
3	Fabricators / Fitter: -	
4	Welder / Gas cutter: -	
5	Riggers	
6	Helpers	
7	Any other Mention	

PART B	**SAFETY PLAN FOR LIFTING AND ERECTION PLAN**

[I] DETAILS OF LIFTING TOOLS AND TACKLES/ WIRE ROPE SLING /WEB SLING:

SR.NO.	**MAKE - MANUAL / MECHANICAL**	**NUMBER**	**CAPACITY**	**LENGTH**	**DIAMETER**

SR.NO	Particular	NUMBER	CAPACITY
	D-SHACKLE:		
	CHAIN PULLEY BLOCK:		

[II]	SAFETY PRECAUTIONS:		
Sr.No.	Check Point	YES	NO
1	Valid test certificate of lifting equipment, lifting tools & tackles		
2	Visual checks conducted for all lifting tools & tackles		
3	Levelled and compacted ground		
4	Steel plates laid below crawler chains		
5	Outrigger working properly		
6	Area Cordoned off		
7	PPEs for working at height provided to all		
8	Safe access to higher elevation ensured		
9	Safe working platform provided		
10	Trained signal man deployed		
11	Sufficient illumination level ensured (for night work)		
12	Emergency light available at night time		
13	Emergency vehicles available at working location		
14	Lifting & erection plan explained to the team members		

Name and Signature of
Contractor In charge

Name and Signature of
IGL Representative (Doer Dept.)

Name and Signature of IGL Project Engineer /PMC/TPI

6.8 SAFE ENTRY INTO CONFINED SPACE OR UNDERGROUND (STEEL / MDPE) GAS PIPELINE VALVE CHAMBER/ UNDERGROUND TANK:

Work place, having restricted means of entry & exit and not designed for continuous human occupancy are known as confined space such as Steel valve chamber.

Hazards present in confined space.

→ Oxygen deficiency
→ Flammable gas
→ Toxic gas (Carbon monoxide, Hydrogen sulphide, welding fumes)
→ Electricity
→ Mechanical Hazard

6.8.1 CONFINED SPACE SAFETY REQUIREMENT:

IMPORTANT: As per hierarchy of hazard control preference shall be given by line incharge of concerned doer (executing department) to eliminate the hazard i.e. avoiding entry into confined space. However, in exceptional cases if there is need to enter in a confined space then following points shall be adhered strictly-

1. Ensure that Hot Work Permit is obtained for the checking of Underground Sectionalizing Valve Chamber(s) or Other Confined Space(s).
2. Ensure that work area is barricaded and cautionary boards are installed as per the site risk assessment.
3. Open the valve chamber cover slowly and let it remain open for minimum 15 minutes for sufficient air exchanges (**at this point of time do not allow any person to enter into valve chamber/confined space**).
4. Ensure availability of gas detector for checking of atmospheric condition inside the valve chamber and gas leakage.
5. Check the percentage of oxygen by inserting the probe of gas detector, If, the percentage is below **19.6%** do not allow the entry of any person.

OXYGEN DEFICIENT ATMOSPHERES	
19.5 %	**MINIMUM ACCEPTABLE OXYGEN LEVEL.**
15 - 19%	Decreased ability to work strenuously. Impair coordination. Early symptoms.
12-14%	Respiration increases. Poor judgment.
10-12%	Respiration increases. Lips blue.
8-10%	Mental failure. Fainting. Nausea Unconsciousness. Vomiting.
6-8%	8 minutes - fatal, 6 minutes - 50% fatal, 4-5 minutes - possible recovery.
4-6%	**Coma in 40 seconds. DEATH**

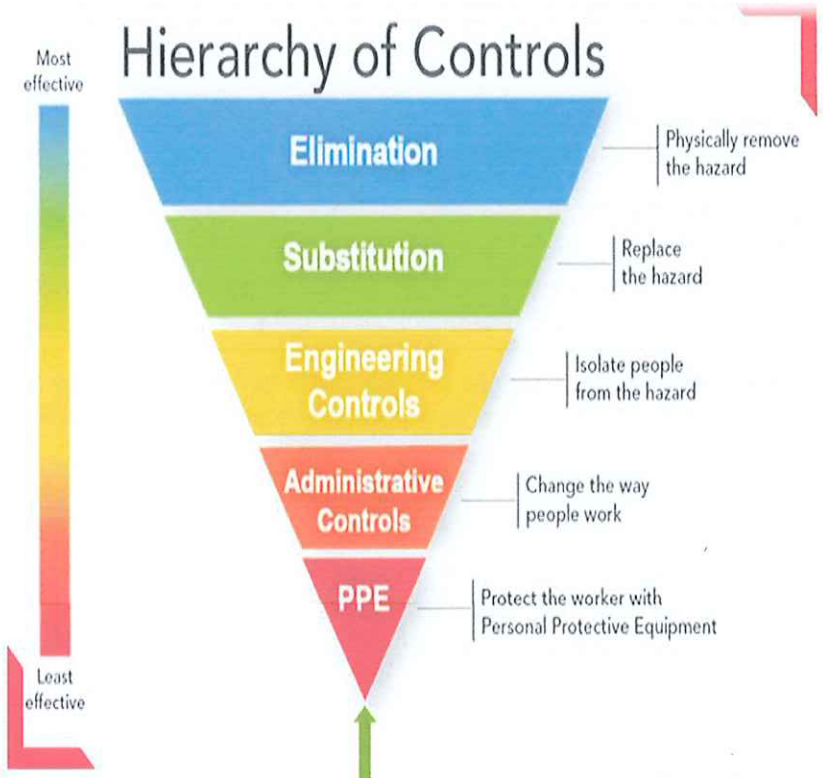
6. Ensure proper illumination before entry into valve chamber / confined space and shall keep flame proof torch in working condition.
7. Ensure the availability of Fire Fighting Equipment in ready to operate condition at site 02nos. (two) and 01no. (One set) of breathing apparatus (SCBA).
8. Ensure availability and usage of non-sparking tools whilst working inside the valve chamber.
9. Before entry into valve chamber / confined space ensure that there are no reptiles (e.g. snake or any other venomous creature) present.
10. Ensure that Person entering valve chamber / confined space should be medically fit & healthy. The individual is not present at site with empty stomach, should have taken proper meal prior to entry and should not be under influence of any drug/alcohol.
11. At no point of time there shall be a lone worker for confined space entry. There shall be minimum two medically fit and trained persons i.e. the worker who will enter the confined space and a standby person outside the confined space having a secure line of communication established with the worker entering the confined space.
12. The work of standby person and worker shall also be supervised by trained and qualified supervisor.
13. All persons involved shall use fit for purpose personal protective equipments i.e., Safety Goggles Helmet, Gum boots, Safety Belt (full body safety harness with lanyard / lifeline shall be used by individual during entry at confined space area), Reflective jackets along with cotton attire etc.
14. Ensure that No person should remain inside the chamber continuously for more than **10 minutes** in first time entry.
15. Ensure that stand by person is stationed outside the valve chamber holding the lifeline and is having secure lines of communication with person inside the valve chamber / confined space. (Secured lines of communication means that person entered and working inside the chamber /confined space and Standby person outside the chamber / confined space should be in constant contact with each other).
16. In case of any breathing problem / uneasiness the person should immediately come outside in fresh air and if required administer first aid or rush to nearby hospital.
17. Ensure that continuous testing of atmosphere is conducted /verified using gas detector and repeated as per dynamic site risk assessment.
18. In case of emergency rescuer must enter in valve chamber / confined space with donning of breathing apparatus properly.
19. Ensure availability of –

- First aid box.
- Nearest Hospital Emergency number.
- Vehicle for transportation

6.9 PERSONAL PROTECTIVE EQUIPMENT:

While working at IGL sites, all the required & appropriate and suitable PPEs will be provided to workers by his contractor. All the personal protective equipment's should be of good quality & reputed make & shall have the national or international certification.

If the contractor does not provide the required PPEs to his workmen, the job may be suspended till the time contractor provides the job specific PPEs to all concerned workforce.



PERSONAL PROTECTIVE EQUIPMENT (PPE) IS OUR LAST LINE OF DEFENSE EXCEPT IN CONSTRUCTION WORKS AND WHILE WORKING IN PROXIMTY OF ELECTRICAL HAZARD

- **HELMET** - Safety helmets shall be certified to IS 2952 or internationally recognized such as CE.
  - **Helmet, industrial safety (v-guard) -** Advance vented protective cap with 4-point fas-trac suspension padded for comfort & helmet should have cooling vents for improved air circulation. Approval ANSI/ISEA Z89.1.2009.
  - **Helmet, chemical resistant HDPE -** Safety helmet made of chemical resistant HDPE with structured brim designed for additional side, protection designed to take clip on accessories. Safety helmet made of chemical resistant hdpe with structured brim designed for additional side, protection designed to take clip on accessories.

- **HEARING PROTECTION -** The surest method of preventing occupational deafness is to reduce noise at the source by engineering methods. However, in certain workplaces, engineering methods may not be sufficient enough to reduce the noise level reaching the user below 85 dBA. In such work places, hearing protectors need to be used to reduce the amount of noise reaching the ears. Ear plugs should be used in high noise area.

- **EYE & FACE PROTECTION -** Eye & face protection devices should be used whenever workmen are exposed to hazards, which could injure eyes and/ or face. Ear plug should be of high quality foam, non-irritant and allergy-free material, suitable for protection against long term, exposure to, medium noise levels. Corded in fluorescent orange color.

  Chemical splash protective goggle- soft vinyl frame, high- impact polycarbonate lens, can be worn over prescription spectacles, indirect ventilation, approvals: VJTI TST/1/STRUCT/SP-834/2047/89

  Safety goggles-
  - lens material -polycarbonate, spherical refractive power tolerance:-within 0.06/m
  - Astigmatic refractive power tolerance:-within 0.06/m
  - Difference in prismatic refractive power
  - Tolerance:- horizontal base out=0.75cm/m
  - Horizontal base-in=0.25cm/m
  - Vertical=0.25cm/m
  - Optical glass:-1
  - Maximum spectral transmittance in the ultra violet:-313nm (0.0003%)
  - Maximum spectral transmittance in the ultra violet:- 365nm=clear:10%,smoked:0.30%
  - Luminous transmittance:-clear=74.4%-100% smoked=29.1-43.2%
  - Lens scale number:- clear=2-1.2&2c-1.2 smoked:5-2.5
  - Resistance to low impact energy of high-speed particles:-with stands the impact of 6mm nominal diameter steel ball, weighing 0.86 gata speed of 45m/sec. the impact is carried out after conditioning the eye wear to temp.55degrees centigrade ,and- 5 degrees centigrade.
  - Weight: - 24 gms. Smoked lens filters out more than 99% of UV rays

- **HAND & ARM PROTECTION -** Hand & arm protection is necessary to protect the workers from potential injuries like thermal & chemical burns, bruises, cuts, electrical shock and absorption of chemical through skin contact.

  Cotton hands gloves - netted cotton gloves H.D.

- **FOOT PROTECTION** - Foot protection shall be used to protect the workers from the following injuries-
    - Impact Injuries
    - Compression injuries
    - Electrical shocks
    - Puncture

  Safety shoes should be worn by all person at all times whenever they are at IGL worksite. Using of gumboots should be ensured whenever required.

  Specification of Safety Shoes:
    - ✓ Shoe- derby shoe occupational footwear as per ISO: 20347, anti-static, high voltage resistant
    - ✓ Upper leather- Buff Barton
    - ✓ Sole- oil & skid resistant P.U
    - ✓ Manufacture- shoe to be manufactured by direct moulded system after Strobel lasting on lasts confirming to h fitting.
    - ✓ Toe puff- good quality fibre thermoplastic.
    - ✓ Lining- fabtex grey colour
    - ✓ Heel grip- leather lining
    - ✓ Insole- antistatic
    - ✓ Eyelets - 3 nos.
    - ✓ Thread – nylon
    - ✓ Electric resistant - 100 Ω to 1000 MΩ
    - ✓ High voltage - upto 15k volt Size - 38 to 46 (4 to 12)

- **FALL PROTECTION** - Full body harness shall be used by all personnel when working or travelling in elevated area more than 2 meter above ground level or adjacent surface where a fall exposure exists.

  Full body harness-

  Light weight full body harness easily adjustable, durable with specially designed seat strap for optimising comfort and energy absorbing dorsal d-ring for user safety to be used for confined space entry and for protection against falling from height.
    - Must ensure adequate distribution of fall impact to the various parts of human body
    - Should have not less than 2-meter polyamide rope attached with self-closing auto locking steel hook.
    - Must have adjustable primary straps of not less than 44 mm polyamide webbing & secondary straps of not less than 20mm equipped with shoulder, waist & thigh straps differentiated by a different colour.
    - Must have seat strap which must be ideally positioned for more comfort.
    - Must be provided with two chest attachment textile loops and a dorsal attachment steel d-ring
    - Must be provided with tool holder loops and rings.
    - Must confirm to EN361 & EN358 standard and must submit a test certificate from authorized govt. Agency.
  - The harness shall withstand a minimum 15 KN load when tested as per BIS 3521.

INDRAPRASTHA GAS LIMITED -PERSONAL PROTECTIVE EQUIPMENT MATRIX																									
POTENTAL INJURY/HARM /HAZARD	HEAD	EYES		HEAD			FEET		FALL	NOISE		HANDS					BODY				RESPIRA—TORY		TRAFFIC	ELECTRIC SHOCK
PERSONAL PROTECTIVE EQUIPMENTS / JOB ACTIVITY	SAFETY HELMET	SAFETY GOGGLES	WELDING GOOGLES	FACE SHIELD	WELDING HELMET	HOOD TURTLE NECK	INSULATING BOOTS	SAFETY SHOES	SAFETY HARNESS/FALL	EAR PLUG	EAR MUFF	Cut Resistant Gloves	LEATHER GLOVES	COTTON GLOVES	NITIRILE GLOVES	RUBBER INSULATION	LEATHER APRON	Chemical resistant clothing /PVC suit	Coverall / Fire retardant	FIRE PROXIMITY SUIT	FACE MASK/DUST MASK	Self-contained breathing apparatus*	REFLCTIVE JACKET	INSULATED HAND TOODLS
SITE INSPECTION*	✓	✓						✓													✓		✓	
CNG STN EQUIPMENT /MACHINE MAINTENANCE WORK	✓	✓						✓					✓						✓		✓			
PNG EQUIPMENT /MACHINE MAINTENANCE WORK	✓	✓						✓					✓						✓		✓		✓	
MDPE /STEEL PIPELINE CONSTRUCTION WORK	✓	✓						✓					✓						✓		✓		✓	
MDPE PIPELINE FITTING ELECTROFUSION	✓	✓						✓						✓									✓	
WELDING WORK			✓		✓			✓					✓						✓					
CUTTING AND GRINDING WORK	✓	✓		✓		✓		✓		✓	✓	✓											✓	✓
EXCAVATION WORK#	✓	✓					✓	✓	✓*														✓	✓
CONFINED SPACE ENTRY#	✓	✓					✓	✓	✓*				✓					✓				✓*	✓	✓
ODORANT /CHEMICAL TRANSFER /HANDLING	✓	✓					✓	✓							✓			✓				✓*		
MECHANICAL LIFTING WORK	✓	✓						✓						✓					✓*		✓		✓	
ELECTRICAL WORKS/ WORK NEAR ELECTRICAL INSTALLATION#	✓	✓					✓	✓								✓					✓		✓	✓
FIRE FIGHTING	✓*	✓*						✓											✓*	✓*		✓*		
WORK AT HEIGHT	✓	✓							✓					✓									✓	✓
CIVIL MASONARY WORK and PAINTING	✓	✓							✓					✓							✓		✓	
ROUTINE O&M JOBS AT CNG & PNG FACILITIES	✓																				✓			
Note (1): Selection of PPE marked with * shall be judicious requiring proper Job planning and risk assessment amongst team before use. For firefighting situational awareness is must.																								
Note (2): Activity Marked with "#" shall be started /begin only after ensuring proper lock out and tag out and complete energy (gas/electrical) isolation from the concerned owner/ in charge.																								
Note (3) In case of redundancy most suitable PPE shall be used keeping the dynamic site risk assessment and site situation awareness.																								
Note (4) In case of community /mass viral infection every effort shall be made to practice personal hygiene, maintain social distancing and strict use of suitable face mask preferably of N95 type mask.																								
DISTRIBUTION LIST: All concerned line in-charges of CNG /PNG PROJECTS CNG /PNG O&M and All Concerned.																								

6.10 ELECTRICAL SAFETY:

6.10.1 GENERAL: Electricity can kill or severely injure people and cause damage to property from the effects of fires and explosions. In INDIA every year accidents at work involving electric shock or burns are reported. Electric shocks do not always cause lasting injury but in certain circumstances can result in death, known as electrocution. The sudden muscular contraction during the shock can result in injuries from, for example, falling. Electric current flowing through the body can cause deep burns.

Electrical arcing (sometimes called a 'flashover' or 'arc flash'), perhaps as a result of a short circuit caused by unsafe working practices, can generate intense heat leading to deep-seated and slow-healing burns, even if it persists for a short time. The intense ultraviolet radiation from an electric arc can also cause damage to the eyes. Often those working with or near electricity do not appreciate the risk of serious injury and consequential damage to equipment that can arise from arcing.

Arcing, overheating and, in some cases, electrical leakage currents can cause fire or explosion by igniting flammable materials. This can cause death, injury and considerable financial loss.

Most electrical accidents occur because people are working on or near equipment that is

→ thought to be dead but which is live;
→ known to be live but those involved do not have adequate training or appropriate equipment to prevent injury, or they have not taken adequate precautions
→ poor situational awareness due to improper or no supervision of job by authorized person of contractor.

Every contractor must make sure that electrical equipment and installations that are used at IGL's worksite by the contractor and his employees, workers, staff are maintained to prevent danger. The contractor supervisor and the user (worker) should carry out daily visual checks of all electrical equipment, including portable appliances, and must remove the equipment from use immediately and check it, repair it or replace it if:

→ the plug or connector is damaged;
→ the cable has been repaired with tape (having joints), is not secure, or internal wires are visible etc.;
→ burn marks or stains are present (suggesting overheating).

Contractor shall make arrangements for inspection at regular intervals for testing of electrical wiring/cables and equipments through competent electrician, so to ensure that there is little chance of deterioration leading to danger of electric shock to workers.

In addition to the above contractor are also advised and instructed to comply the below mentioned conditions as enshrined in BOCW (Building and other construction works) Act 1996 to ensure electrical safety at IGL's work site.

(1) Before commencement of any building or other construction work, the employer shall take adequate measures to prevent any worker from coming into physical contact with any electrical equipment or apparatus, machines or live electrical circuit which may cause electrical hazard during the course of his employment at a building or other construction work.

(2) The contractor shall display and maintain suitable warning signs at conspicuous places at a building or other construction work in Hindi and in a local language understood by the majority of the building workers.

(3) In work places at a building or other construction work where the exact location of underground electric power line is not known, the building workers using jack hammers, crow bars or other hand-tools which may come in contact with a live electrical line, shall be provided by the employer with insulated protective gloves and footwear of the type in accordance with the national standards.

(4) The contractor shall ensure that, as far as practicable, no wiring, which may come in contact with water or which may be mechanically damaged, is left on ground or floor at a building or other construction work.

(5) The contractor shall ensure that all electrical appliances and current carrying equipment used at a building or other construction work are made of sound material and are properly and adequately earthed.

(6) The contractor shall ensure that all temporary electrical installations at a building or other construction work are provided with earth-leakage circuit breakers.

(7) The contractor shall ensure that all electrical installations at a building or other construction work comply with the requirements of any law for the time being in force.

INSULATED HAMMER

INSULATED CROW BAR

6.10.2 SAFETY PRACTICES- WORKING IN PROXIMITY OF ELECTRICAL INSTALLATION :

IMPORTANT:

A] Before commencing any work, the concerned contractor shall in coordination with line incharge of the doer department (work executing department) should assess the need of the safety work permit system which is a critical component of IGL's safety management system for life safety.

B] No Person shall approach or take/carry any conductive object closer to any electrical installations in accordance to Rule 82 (A) of Indian Electricity Rules 1956 # which reads as:

"Rule no. 82-A Transporting and storing of material near overhead lines-

(1) No rods, pipes or similar materials shall be taken below or in the vicinity of any bare overhead conductors or lines if they are likely to infringe the provisions for clearances under rules 79 and 80, unless such materials are transported under the direct supervision of a competent person authorized in this behalf by the owner of such overhead Conductors or line;

(2) Under no circumstances rods, pipes or other similar materials shall be brought within the flash over distance of bare live conductors or lines; and

(3) No material or earth work or agricultural produce shall be dumped or stored or trees grown below or in the vicinity of bare overhead conductors lines so as to reduce the requisite safety clearance under rules 79 & 80.

***# for detail please refer* Indian Electricity Rules 1956.**

i) As a general safety practice the above rule should also be adhered while doing any excavation and digging work near the electrical installations i.e. presence of electrical cables /lines shall be determined before going ahead for any digging /excavation work.

ii) Keeping above as cardinal rules in mind, following general safety practices should be strictly adhered by all persons (IGL employees as well as IGL's contractual workforce) while working in vicinity /proximity of electrical installation:

1) Joint Site Visit:

i) Joint site visit to perform site risk assessment shall be done prior to starting any work (including digging excavation work) in proximity of electrical installation, to identify any potential hazards, to implement appropriate control measures, and to determine appropriate tools, safety precautions appropriate Personal Protective Equipment to be used for the job viz. electrical rubber hand gloves, insulation rubber mat, safety helmet, safety shoes etc.

ii) SITE SAFETY RISK ASSESSMENT CHECKLIST shall be filled jointly by user/doer department and Fire & Safety.

2) Treat everything as live:

i) Treat all electrical conductors and apparatus/equipment /installation as live and consequently dangerous to human life, do not proceed for work unless it is positively confirmed to be dead and properly earthed by the owner /authorised person and take precautions accordingly.

ii) Arrange to isolate the electrical supply- Doer department shall coordinate with electricity supply company or other concerned to :

→ Personnel working in these areas should be aware of Induction Voltages present

→ Confirm deactivation (isolate electrical supply) and proper ground/earthing of live power cables before work is performed on, or in close proximity to the lines.

3) Exercise Care:

i) Ensure 100% compliance to IGL's 9 Life Saving rules.

ii) Never work in isolation i.e. No lone worker shall be allowed. Always a buddy system approach be adopted i.e. supervisor along with worker(s) shall be present at site to supervise the work w.r.t. safety

and quality of work being performed.

iii) Place yourself in a safe and secure position to avoid slipping, stumbling or moving backward against live conductors or apparatus / installation.

iv) Do not rely for protection upon the care assumed to be exercised by others.

v) Workers shall not approach an exposed, energized or conductive part even if properly trained unless:

- ✓ The worker is properly insulated from the energized part with gloves or other approved insulation.
- ✓ The energized part is properly insulated from the worker and any other conductive object
- ✓ The worker is properly isolated and insulated from any other conductive object.

vi) Never touch a fallen overhead power line. Call the electric utility company to report fallen electrical lines.

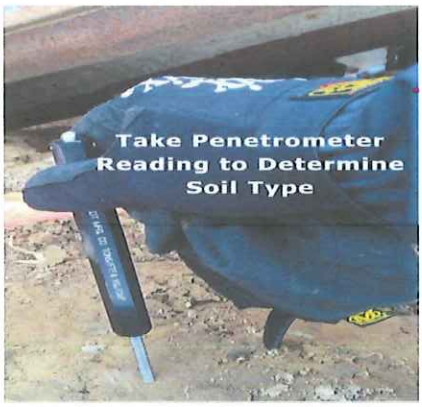
4) **Think before you act:** Think carefully before you act, make sure you are right, watch out for the other man and make sure he is right.
5) **Be attentive:** Concentrate fully on the job, do not distract yourself and others and never speak to any person while working upon live mains or apparatus.
6) **Be cautious:** Develop a habit of being cautious. Look out for danger, notice plates, danger tags, warning boards and signals. Warn others when they seem to be in danger near live conductors or apparatus, in such a way that they are not taken by surprise of your warning.
7) **Personal Apparel/Clothing:**
   - i) Use of overall coats having metal buttons, metal straps and similar metal fittings should be avoided. Bone buttons shall be used, buttons shall be sewed in place with thread. Loose clothing should not be worn.
   - ii) IS marked Electrical rubber insulated gloves rated for the voltage shall be worn while working in proximity of electrical installation.
   - iii) IS marked Safety Shoes shall be worn and do not wear shoes with nailed soles while working in proximity of electrical installation
   - iv) Do not wear suspenders, armbands with metal buckles, metal chains, and rings. Metal key chains or metal keepers for key rings or watch chains should not be worn on the outside of clothing. There is always a possibility that these might come in contact with live part or live apparatus and cause injury.
8) **Shifting storing of materials within low or high voltage enclosures: Never** shift/store materials within low voltage or high voltage electrical installations /conductors/ power lines..
9) **Working in Damp Situation:** Extra precautions should be taken when working in abnormally damp area and during monsoon season.
10) **Precautions while mechanical lifting work using hydra /crane near overhead power line:** Following Minimum Distance criteria from Overhead Power Lines as per 3.1.5/ IS:7293 shall be adhered:

Minimum Distance criteria from Overhead Power Lines as per 3.1.5/ IS:7293	
Power	**Distance**
≤ 11kv	1.40 meter
≤ 33kv	3.60 meter
≤ 132kv	4.70 meter
≤ 275kv	5.70 meter
≤ 400kv	6.50eter

6.11 SAFETY IN EXCAVATION WORK :

6.11.1 GENERAL: To ensure safety of the persons while performing their activities while excavating and while in excavations the contractor shall ensure following:

- Ensure Soil testing an analysis before planning to conduct the excavation activity through an expert.



- Ensure the availability of valid Safety Work Permit.
- Ensure the usage and availability of locating device to detect the other underground utility location and depth.
- Ensure that buried /underground utilities (electrical cable, fire water lines, gas pipeline, telephone cables etc.) have been identified in coordination with owner /authorised representative of the owner to ensure that utilities have isolated before doing the excavation work.
- The contractor shall ensure the excavation clearance from the concerned agencies in writing before the excavation work starts.
- Ensure the work is carried out in the presence of site Engineer / Supervisor.
- Ensure that all workmen who are doing the excavation activity are issued with safety helmet, Safety shoes, safety goggles, Reflective jackets and safety gloves.

- Ensure that persons shall not work in excavations that contain or accumulating water unless dewatering from the excavated pit has been done. Dewatering from the excavated pit shall be done at remote location to avoid backflow to the pit resulting in soil collapse.

- Ensure that excavated soil and other debris kept at least 2' away from the edge of the excavated area (See Figures-2).

- Ensure that excavations 1.5 meter or deeper correctly sloped, benched, shored.
- Ensure that excavated area barricaded adequately and caution board being put on the both site.
- Ensure that steps or other means of ingress & egress are provided in excavations deeper than1.5 meter.
- Ensure that under cutting of the trench wall is NOT permitted.
- Ensure that when ladders are used, they do extend 1 meter above the surface and they are secured. Suitable safe access and egress devices such as ladders, steps, ramps or other safe means of exit shall be provided for personnel working inside an excavation. In excavations 1.25 meters or deeper these devices must be located in the excavation within easy reach of all the workers at regular intervals.
- In case of rain or other climatic conditions inspect excavation before sending the workmen.
- Ensure that overhead utility lines are identified and precautions taken to avoid contact with the equipment.
- Ensure that mobile excavating / hoisting equipment are not lowered, raised and no swinging loads suspended over the personnel working in the excavated area.
- Ensure that shoring and shielding systems inspected visually daily by contractor site Engineer / Supervisor.
- Ensure that excavation area and vehicle movement area to be isolated or barricaded.
- When excavation sites are active, signage shall be displayed to clearly demarcate the safe traffic movement.
- Ensure that Excavations carried out at any place to which the public have or might gain access must be guarded to avoid danger to people.
- Where excavation work is in or near public access ways and hazards exist, barricades, overhead protection, enclosed walkways, or other means of protection shall be provided for the public.
- Any excavation, regardless of the depth, shall be classified as "Confined Space" if the head of the person working in the excavation is below ground level. All such excavations: shall be tested by a competent person for oxygen deficiency and hazardous atmosphere before permitting anyone to enter after proper site risk assessment.
- Contractor shall make necessary arrangement emergency rescue equipment such as breathing apparatus, safety harness and life line, first aid medical kit, stretchers, vehicle to transport the injured in the event of any exigency made readily available for use at the excavation site.
- Note. Particular care must be taken when water has entered the excavation and has to be removed. Water will have entered the soil of the trench wall that could make it liable to collapse when the water is removed from the excavation.

6.11.2 Guarding of excavations and precautions against vehicular traffic:

a) As per rule 48 of BOCW Act 1996, whenever any building or other construction work is being carried on, or is located in close proximity to a road or any other place where any vehicular traffic may cause danger to building workers, the contractor shall ensure that such building or other construction work is

→ Barricaded and suitable warning signs and lights displayed or erected to prevent such danger and if necessary, contractor should make a request in writing to the concerned authorities to control such traffic.

→ Signs and barriers and / or road tape and pins shall be used around the excavation(s).

→ Excavation shall be illuminated at night with appropriate warning lamps where necessary and as directed by IGL site engineer.

→ Fence is 1 m high, a combination of signs, barriers, lights markers, flags or sentries may be necessary to provide adequate protection for the public and employees.

b) The contractor shall ensure that all vehicles used at construction site of a building or other construction work comply with the requirements of the Motor Vehicles Act, 1988 (59 of 1988) and the rules made thereunder.

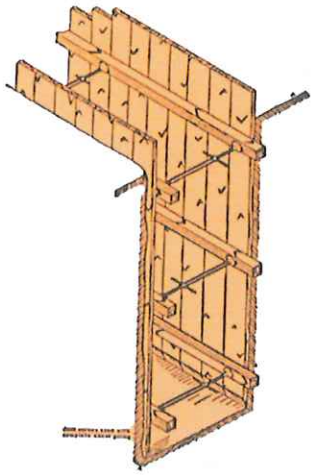
c) The contractor shall ensure that a driver of a vehicle of any class or description operating at a construction site of a building or other construction work holds a valid driving licence under the Motor Vehicles Act, 1988 (59 of 1988).

d) Further conditions of IGL's IGL WORK SITE BARRICADING STANDARD shall be strictly followed for guarding of excavations guarded to protect the workers, and warn pedestrians and vehicles that work upon the road and footpath is taking place.

6.11.3 Trench Excavation Safety:

a) To avoid collapse of soil upon the workers working inside the trench, the trench shall preferably be made of V shaped.

b) Ensure that excavations greater than or equal to 1.5 m deep are particularly hazardous and must be shored. Excavation of depth exceeding man height will be adequately supported by shoring kit or other suitable means to avoid collapse.



c) Ensure that Shoring members should be checked for tightness against each other and against the soil face.

d) Ensure that Excavations, including shoring and underpinning, shall be examined by the contractor site Engineer /supervisor before work starts each day.

6.11.4 Daily Safety Checks at Excavation Sites:

1. Valid work permit shall be obtained for any excavation prior to the job.

2. Clearances from different department must be obtained for underground utilities.

3. Common buried services found in a construction site are:

→ Water mains (Fire, Industrial and Common Services)

→ Electrical cables (High Voltage and Low Voltage, Permanent and Temporary).

→ Drainages and Sewers

→ Fuel pipes (Oil, Gas and Chemical).

→ Communication and Optic Fibre cables (Telephone and Instrumentation)

4. CONTRACTOR will be responsible for detecting, identifying and marking of all buried services on work area affected by the excavation operation.
5. Comply with hazard controls listed in the permit.
6. Area around the excavated pit must be barricaded with sufficient height by appropriate means like sheets etc. in case of Project site for construction of new CNG stations, building etc so that no disturbance to the adjacent & from the adjacent should be made.
7. Deploy a competent supervisor at work site during the work execution.
8. Excavation should be done in V shape to avoid collapse of soil.
9. Excavated material should be kept at least 1.5 m away from the top edge of excavation.
10. No heavy equipment, vehicle is permitted near to the edge of the excavated area.
11. Stop blocks will be used to prevent construction plants and equipment from coming too close to the edge of an excavation.
12. Excavation pit adjacent to public access will be adequately illuminated.
13. Continuous mechanical ventilation will be provided in deep excavation to prevent the build-up of toxic or explosive gases.
14. Atmospheric monitoring will be carried out in advance of any work and throughout the duration where work is being performed in a deep and narrow excavation.

15. Workers working in excavation pit will be briefed on the potential hazards involved, escape routes and the emergency and rescue procedures will the need arises.
16. Adequate first aid and effective rescue equipment will be provided in close proximity to an excavation.
17. Workers will be trained in basic rescue procedures such as removing unconscious and injured workers from an excavation.
18. When live gas working is being carried out consideration should be given to preventing the possibility of gas pockets being formed.
19. High visibility clothing must be worn when working on or near a public high or private road.
20. The site must be checked daily for tidiness and safety before work starts and shall include the following:
    a) Barricades and Barriers are in place
    b) Road plates are secure
    c) Trench supports and ore trench wall are safe
    d) Special regard shall be paid to by the IGL Site Engineer:
    e) The stability of the ground – checking for any change in ground water table
    f) Adequacy of supports;
    g) Undue loading to trench edges;
    h) Clear working space;
    i) Adequate means of entry and exit;
    j) Provision of suitable protection to prevent persons falling into the excavations including proper crossover with guard rails.

6.12 IGL WORKSITE BARRICADING STANDARD

Barricading means a physical barrier, usually temporary, erected or placed to restrict the entry of persons to an area and/or to prevent personnel (workers, general public) being exposed to a hazard.

In IGL it is the mandatory that concerned contractor has to provide suitable barricading in all non-routine jobs, hazardous jobs, and construction work of CNG station and gas pipeline or wherever as decided and deemed suitable based on site risk assessment done by IGL employee.

NOTE: Barricading of 1 m height (with red and white band/ self-glowing caution boards) should be carried out for excavation beyond 1.5 m depth.

6.12.1 SITE BARRICADING SELECTION CRITERIA:

Access Condition

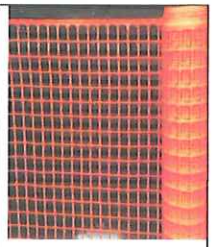
Access permitted against valid safety work permit to :

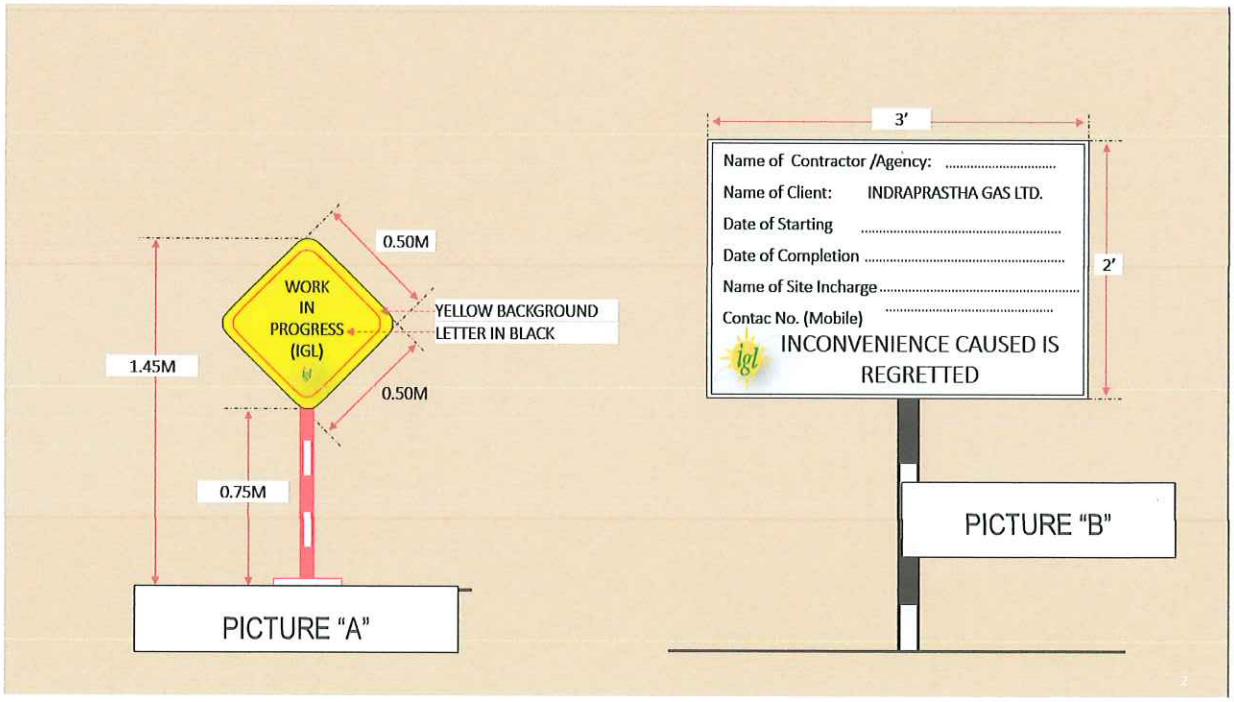
→ IGL Authorized Contractual Staff

→ IGL Employees of doer department and Fire & Safety Department

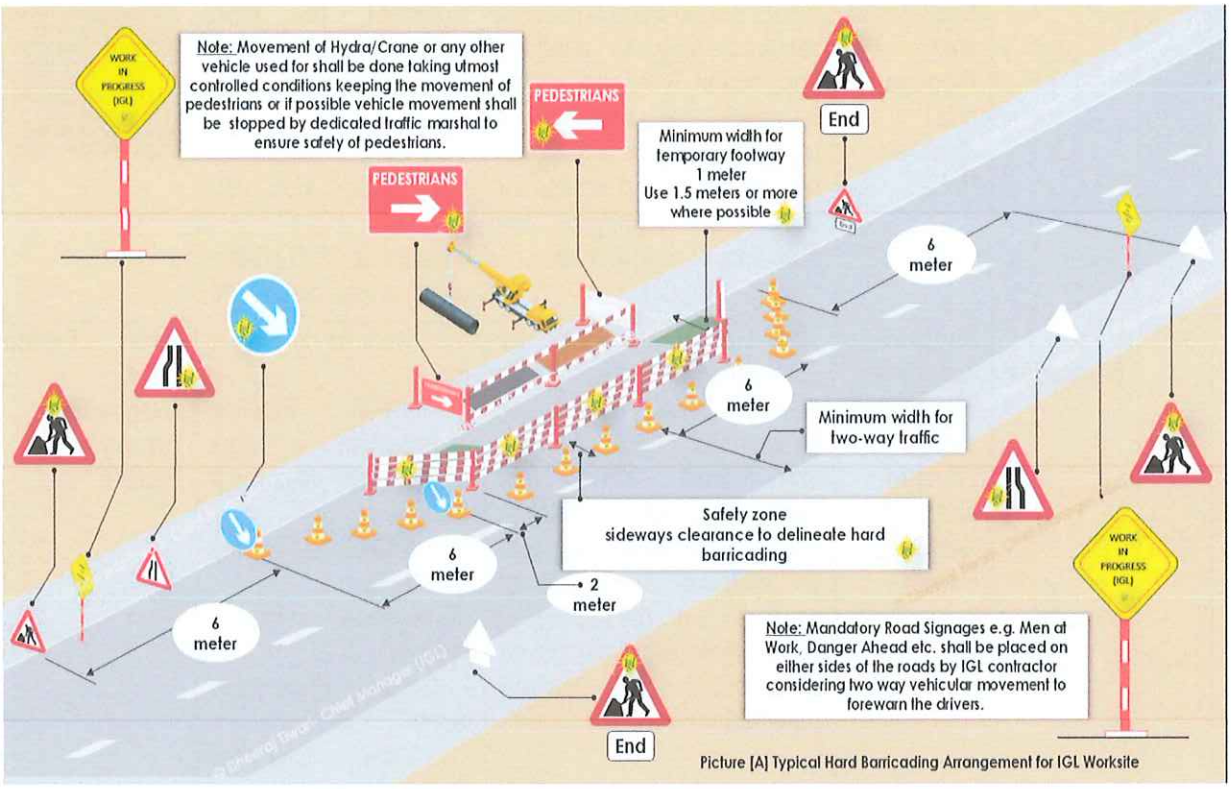
→ Mandatory Display of Information Boards as given against **Picture "A" & Picture "B" SITE DISPLAY BOARDS.**

Sr. No.	Type	Signage Required	Application	Suitable for	Example
1	Caution Required before Entering the work site.	Required Signages to alert Workers and General Public	The caution tape is to be used to highlight hazards to other personnel that may need to access the area. Any person may access into a caution barricaded area, as long as they have familiarized themselves with the hazards detailed on the barricade signage and implemented any controls indicated on the Signage.	For any non-routine Cold Work Jobs and hazardous work Enclosed Premises e.g. i) inside Under Construction /commissioned CNG station. ii) IGL Office Building iii) IGL store building	Yellow Colored Caution Tape of sufficient length covering the entire work area. 
2	Restricted Access / Danger	Required appropriate Signages to alert Workers and General Public	This barricade is suitable to use to restrict access from hazards such as: → hot work; → persons working above / falling objects; → spills / leaks; → unprotected edges creating a fall risk may be used to delineate a hard barrier.	-For All Hot Work Jobs. -Emergency response to a site requiring initial barricading for exclusion zone. -PNG related work in Domestic/Industrial /Commercial Customer Premises for preparing the exclusion Zone.	

3	Barrier Mesh	Required appropriate Signages to alert Workers and General Public	Barrier mesh are high visibility soft barricading options where a solid barricade is not required. May be used in conjunction with appropriate barricading tape and signage to delineate work areas that require authorized access, or used to highlight the boundary of a work area.	To avoid distraction of Traffic (Drivers of Vehicles) to avoid gathering of bystanders or onlookers. -Hot work or cold work near road side SV stations. -Road side CNG station construction (civil) work.	
4	Hard Barricades	Required appropriate Signages to alert Workers and General Public	The Hard barricades are established to maintain a safe distance that segregates pedestrians and Workers from work site Hard barricades can provide a safety barrier system capable of physical protection of workers e.g preventing a person from falling off / into an Unprotected edge / surface penetration.	-Hot work or cold work for - Steel Pipeline construction work (Excavation, laying, & testing) - MDPE Pipeline construction. (Excavation, laying, & testing) - Ground Excavation work. - Valve Chamber Construction work.	**Refer Typical Hard Barricading Arrangement Picture "C".**



Typical IGL work site display board



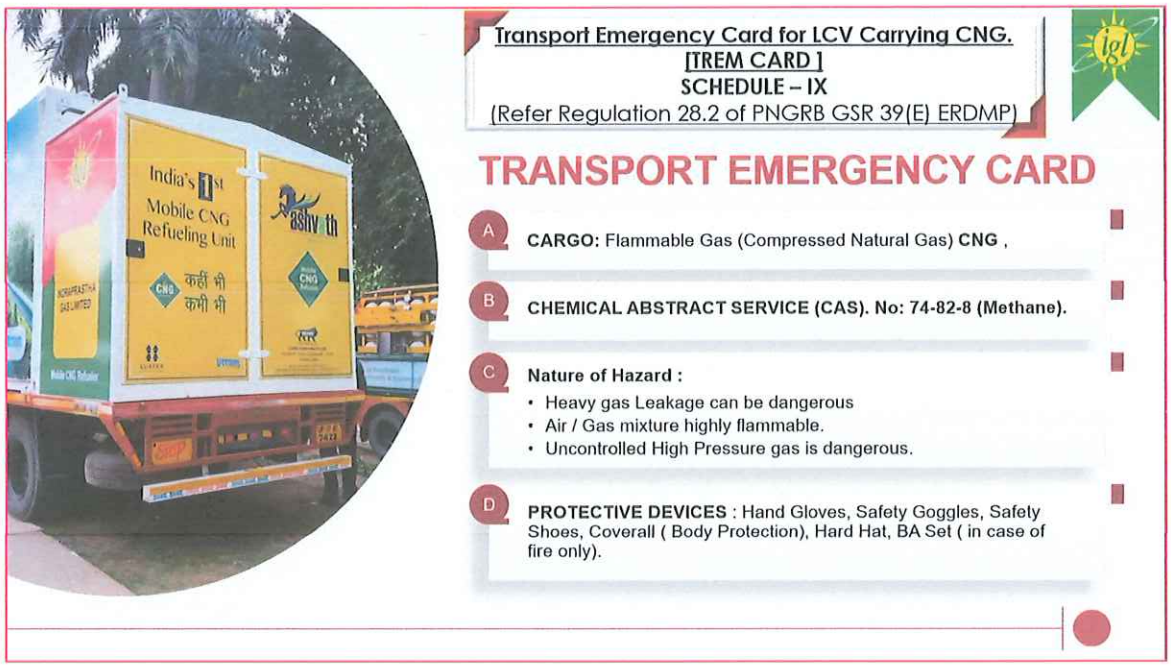
Picture [C] Typical Hard Barricading Arrangement

6.13 LCV OPERATION:

- LCV must be registered to carry CNG.
- LCV must be equipped with the necessary first aid, safety equipment's to carry CNG.
- 02 nos. 09 KG DCP Stored Pressure type Fire Extinguishers and 02 nos. Traffic Cones, HAZCHEM sign & TREM card will be provided by IGL for each LCV.
- Transporter or the owner must have full and adequate information about CNG.
- The driver must be trained in handling the dangers posed during transport of such goods.
- LCV must be equipped with the safety equipment's for preventing fire, explosion or escape of CNG.
- LCV must be fitted with techno-graph – GPS system (an instrument to record the lapse of running time of the LCV; time speed maintained, acceleration, deceleration, etc.). GPS system should be available for monitoring at all the time and non-working of GPS for any LCV will be construed as deviation in operation of LCV.
- LCV must be displayed with class label at its three sides as per statutory requirement.
- Class label must not obscure any other markings required to be displayed. The surface of the vehicle surrounding the label shall be of a colour that contrasts vividly with the background of the class label.
- The company and the transporter shall lay down the route of each trip and the driver shall be bound to take unless directed or permitted otherwise by the Police Authorities. A timetable shall be fixed for each trip to the destination and back with reference to the route so laid.
- The driver must undergo the course on driving of vehicle carrying hazardous goods from an institute recognized by the transport authority.
- A TREM (Transport emergency) card must be provided to the driver, which he shall keep in the cabin at the right-hand side of the dashboard so that it is available for ready use at the time of transportation.
- Display of EIP (Emergency information Panel) must be ensured with three sides of LCV vehicle.
- Driver shall observe at all times the directions necessary for preventing fire, explosion or escape of CNG while LCV is in motion, and when parked it must be at a place safe from fire, explosion and any other risk, and at all times the vehicle remains under the control and supervision of the driver or some other competent person above the age of 18 years.
- The Driver should be imparted Live Fire Fighting Training enabling him to handle any fire emergency before deploying for job.
- The Drivers shall wear Cotton uniform & safety shoes all the time on duty.
- Road safety sign & signals to be followed.
- Driver will not be allowed to work in drunken condition & alcohol/drugs are not allowed during the working hours.
- Drivers should not be allowed to work or drive the vehicle beyond the working hours.
- Contractor has to ensure the safety of man and machine all the time. The contractor shall remain at all times liable to IGL for any loss or damage caused to any building, plant, machinery of IGL due to careless, negligent, inexperienced act or default of the contractor, his/their agents, representative or employees. IGL shall be the sole judge as regards the quantum of loss or damage and it shall be entitled to deduct from the amounts payable hereunder to the contractor,

the cost of repairs or the amount of loss or damages. Any third-party loss to life or property shall be the responsibility of the LCV contractor. Any third-party loss of life or property resulted due to negligence of driver or fault of the vehicle shall be the responsibility of the LCV contractor.

- Duty Hours: Transporter shall maintain driver duty hours as per motor vehicle act and other statutory regulations. However, IGL will levy penalty of up to Rs 500 per day for cases where driver works beyond 16 hours in a day. Transporter shall submit attendance sheet and weekly roster of driver to IGL on start of every month. The driver duty hours shall fulfil requirements of statutory regulations.
- Contractor shall take suitable Group Personal Accident Insurance Cover for taking care of injury, damage or any other risks in respect of his Engineers and other Supervisory staff who are not covered under other relevant clauses. The policy shall cover third party liability. The third party (liability shall cover the loss/ disablement of human life (person not belonging to the Contractor) and also cover the risk of damage to others materials/ equipment/ properties during construction, erection and commissioning at site.
- The Contractor shall also arrange suitable insurance to cover damage, loss, accidents, risks etc., in respect of all his plant, equipment's and machinery, erection tools & tackles and all other temporary attachments brought by him at site to execute the work.
- Qualification of driver: As per IGL's tender specification.
  Driving License: The drivers MUST HAVE valid driving licenses issued by competent authority for driving medium / heavy goods carrying vehicle.
  Hazardous goods driving certificate: The driver must have a valid certificate for driving hazardous goods vehicles from govt / PSU approved training school/institute.
- Medical fitness: The drivers must be medically fit and shall have a certificate issued from registered doctor. The certificate shall be revalidated at least on annual basis or as per doctor's advice.



TRANSPORT EMERGENCY CARD

E **Emergency Actions :Inform Police and Fire Departments Fire:**

- Enter the area after donning/wearing all necessary PPEs.
- Use Dry Chemical Powder Fire Extinguishers,
- Use continuous spray of Water mist /running water to prevent other CNG cylinders from heat and fire.

Gas Leakage:

- Try to move the vehicle to open area and stop Engine.
- Do not park underneath or near any electrical Cable, transformer, electrical installation, ignition source).
- Keep no naked flame and do not allow smoking and use of mobile phones.
- If possible and safe, try to close the valve of leaking cylinder.
- Evacuate all people away from downwind direction.
- Enter the area after donning/wearing all necessary PPEs.

TRANSPORT EMERGENCY CARD

F] First Aid:

- Respiration :Take victim out in open space and help the victim in breathing.
- Skin :Pour water in case of cold or hot burn
- Eyes: Rinse continuously with water
- Seek Doctor's /medical Advice

G]Emergency Telephone Numbers:

- IGL: 155216 or Concerned C/R Contact Number
- POLICE : 100
- FIRE :101

EMERGENCY INFORMATION PANEL

NATURAL GAS (COMPRESSED)

UN Identification No: UN 1971

HAZCHEM CODE 2 S E

Emergency Telephone Numbers:
IGL: 155216
POLICE : 100
FIRE :101

FIRST AID

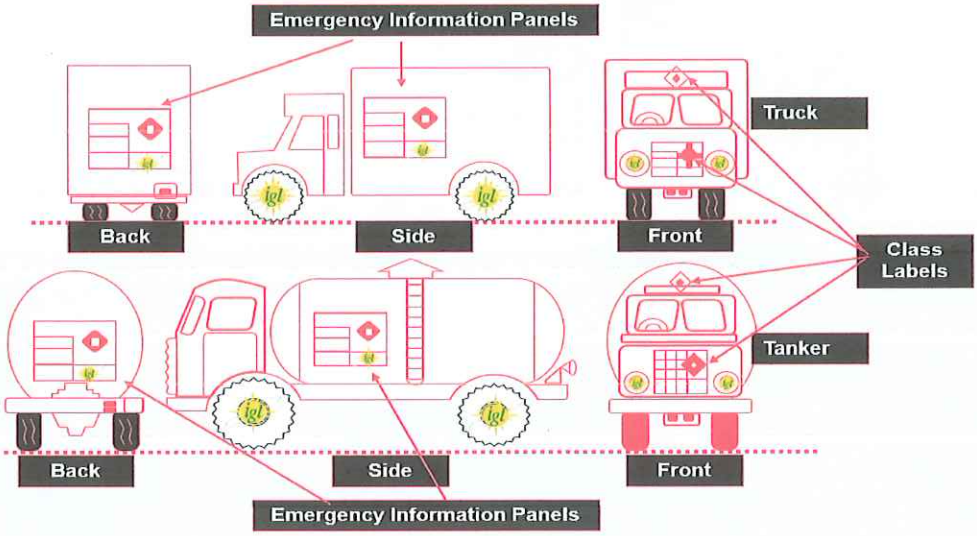
Respiration : Take victim out in open space and help the victim in breathing.
Skin :Pour water in case of cold or hot burn
Eyes: Rinse continuously with water
Seek: Doctor's /medical Advice

EMERGENCY ACTIONS

Fire:
- Enter the area after donning/wearing all necessary PPEs.
- Use Dry Chemical Powder Fire Extinguishers,
- Use continuous spray of Water mist /running water to prevent other CNG cylinders from heat and fire.

Gas Leakage:
- Try to move the vehicle to open area and
- Stop Engine.
- Do not park underneath or near any electrical Cable, transformer, electrical installation, ignition source).
- Keep no naked flame and do not allow smoking and use of mobile phones.
- If possible and safe, try to close the valve of leaking cylinder.
- Evacuate all people away from downwind direction.
- Enter the area after donning/wearing all necessary PPEs.
- In cans of any doubt please seek immediate help from IGL nearest CNG Station/ C.R.

TRANSPORT EMERGENCY CARD
Place of Emergency Information Panel on vehicles



TRANSPORT EMERGENCY CARD
HAZCHEM Code Scale for Fire / Spillage

1 JETS

2 FOG

3 FOAM

4 DRY AGENT

P	V	FULL	DILUTE
R			
S	V	BA	
S		BA for FIRE ONLY	
T	V	BA	
T		BA for FIRE ONLY	
W	V	FULL	CONTAIN
X			
Y	V	BA	
Y		BA for FIRE ONLY	
Z		BA	
Z		BA for FIRE ONLY	
E	CONSIDER EVALUATION		

Notes for Guidance

FOG

In the absence of fog equipment a fine spray may be used.

DRY AGENT

Water must not be allowed to come into contact with the substance at risk.

V

Can be violently or even explosively reactive.

FULL

Full protective clothing with BA.

DILUTE

May be washed to drain with large quantities of water.

CONTAIN

Prevent, by any means available, spillage from entering drains or water course.

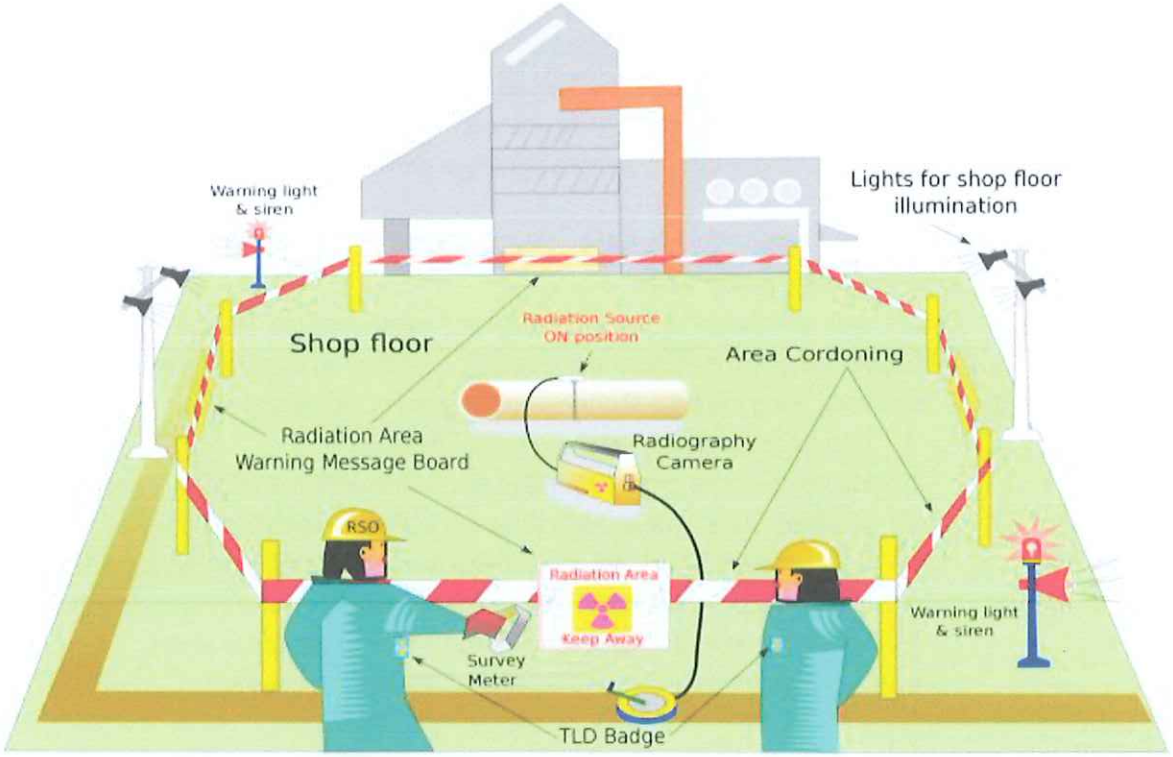
6.14 SAFETY IN RADIOGRAPHY OPERATION:

Site radiography needs to be done in an area where specific protection measures and safety provisions are in place, i.e., in an area designated as a controlled area.

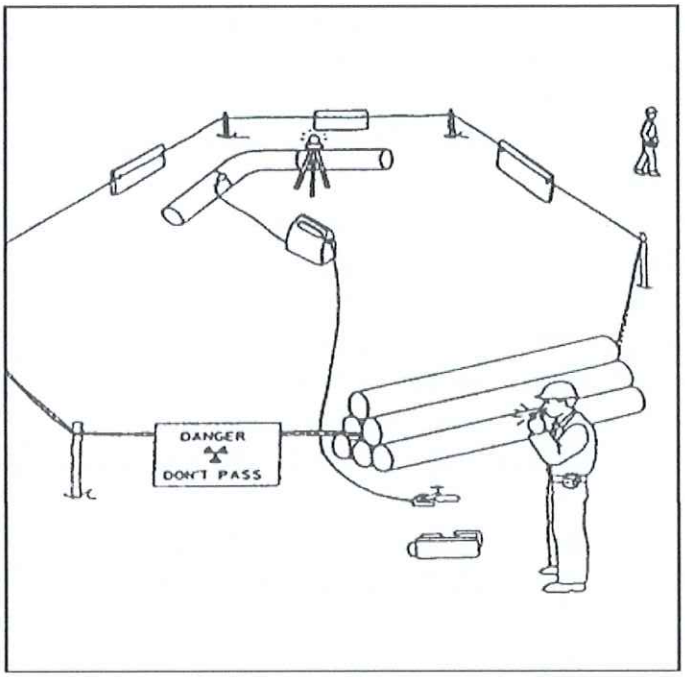
- The boundary of the controlled area has to be demarcated; when reasonably practicable, this is done by physical means. This may include using existing structures such as walls, using temporary barriers, or cordoning an area of 15 meter in radius.

- Notices are displayed at the controlled area boundary at suitable positions. The notices bear the national radiation symbol, warnings and appropriate instructions in the local language.
- Before the start of radiographic work, the area is to be cleared of all people except for authorized personnel.
- The boundary should be clearly visible and continuously patrolled to ensure that unauthorized people do not enter the controlled area.
- Whenever it is possible to take advantage of existing shielding, such as walls, vehicles or shielded enclosures or similar structures to reduce radiation dose levels, radiography personnel need to arrange the disposition of the equipment and parts within the shielding afforded.
- Personal dosimeters such as film dosimeters or direct reading dosimeters are to be worn when radiographers are working with ionizing radiation. A personal dosimeter is worn only by the radiographer to whom it is issued, and it is securely stored in a non-radiation environment when not being worn.
- Personal dosimeters are to be regularly assessed for the radiation to which they have been exposed, as required by the Regulatory Authority. Direct reading dosimeters have to be periodically assessed by the radiographers to monitor doses received during radiography.
- Storage facilities for radioactive are designed to restrict exposure, keep radiographic sources, exposure containers and control sources secure against theft or damage, and prevent any unauthorized persons from carrying out any actions which would be dangerous to themselves or the public. Clear warning notices are to be displayed at the storage facilities.
- A suitable storage facility for radiographic sources, exposure containers, control sources and ancillary equipment is one that provides protection from the prevailing environmental conditions. Resistance to fire is considered in constructing the storage facility in order to minimize loss of shielding and containment. The storage facility is to be located at a remote distance from corrosive and explosive hazards in line with the guidelines of sourcing Agency.

Typical set up at Radiography Site



Source: Directorate of Regulatory Affairs and Communications Atomic Energy Regulatory Board (Government of India)



Source: INTERNATIONAL ATOMIC ENERGY AGENCY

6.15 SAFE VENTING PROCEDURE (NATURAL GAS):

a) Ensure the availability of valid Safety Work Permit. (Hot Work Permit).
b) Ensure the availability of permission from concerned authority (Police etc.)
c) Ensure 100% compliance with IGL's 9 Life Saving rules.
d) Ensure the Vent pipe at least 5 (five) meters away from potential sources of ignition and confirm that all such potential ignition sources are either eliminated or isolated during the course of venting activity.
e) Pre-confirm the reliability of isolation valves used for controlling the venting activity and to address exigency (if any arises) at site.
f) Ensure that adequate hearing protection and other required Personal Protective Equipments (PPEs) including cotton attires made available to all concerned involved in venting activity.
g) A team comprising following should remain present at the venting site:
    a. Line incharge of doer (work executing) department
    b. Identified Worker properly dressed who will operate the vent line isolation valve
    c. Identified Supervisor who will guide the worker for operating the valve.
    d. Deployment of PNG Steel department's manpower at SV stations should the need arise for quick isolation of pipeline *(if the need arise to enter a valve chamber for isolation the same shall be done as per approved procedure of confined space entry)*.
    e. Representatives of Fire and Safety Department equipped with:
        - Fully charged gas detector
        - Ready to operate firefighting equipment.
h) Ensure that proper hand signals for closing and opening of vent isolation valve understood between worker and supervisor.
i) Avoid gathering of unnecessary /unwanted persons during venting.
j) Ensure that all paths of venting area, entry & exit are clear from any obstruction to avoid any slip, trip and fall hazards.
k) Ensure that the safe access with suitable working platform for opening / closing of vent pipe flange and valve.
l) Ensure the minimum height of vent pipe 3 (Three) meters above working level. It should be vertically installed and should discharge to open air.
m) In no case horizontal venting / flushing is permitted.
n) Ensure the electrical continuity bonds (copper) fitted across flange of separated metallic pipe prior to venting operation. Besides suitable arrangements be made to dissipate the buildup of static charge by ensuring that vent pipe properly earthed.
o) Ensure that Vent pipe firmly supported and also ensuring vented gas do not drift towards residential areas.
p) Ensure the usage of Non-sparking tools while doing the work.
q) Ensure the availability of Fire Fighting Equipment in ready to operate condition at site before start of venting.
r) Ensure that Smoking, open flame, naked light or other sources of ignition including mobile / cell phone should be strictly prohibited in gas venting area.
s) Wherever possible use walkie-talkie for communication near the venting location.

t) Ensure that Warning signage/ pictograms like "NO SMOKING" "NO OPEN FLAME "and "NO NAKED LIGHTS" prominently displayed around the work site, including at vent points.

u) Ensure that venting should be done under controlled condition and judiciously performed at site, based on situation awareness and considering dynamic risk assessment.

v) Ensure that continuous testing of atmosphere is conducted /verified and repeated as per site risk assessment and avoid formation of a large gas cloud etc.

w) Ensure availability of –

- First aid box.
- Nearest Hospital Emergency number.

IMPORTANT NOTE(S):

i) In addition to the above, ISO (IMS) procedure or other approved procedure of PNG (MDPE/ STEEL / PROJECT) DEPARTMENT for the said activity should also be adhered.

ii) Further it is to be ensured that there is no fatigue failure in gas piping due to vibrations induced (if any) during natural gas venting activity.

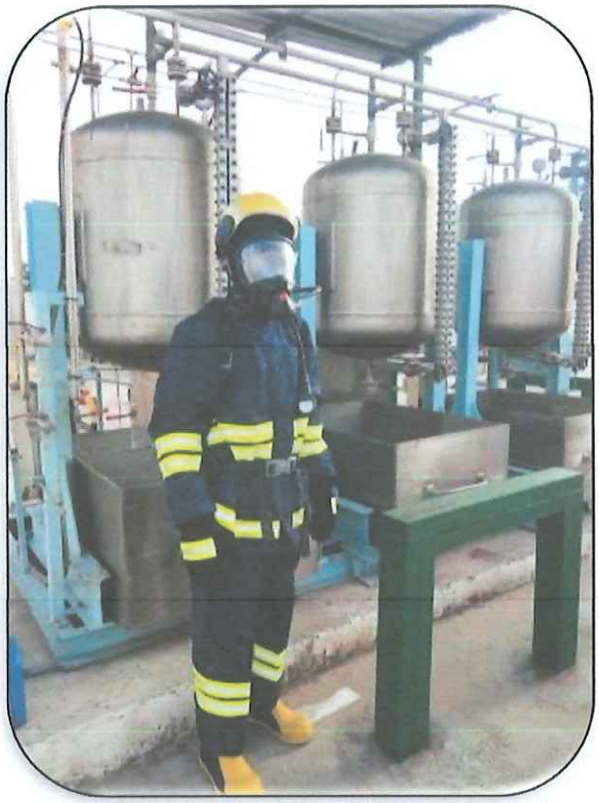
6.16

6.17 GENERAL SAFETY PRACTICE IN ODORANT TRANSFER

Contractor involved in transfer of odorant from semi bulk container carrying odorant in a truck (a sort of milk man concept) to IGL's odorant storage unit shall ensure following minimum checks

6.17.1 IMPORTANT PRE-CHECK:

- Proper planning and schedule to inform all concerned well in advance.
- Availability of valid safety work permit before the start of work.
- Job Specific PPEs must be worn by person involved in the transferring of the Odorant (viz. chemical resistant hand gloves, chemical goggles synthetic, non-permeable (nitrile) clothes, PVC suit).



- Prohibit all sources of sparks and ignition - Do not smoke, do not use mobile phone and ensure no naked flames.

6.17.2 TRUCK OPERATIONS:

- Fix Spark arrestor on truck prior to entering company premises.
- Stop vehicle at site
- Stop engine
- Apply hand brake
- Give Earthing to the truck
- Give Earthing to the container.
- Driver to disembark and leave proximity of site.
- Place fire extinguisher close to the truck (should be easily accessible).
- Keep safety parking cone around the vehicle.

6.17.3 UNLOADING OPERATIONS

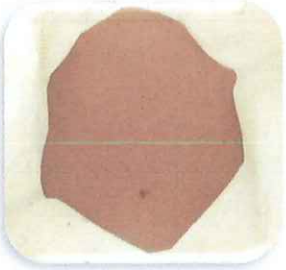
- Ensure 100% compliance to Work Permit conditions throughout the odorant transfer activity.
- Understand and ensure 100 % compliance with IGL's 09 lifesaving rules.
- Ask site in charge to isolate the system before start of work.
- Check customer storage tank pressure. It should be zero before starting odorant transferring. If there is pressure in storage tank, depressurize it in our multistage scrubbing system.
- After completion of the work, close all valves and disconnect all hoses. Do all fitting of odorant storage tank & ask site in charge to resume odorization system
- Keep all equipments in the vehicle, clean area, and request for closure of safety work permit before leaving.

Note: It is also advised that contractor engaged in the transfer of odorant at IGL sites shall prepare its own SOP and get it approved from the IGL incharge.

6.15.4. Handling of odorant spillage:

Arrangement shall be made by the contractor for any emergency spill of the chemical/odorant during the transfer/unloading.

- Sodium hypochlorite or equivalent chemical must be used for the neutralizing the odorant.
- Odourant absorber activated carbon saw dust or EKOPEARL-66 or dry sand must be used for handling spillage
- Refer MSDS of the odorant for further detail. (Annexure 2)



7 DISCIPLINARY ACTION

- If any Contractor allows workers to work in unsafe conditions or violates safety work permits or government regulations, IGL may remove the Contractor or any of its individual workers from Company premises or Penalty may be imposed to the contractor as decided by Engineer In charge of IGL/ F&S In charge (after getting consent from the line in charge of concerned department) for that particular site.
- Immediate and permanent removal may occur if any of the following activities are observed:
  - Openly exhibits disregard, defiance, or disrespect for the safety program
  - Violates established safety or environmental rules, regulations, procedures or codes
  - Participates in fighting, violence, threats of violence, theft, or destruction of property
  - Possesses weapons including but not limited to firearms or knives not typically used in conjunction with normal work tasks.
  - Falsifying documents or information.
- In order to strengthen the safety Management system across IGL Installation (O&M and Project Sites) following Safety Service Level Agreement should be followed by line in charge of concerned Department and Compliance of Safety Service Level Agreement along with copy of MEMO issued and Penalty imposed to contractor /vendor shall be shared by concerned line in charge to Fire and Safety Department for record of compliance.

Safety Service Level Agreement			
Sr. No.	Particular Parameter	Service Level Agreement	**Penalty Proposed** *(Subject to investigation /enquiry and subsequent approval by IGL management)*
1	Incident Reported at IGL work site.	Contractor shall adhere to all HSE requirement to prevent any incident at IGL work site and ensure "zero incident"	Rs. 20,000 Per FAC (First Aid Case)
			Rs. 30,000 Per LTI (Lost Time Injury)
			Rs. 5,00,000 or more Per Fatal incident and/or terminate/ foreclose the existing contract with vendor/ contractor.
2	Noncompliance of PPEs observed at (Personal Protective Equipment) against the issued Hot/Cold Safety Work Permit)	Strict and 100 % adherence of PPEs as per PPEs Matrix and Safety work Permit	Rs. 5000 Per Case.
3	Noncompliance of SWP (Safety Work Permit)/ / Reporting of Unsafe condition or unsafe act.	Strict and 100 % adherence to safety work permit at IGL sites. Safe system of work shall prevail at IGL worksites.	Rs. 5000 Per Case

4	Non-availability of contractor supervisor at work site	Each work activity at IGL work site shall be supervised throughout the job /during entire work activity	Rs. 5000 Per Case
5	Use of Unfit/unhealthy machinery, Tools and tackles at site.	All Tool and tackle must be in healthy and Sound condition	Rs. 5000 Per Case
6	Untrained Contractual Staff at site.	Only trained manpower must be deployed by concerned contractor at site	Rs. 5000 Per Case
7	Deviation to IGL SOP	Strictly adhere to various SOPs and Manuals and contract conditions.	Rs. 5000 Per Case or higher degree of penalty depending upon the criticality of the job.

8 ACCIDENT / INCIDENT REPORTING AND INVESTIGATION:

- The Contractor must immediately report all accidents/incidents and near misses to the Company Representative.
- The Contractor must investigate all accidents/incidents that result in, or have the potential to result in, injury or illness, property damage, process/product loss or harm to the environment.
- The investigative process must include the identification of root causes or causal factors that contributed to the occurrence. The Contractor must determine the necessary corrective actions and ensure closure/completion in timely manner. In addition to the Contractor's analysis/investigation, IGL retains the right to conduct their own investigation for any illnesses, injuries, fatalities, incidents or near misses occurring on its premises.
- The Contractor must conduct the thorough investigation required by and submit a copy of the written report to the IGL Representative, unless otherwise specified, within 48 hours of occurrence. Contractor must maintain injury logs for their respective workers and must report to concerned IGL EIC for investigation purpose.

9 PROHIBITION ON USE OF TOBACCO, ALCOHOL, ILLEGAL DRUGS, FIREARMS AND UNDER AGE/CHILD LABOR:

Contractor must develop and enforce a policy that prohibits the possession, distribution, promotion, manufacture, sale, and use of illegal drugs, drug paraphernalia, controlled substances, alcoholic beverages and weapons by workers while on Company premises or during work at site. Contractor shall also ensure no underage or child labor will be available or working at any of the IGL Site.

10 EMERGENCY EVACUATION

- Familiarize your workers with the IGL Emergency Action Plan used at each specific work location. If any Contractor suspects that an emergency condition exists, they must immediately contact the IGL Representative and perform emergency evacuation based on situation awareness. In the event of

any emergency, the Contractor and their personnel shall follow the direction of IGL Emergency Action Plan.

11 HOUSEKEEPING:

- Good housekeeping is mandatory. Work areas must be kept neat, clean, and orderly.
- If a contractor's work area is not kept clean, IGL may have the area cleaned and charge the cost to the Contractor.
- IGL may also stop work until the area has been cleaned.
- Keep work areas, passageways, fire exits, fire lanes, and stairs in and around the buildings and structures clear of debris at all times.
- Properly store all tools and equipment after use.
- Keep walkways free of cords, cables, obstructions, and debris.
- Changes in walkway elevations or dangerous depressions must be cleared marked with cones, barricade tape or other appropriate warning signs.
- Clean the work area daily and dispose of debris in dumpsters, or off site in accordance with the environmental regulations.
- Contractor must remove all unused material and equipment upon the completion of the work.

12 FIRE PREVENTION AND PROTECTION:

- Obtain appropriate Work Permit from respective Control room to perform work activity.
- Make sure that firefighting equipment are available near work area for emergency situation.
- Make sure that workers engaged in activities are capable to use of firefighting equipment in case of fire or emergency.
- Smoking is not allowed near work locations or near flammable materials.

13 ENVIRONMENTAL REQUIREMENTS

- Contractors are required to comply with all applicable environmental laws, rules and regulations over the specific location of where work activities are being performed.
- Contractor must review and comply with all applicable environmental conditions, laws, regulations and Company requirements prior to the start and during work.
- Contractor must participate in and comply with all applicable work-specific environmental training prior to commencing work.
- Contractor shall use only approved access roads and stay within approved and designated working, staging, temporary use, and parking area boundaries.
- Contractor must handle, treat, characterize and dispose of all waste in accordance with all applicable federal and state/provincial regulations and any specific contract requirements, such as IGL approval of the disposal site. Trash, debris, and other wastes shall not be burnt or otherwise disposed on site without proper permission. Waste materials must be secured while on the worksite.
- Contractor shall maintain a clean and safe worksite. Trash and debris will be collected at the end of each day & disposed off properly.

14 LEGAL REQUIREMENT

Contractors & their representative shall comply with all applicable Health, Safety & Environment legal requirement. For example: Factory Act-1948, PNGRB ACT, Rules, Regulations and Guidelines, Gas Cylinder Rules, BOCW Act & Rules etc.

15 REQUIREMENT OF FIRST AID

First Aid items for the contract worker which are working at IGL PNG sites, shall be provided by Contractor as given below:-

Sr. No.	Quantity	Description
1	4 Pcs	Roller bandage (सफ़ेद पट्टी)
2	1 Pkt	Absorbent Gauze
3	1 Pkt	Cotton (रुई)
4	1 No.	Savlon / Dettol
5	1 No.	Vellosulph Powder
6	1 No.	Scissor (कैंची)
7	1 Pkt	Burn Ointment/ (Burnol)
8	1 Pkt	Soframycin Ointment
9	5 Nos.	Band Aid (Waterproof)
10	1 Nos.	Pain Relief Spray /Ointment

However, the first aid for the contractual manpower of IGL CNG Stations, IGL Offices, will be provided by IGL.

16 SITE RISK ASSESSMENT

All the CNG-PNG installations, Stores, Offices, construction sites of IGL wherever there is a foreseeable reasonable risk of any injury, threat to community or damage to environment. Site risk assessment should be carried as and when required basis. A typical checklist of site risk assessment is as given below:

Activity		:		**Date:**
Ref. **SSRA/DDMMYY/CNG or PNG/XXX** ***e.g. SSRA/14/11/2020/PNG/001***		:		
Site / Location		:		
Department:		:		
Sr. No.	**Obvious Risk and Hazard Specific to the worksite and its Surrounding**	**Observation**		**Required Measures to address and control the identified Risk and Hazard**
		Yes /Ok OK / **No Not**	NA	
A	**Worksite Condition:**			

1	Slippery Surface			
2	Uneven Surface			
3	Floor / Manhole open without guard / cover			
4	Obstruction / Hazard on walk path			
5	Stairs without side railing and toe guard			
6	Open lift ducts in building			
7	Water logging area / Muddy area			
B	**Atmospheric condition:**			
1	Poor illumination			
2	Continuous Rain			
3	Heavy Wind			
4	Extreme Hot Condition			
5	Fumes / Harmful gases / Smoke / Steam			
6	Unhygienic condition			
7	Risk of flammable atmosphere due to gas venting, spillage of flammable liquid, combustible material, Dry Vegetation, LPG cylinder etc.			
C	**Electrical**			
1	Temporary Joints on cable			
2	Pin / plug / equipment without earthing			
3	Working near live exposed panel / cable / High Tension Line/ Electrical Poles &Transformers			
4	Working under / near Overhead electrical cable			
5	Any open flame in surrounding that may pose risk.			
D	**Working at Height:**			
1	Difficult access to height			
2	No arrangement of anchorage for fastening/ (securely tying) the safety harness / ascender descender / lifeline rope			
3	No parapet on roof / side railing			
4	Opening on roof / terrace without guard/ railing/ toe guard.			

5	Fragile roof / Nearby any construction work / unsafe Building Protrusions (Impalement hazard)			
6	Working at height by other agencies nearer to IGL activities			
E	**Risk and Hazard with Excavation work:**			
1	Road Traffic risk			
2	Collapsible soil condition			
3	Water seepage in trench			
4	Risk of depth / confined Space			
5	Risk of unknown pits			
6	Risk of fall of pole / trees			
7	Underground live Power cable			
8	Material dumped nearer to pipeline to be excavated			
9	Unstable structures in the vicinity of excavation (vibration impact)			
10	Risk of hitting the underground utilities (Water, Gas, OFC etc.)			
F	**Any other Obvious Hazards identified**			
1	Risk of Snake / scorpion / rodents			
2	Unsafe work of other agencies in nearby area			
G	**Any Other Obvious Risks:**			
1	Working area in the vicinity of shop / home / Industry Entrance			
2	Hot work nearby Petrol pump, highly flammable Zone			
3	Poor housekeeping			
4	Risk of falling objects			
5	Excessive vibration			
6	Inadequate Entry/ exit			
7	Excessive Noise			
8	Hot Surface			
9	Unguarded moving objects in work area			
10	Improper Electrical/Mechanical isolation facilities			

11	Sharp Edges, nails etc. in work area			
12	Others, if any			

Name Signature with Time & Date of all other concerned Representatives:

Contractor Supervisor

(Name, Contractor Company, Department, Designation and Signature with Time & Date)

TPI / PMC

(Name, Company Name, Designation, Department and Signature with Time & Date)

Other Person (if any)

(Name and Signature with Time & Date)

IGL

(Name, Department, Designation and Signature with Time & Date of all other concerned Department Representatives):

17 PRODUCT INFORMATION AND MSDS:

Product information & Material safety data sheet for Natural gas and odorant has been prepared and same are enclosed as Annexure-1, Annexure-2 respectively.

18 CONTRACTOR CERTIFICATION:

I/We hereby certify that I/We have read and understood the IGL Contractor Safety Manual and I/We will abide by the all the safety standards/conditions/details as given in the manual while working at IGL's worksites.

Signing Authority

Name, Designation and Signature with Stamp. Date:

Name of Contractor

PRODUCT INFORMATION- NATURAL GAS

Natural gas is a mixture of various hydrocarbons with predominantly Methane. It is highly inflammable and so calls for special attention. It is being transported through pipe line and distributed within the cities where population density is high.

Natural Gas is used as a heating fuel (Piped Natural Gas known as PNG) and motor fuel (Compressed Natural Gas known as CNG).

MATERIAL SAFETY DATA SHEET NATURAL GAS			
Section 1: Identification			
Chemical Name	Methane		
Synonyms	Methane or natural gas; Marsh gas; Methyl hydride; CH4; Fire Damp;	**Trade Name**	Compressed Natural Gas (CNG) and Piped Natural Gas (PNG)
Formula	CH_4	**Product Identifier**	CAS No:74-82-8 UN. No: UN 1971
Use of Substance or Mixture: Mixture			
Distributor's Name, Address & Emergency Telephone Number: Indraprastha Gas Limited (IGL), IGL Bhawan, Plot No.04, Community Centre, RK Puram, Sec-09, New Delhi, 110022, Emergency Phone Number 155216, 1800111817			
Section 2: Hazard Identification			
Classification of Substance/Mixture (GHS)	FLAMMABLE GASES- Category 1 GASES UNDER PRESSURE- Compressed Gas SIMPLE ASHPHYXIANT		
Label Elements	**DANGER** 		
Signal Word	DANGER		
Hazard Statement	H220 - Extremely Flammable Gas H280 - Contains Gas Under Pressure; May Explode If Heated OSHA-H01 - May Displace Oxygen And Cause Rapid Suffocation. CGA-HG04 - May Form Explosive Mixtures With Air		
Section 3: Composition/Information of Ingredients			
Hazardous Component (Specific Chemical Identity, Common Names)		**Product Identifier**	**% (Optional)**
METHANE		CH4	>85 to 90%
ETHANE		C2H6	(3-8)

PROPANE	C3H8	(1-2)
BUTANE	C4H10	<1
PENTANE	C5H12	<1
CARBON DIOXIDE	CO2	<1
HYDROGEN SULPHIDE	H2S	<1
NITROGEN	N2	(0.5)
HELIUM	HE	<0.5

Section 4: First Aid Measures

RISK	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.	Use ventilation. Use breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention, doctor advice and hospitalisation.
Skin Contact	CONTACT WITH LIQUID: frostbite CONTACT WITH PRESSURIZED GAS: may cause physical damage to skin.	COLD-INSULATING GLOVES	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .The person exposed should be treated for shock and seek immediate medical treatment.
Eye Contact	ON CONTACT WITH LIQUID: FROSTBITE.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for immediate medical treatment.
Ingestion	*This material is a gas at standard temperature and pressure and ingestion is unlikely.*		

Section 5: Fire Fighting Measures

Suitable Extinguishing Media	Carbon dioxide, Dry chemical powder, Water spray or fog
Special Hazards arising from Substance or Mixture	
Fire Hazard	EXTREMELY FLAMMABLE GAS. May catch fire when mixed with air and get in contact with spark/flame. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
Explosion Hazard	Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Could be potentially hazardous if uncontrolled in a confined space.
Reactivity	EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents.
Fire Fighting Instructions	Danger! FLAMMABLE, HIGH PRESSURE GAS. Evacuate all personnel from the danger area.

	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray, dry chemical powder, carbon dioxide extinguishers. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position and maintain a safe distance upwind and uphill of the leak. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so.

Section 6: Accidental Release Measures

Personal Precautions, Personal Protective Equipment and Emergency Procedures:

Danger: EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents. See section 5. Evacuate personnel to a safe area. Appropriate self-contained breathing apparatus may be required. Approach suspected leak area with caution. Stay upwind and warn of possible downwind explosion hazard. Avoid breathing vapor. Avoid contact with eyes, skin, or clothing. Remove all sources of ignition including internal combustion engines and power tools, if safe to do so. Reduce gas with fog or fine water spray. Stop flow of product if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable gas may spread from leak. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.

Environment Precautions (Method of Containment and Clean up):

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations.

Section 7: Handling and Storage

Precautions for Safe Handling:

Ensure strict adherence to use of personal protective equipment and exercise care when opening bleeders, sampling ports, vent point, drain points as the natural gas may be at elevated temperatures and/or pressures.
Use non-sparking tools.
Ensure natural gas handling container, equipment/machine is adequately earthed.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.
Use with adequate ventilation available.
Ensure no smoking.
Use only explosion-proof equipment.
Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances.

Conditions for Safe Storage including incompatibilities:

Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements e.g. OISD 179, PESO -Gas Cylinder Rules, PNGRB T4S Regulations and other applicable NFPA etc.
Store in a well-ventilated place.
Store away from incompatible materials.
GROUND AND BOND CONTAINER, TRANSFER LINE, AND RECEIVING CONTAINER. KEEP AWAY FROM HEAT, SPARKS, FLAME, AND OTHER SOURCES OF IGNITION.

Section 8: Exposure Controls/Personal Protections

Control Parameters

ACGIH TLV-TWA (ppm)	OSHA PEL TWA (mg/m3)	OSHA PEL TWA (ppm)
Not established	Not established	Not established

Exposure Control

Engineering Controls:	Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas concentrations below any lower explosive limits. Use explosion-proof ventilation equipment. Follow appropriate confined space entry procedures. Use explosion proof general ventilation and lighting in classified/controlled areas. Be sure explosion proof flashlights and equipment are used.
Hand Protection:	Based on site risk assessment use of leather or cotton gloves along with flame retardant clothing should be recommended in any situation where pressurized natural gas is handled during non-routine operations.
Eye Protection:	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to natural gas. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side shield.
Skin and Body Protection:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Respiratory Protection:	When workplace conditions (the hazard and potential for exposure based on site risk assessment) warrant respirator use, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9: Physical/Chemical Characteristics

Physical State	Gas (compressed or liquefied gas).	**Colour**	Colourless
Boiling Point	-161.48°C (-258.7°F)	**Freezing Point**	NA
Vapor Pressure (mm Hg)	gaseous at 60 o F and 1 atmosphere	**Melting Point**	-82.45°C (-116.4°F)
Vapor Density (Air=1)	0.55-0.60	**Evaporation Rate**	N/A
Solubility in Water	No data available	**Appearance and Odor***	Colourless & Odourless* Note*: **An odorant chemical is added to natural gas in order impart a pungent smell to detect its presence in case of leakage.**
Auto Ignition Temperature	537° C (998.6°F)	**Specific Gravity (H2O=1)**	0.554 (LNG)
Flammability	Extremely flammable gas	**LEL** 5%	**UEL** 15%
Oxidising Properties	No data available	**PH**	Not classified.

Explosion Data: Sensitivity to Impact	No data available	**Explosion Data: Sensitivity to Static Discharge**	Flammable
Hazardous Combustion Products	Carbon Monoxide, Carbon Dioxide, Nitrogen Oxides, Sulphur Dioxide, Aldehydes		
Section 10: Stability and Reactivity			
Reactivity	When natural gas is mixed with appropriate amounts of oxidizing agents, including air and oxygen, in the presence of an ignition source, an uncontrolled explosive reaction can occur		
Chemical Stability	Stable under normal conditions.		
Possibility of Hazardous Reactions	Can form explosive mixture with air can burn or explode. However, under normal conditions of storage and use, hazardous reactions will not occur.		
Incompatible Materials	Oxidizers.		
Hazardous Decomposition Products	Thermal decomposition may produce: Carbon dioxide. Carbon monoxide water vapours, hydrogen. However, under normal conditions of storage and use, hazardous decomposition products shall not be produced.		
Section 11: Toxicological Information			
Information on Toxicological Effects	Not Classified		
Section 12: Ecological Information			
Information on Ecological Effects	No Ecological effect caused by this product.		
Section 13: Disposal Considerations			
Waste Disposal Methods	The generation of waste /fugitive leakage should be avoided or minimized wherever possible. Allow to dissipate to the atmosphere in the event of any emergency /exigency under controlled conditions. Care must be taken to ensure complete dissipation of the gas to a concentration below its flammable limits.		
Waste Treatment Methods	NA		
Section 14: Transport Information			
Hazard Classes	Hazard class- 2.1 Class Flammable gas		
NFPA Hazard Label			
Special Transport Precautions	Follow all traffic and CMVR rules. Check the tyre condition of the vehicle. Hazchem code to be painted both side of the vehicle.		
Section 15: Regulatory Information			
National Regulations	PNGRB- Petroleum and Natural Gas Regulatory Board –T4S regulations. PESO- Petroleum and Explosive Safety Organisation- Gas Cylinder Rules.		

International Regulations	NFPA 52, ISO 16923

Section 16: Other Information

16.1 All rights reserved.

16.2 Emergency Response Guide (ERG) Number: 115 (UN1971) – Please do refer the latest version of Emergency Response Guide.

16.3 Indraprastha Gas Limited expects and asks users of this product (CNG/LNG/PNG) to study this material safety data sheet (MSDS) and become aware of the product hazards and safety information and correlate its use accordingly.

16.4 DISCLAIMER: To the best of our knowledge, the information contained herein is accurate. The published material is being distributed without warranty of any kind, either expressed or implied. Neither Indraprastha Gas Limited nor any of its employees, shall be responsible for the interpretation and use of the information contained in this material safety data sheet. It shall be the user's obligation and responsibility to ultimately determine use of this information and the conditions of safe use of the product.

MATERIAL SAFETY DATA SHEET- SCENTINEL S-20 (TBM+MES)				
Section 1: Identification				
Chemical Name	SCENTINEL S-20			
Synonyms	Gas Odorant Mixture of t-butyl mercaptan and methyl ethyl sulfide Mercaptan Mixture	**Trade Name**	SCENTINEL S-20	
Formula	Mixture	**Product Identifier**	**t-Butyl Mercaptan**	
			CAS No:	75-66-1
			Methyl Ethyl Sulfide	
			CAS No:	624-89-5
Use of Substance or Mixture: mixture of T-Butyl Mercaptan, Methyl ethyl Sulfide				
Manufacturer's Name, Address & Emergency Telephone Number: Chevron Phillips Chemical Company LP Specialty Chemicals 10001 Six Pines Drive The Woodlands, TX 77380 Emergency Contact:866.442.9628 (North America) 1.832.813.4984 (International)				
Section 2: Hazard Identification				
Classification of Substance/Mixture (GHS)	Flammable liquids, Category 2 Eye irritation category 2A Skin sensitization category 1			
Label Elements				
Signal Word	Danger			
Hazard Statement	H225: Highly flammable liquid and vapor. H305: May be harmful if swallowed and enters airways. H319: Cause serious eye irritation H317: May cause an allergic skin reaction. H411: Toxic to aquatic life with long lasting effects.			
Precautionary Statements:	P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P233 Keep container tightly closed. P240 Ground/bond container and receiving equipment. P243 Take precautionary measures against static discharge. P273 Avoid release to the environment. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.			

Section 3: Composition/Information of Ingredients		
Hazardous Component (Specific Chemical Identity, Common Names	**Product Identifier**	**% (Optional)**
t-butyl Mercaptan	75-66-1	76-80%
Methyl ethyl sulfide	624-89-5	20-24%
Section 4: First Aid Measures		

Description of First Aid Measures	
First Aid Measures after Inhalation	If breathed in, move person into fresh air. Move to fresh air in case of accidental inhalation of vapors. If not breathing, give artificial respiration and seek medical advice. If symptoms persist, Call a physician.
First Aid Measures after Skin Contact	Take off contaminated clothing and shoes immediately. Wash off with soap and water. If symptoms persist, call a physician.
First Aid Measures after Eye Contact	Flush eyes with water at least 15 minutes. Get medical attention if eye irritation develops or persists.
First Aid Measures after Ingestion	Drink plenty of water. Do NOT induce vomiting. Never give anything by mouth to an unconscious person.
Section 5: Fire Fighting Measures	
Suitable Extinguishing Media	Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Carbon dioxide (CO_2), Dry chemical Powder In the event of fire, wear self-contained breathing apparatus
Special Hazards arising from Substance or Mixture	
Fire Hazard	Do not spray on an open flame or any other incandescent material. Take necessary action to avoid static electricity discharge(which might cause ignition of organic vapors)
Explosion Hazard	Use only explosion proof equipment. Keep away from open flames, hot surface and source of ignition.
Reactivity	Carbon oxides and Sulfur oxides
Fire Fighting Instructions	Do not allow run-off from firefighting to enter drains or water courses.
Section 6: Accidental Release Measure	
Personal Precautions, Personal Protective Equipment and Emergency Procedures:	
Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.	
Environment Precautions (Method of Containment and Clean up):	
Prevent product from entering drains. Prevent further spillage if safe to do so local authorities should be advised if significant spillages cannot be contained. Keep in suitable, closed containers for disposal. Clean contaminated floors and objects thoroughly while observing environmental regulations.	
Section 7: Handling and Storage	
Precautions for Safe Handling:	
For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area.	
Conditions for Safe Storage including incompatibilities:	
No smoking. Keep container tightly closed in a dry and well ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.	
Section 8: Exposure Controls/Personal Protections	
Control Parameters	

TWA (ppm)	OSHA PEL TWA (mg/m3)	OSHA PEL TWA (ppm)
0.5 ppm	NA (NOT PROVIDED BY MANUFACTURER)	NA (NOT PROVIDED BY MANUFACTURER)

Exposure Control	
Engineering Controls:	Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2),

	applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.
Hand Protection:	The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye Protection:	Safety glasses. Ensure that eyewash stations and safety showers are close to the workstation location.
Skin and Body Protection:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate: Remove and wash contaminated clothing before re-use. Skin should be washed after contact. Footwear protecting against chemicals.
Respiratory Protection:	In the case of vapor formation use a respirator with an approved filter. Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as. Air-Purifying Respirator for Organic Vapors. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, aerosolization, exposure levels are not known, or other circumstances where airpurifying respirators may not provide adequate protection.
Hygiene measures	Wash hands before breaks and immediately after handling the product. Remove contaminated clothing and protective equipment before entering eating areas.

Section 9: Physical/Chemical Characteristics

Physical State	Liquid			**Color**	Clear with no particulate matter.
Boiling Point	63 - 68 °C (145 - 154 °F)			**Freezing Point**	No data available
Vapor Pressure (mm Hg)	5.70 PSI at 38 °C (100 °F)			**Melting Point**	No data available
Relative Density	0.82, 16 °C(61 °F)	**Relative vapor density** (Air=1)	1	**Evaporation Rate**	1
Solubility in Water	Slightly soluble			**Appearance and Odor**	Clear and Repulsive
Auto Ignition Temperature	No data available			**Specific Gravity (H2O=1)**	No data available
Flammability	No data available			**LEL** No data available	**UEL** No data available
Oxidizing Properties	No			**PH**	Not applicable

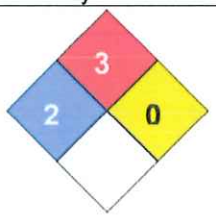
Explosion Data: Sensitivity to Impact	No data available	**Explosion Data: Sensitivity to Static Discharge**	No data available
Hazardous Combustion Products	No data available		
Section 10: Stability and Reactivity			
Reactivity			
Chemical Stability	This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.		
Possibility of Hazardous Reactions	Conditions to avoid: Heat, flames and sparks. Thermal decomposition: No data available Other data: No decomposition if stored and applied as directed		
Incompatible Materials	Carbon oxides, Sulphur oxides		
Hazardous Decomposition Products	Carbon oxides, Sulphur oxides		
Section 11: Toxicological Information			
Acute oral toxicity **SCENTINEL® S-20 Gas Odorant**	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method		
Acute inhalation toxicity t-Butyl Mercaptan	LC50: 98.3 mg/l Exposure time: 4 h Species: Rat Sex: male and female Test atmosphere: vapor Method: OECD Test Guideline 403 LC50: 81.9 mg/l Exposure time: 4 h Species: Rat Sex: male Test atmosphere: vapor Method: OECD Test Guideline 403 LC50: 60.9 mg/l Exposure time: 4 h Species: Mouse Sex: male Test atmosphere: vapor Method: OECD Test Guideline 403		
Acute inhalation toxicity Methyl Ethyl Sulfide	LC50: > 21.7 mg/l Species: Rat Test atmosphere: vapor Method: OECD Test Guideline 403		
Acute dermal toxicity t-Butyl Mercaptan	LD50: > 2,000 mg/kg Species: Rabbit		
Skin irritation SCENTINEL® S-20 Gas Odorant	May cause skin irritation and/or dermatitis. Largely based on animal evidence.		
Eye irritation SCENTINEL® S-20 Gas Odorant	Eye irritation. Largely based on animal evidence.		
Sensitization SCENTINEL® S-20 Gas Odorant	Causes sensitization. Largely based on animal evidence.		
Repeated dose toxicity t-Butyl Mercaptan	Species: Rat, Male and female Sex: Male and female Application Route: Inhalation Dose: 9, 97, 196 ppm Exposure time: 13 wks Number of exposures: 6 hrs/d, 5 d/wk NOEL: > 196 ppm Species: Rat, Male and female Sex: Male and female Application Route: oral gavage Dose: 10, 50, 200 mg/kg bw/day Exposure time: 42-53 days Number of exposures: Daily NOEL: 50 mg/kg bw/day Lowest observable effect level: 200 mg/kg bw/day Method: OECD Guideline 422 Species: Rat, Male and female Sex: Male and female Application		

	Route: Inhalation Dose: 25.1, 99.6, 403.4 ppm Exposure time: 13 wks Number of exposures: 6 hrs/d, 5 d/wk NOEL: 99.6 ppm Lowest observable effect level: 403.4 ppm Method: OECD Guideline 413 Target Organs: Liver, Kidney, Blood, Upper respiratory tract Information given is based on data obtained from similar substances
Genotoxicity in vitro t-Butyl Mercaptan	Test Type: Mouse lymphoma assay Metabolic activation: with and without metabolic activation Result: negative Test Type: Sister Chromatid Exchange Assay Metabolic activation: with and without metabolic activation Result: negative Test Type: Ames test Metabolic activation: with and without metabolic activation Result: negative
Genotoxicity in vitro Methyl Ethyl Sulfide	Test Type: Ames test Result: negative Test Type: Chromosome aberration test in vitro Result: negative
Genotoxicity in vivo t-Butyl Mercaptan	Test Type: Mouse micronucleus assay Species: Mouse Dose: 1250, 2500, 5000 mg/kg Method: Mutagenicity (micronucleus test) Result: negative
Reproductive toxicity t-Butyl Mercaptan	Species: Rat Sex: male and female Application Route: oral gavage Dose: 10, 50, 200 mg/kg bw/day Number of exposures: Daily Test period: 42 -53 days Method: OECD Guideline 422 NOAEL Parent: 200 mg/kg bw/day NOAEL F1: 50 mg/kg bw/day No adverse effects expected
Developmental Toxicity t-Butyl Mercaptan	Species: Mouse Application Route: Inhalation Dose: 11, 99, 195 ppm Exposure time: GD 6-16 Number of exposures: 6 hrs/d NOAEL Teratogenicity: > = 195 ppm NOAEL Maternal: > = 195 ppm Species: Rat Application Route: Inhalation Dose: 11, 99, 195 ppm Exposure time: GD6-19 Number of exposures: 6 hrs/d NOAEL Teratogenicity: > =195 ppm NOAEL Maternal: > = 195 ppm Species: Rat Application Route: oral gavage Dose: 10, 50, 200 mg/kg bw/day Exposure time: 42-53 days Number of exposures: Daily NOAEL Teratogenicity: 50 mg/kg bw /day NOAEL Maternal: 200 mg/kg bw /day
Aspiration toxicity SCENTINEL® S-20 Gas Odorant	May be harmful if swallowed and enters airways.
CMR effects t-Butyl Mercaptan	Carcinogenicity: Not available Mutagenicity: Did not show mutagenic effects in animal experiments. Teratogenicity: Did not show teratogenic effects in animal experiments. Reproductive toxicity: No toxicity to reproduction
Further information SCENTINEL® S-20 Gas Odorant	Solvents may degrease the skin.
Section 12: Ecological Information	
Toxicity to fish t-Butyl Mercaptan:	LC50: 34 mg/l Exposure time: 96 h Species: Oncorhynchus mykiss (rainbow trout) semi-static test Method: OECD Test Guideline 203

Toxicity to fish Methyl Ethyl Sulfide	LC50: > 49.8 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates t-Butyl Mercaptan	EC50: 6.7 mg/l Exposure time: 48 h Species: Daphnia magna (Water flea) static test Method: OECD Test Guideline 202
Toxicity to daphnia and other aquatic invertebrates Methyl Ethyl Sulfide	EC50: 16 mg/l Exposure time: 48 h Species: Daphnia Method: OECD Test Guideline 202
Toxicity to algae t-Butyl Mercaptan	EC50: 24 mg/l Exposure time: 72 h Species: Pseudokirchneriella subcapitata (green algae) Method: OECD Test Guideline 201
Toxicity to algae Methyl Ethyl Sulfide	ErC50: > 500 mg/l Exposure time: 72 h Species: Pseudokirchneriella subcapitata (green algae) Method: OECD Test Guideline 201 EbC50: 310 mg/l Exposure time: 72 h Species: Pseudokirchneriella subcapitata (green algae) Method: OECD Test Guideline 201
Toxicity to bacteria Methyl Ethyl Sulfide	EC50: > 1,000 mg/l Exposure time: 3 h Species: Bacteria Respiration inhibition Method: OECD Test Guideline 209
Biodegradability	This material is not expected to be readily biodegradable.
Elimination information (persistence and degradability) Bioaccumulation t-Butyl Mercaptan	Bioconcentration factor (BCF): 12 Bioaccumulation is unlikely
Elimination information (persistence and degradability) Bioaccumulation Methyl Ethyl Sulfide	This material is not expected to bioaccumulate
Mobility t-Butyl Mercaptan	The product will be dispersed amongst the various environmental compartments (soil/ water/ air).
Mobility Methyl Ethyl Sulfide	The product evaporates readily.
Results of PBT assessment t-Butyl Mercaptan	Non-classified PBT substance, Non-classified vPvB substance
Additional ecological information	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal., Toxic to aquatic life with long lasting effects.
Ecotoxicology Assessment **Short-term (acute) aquatic hazard** t-Butyl Mercaptan	Toxic to aquatic life.
Short-term (acute) aquatic hazard Methyl Ethyl Sulfide	Harmful to aquatic life.
Long-term (chronic) aquatic hazard t-Butyl Mercaptan	Toxic to aquatic life with long lasting effects.
Long-term (chronic) aquatic hazard Methyl Ethyl Sulfide	Harmful to aquatic life with long lasting effects.
Section 13: Disposal Considerations	
The information in this SDS pertains only to the product as shipped. Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this	

material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.	
Product	The product should not be allowed to enter drains, water courses or the soil. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.
Contaminated packaging	Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

Section 14: Transport Information

Hazard Classes	NFPA Classification: Health Hazard: 2 Fire Hazard: 3 Reactivity Hazard: 0
NFPA Hazard Label	
Special Transport Precautions	Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

Section 15: Regulatory Information

National Regulations	Environment Protection Act 1986.
International Regulations	**Clean Air Act** **US State Regulations**

Section 16: Other Information

16.1 This document is based on the information available on website of Chevron Philips chemical company under Safety data sheet of the product mentioned above and the available version 2.2, Revision Date 2021-06-30 is referred.

16.5 Indraprastha Gas Limited expects and asks users of this product (CNG/LNG/PNG) to study this material safety data sheet (MSDS) and become aware of the product hazards and safety information and correlate its use accordingly.

16.6 DISCLAIMER: To the best of our knowledge, the information contained herein is accurate. The published material is being distributed without warranty of any kind, either expressed or implied. Neither Indraprastha Gas Limited nor any of its employees, shall be responsible for the interpretation and use of the information contained in this material safety data sheet. It shall be the user's obligation and responsibility to ultimately determine use of this information and the conditions of safe use of the product.

TYPICAL MEMO FORMAT

	SITE MEMO Book No..... Serial No.....
CONTRACTOR NAME :	
Project:	**Date:**
Client: INDRAPRASTHA GAS LIMITED	**Report No.:**
Consultant:	**Area:**
Zone:	**Location**
Activity:	
Observations:	
Issued By: **Name:** **Signature**	**Received By:** **Name:** **Signature:**
Circulate To:	

Contractor (White Copy)	IGL Incharge (Blue Copy)	PMC (Pink Copy)	TPI (Yellow Copy)

Note: Line in-charge of concerned department may prepare /use their own format of MEMO.

TYPICAL SAFETY PLAN FOR LIFTING AND ERECTION

[I] DETAILS OF LIFTING TOOLS AND TACKLES:

1. **WIRE ROPE SLING /WEB SLING:**

SR.NO.	MAKE - MANUAL / MECHANICAL	NUMBER	CAPACITY	LENGTH	DIAMETER

2. **D-SHACKLE:** Number: Capacity:
3. **CHAIN PULLEY BLOCK:** Number: Capacity:
4. **SAFETY PRECAUTIONS:**

- Valid test certificate of lifting equipment, lifting tools & tackles Yes / No
- Visual checks conducted for all lifting tools & tackles Yes / No
- Levelled and compacted ground Yes / No
- Steel plates laid below crawler chains Yes / No
- Outrigger working properly Yes /No
- Area Cordoned off Yes / No
- PPEs for working at height provided to all Yes / No
- Safe access to higher elevation ensured Yes / No
- Safe working platform provided Yes / No
- Trained signal man deployed Yes / No
- Sufficient illumination level ensured (for night work) Yes / No
- Emergency light available at night time Yes / No
- Emergency vehicles available at working location Yes / No
- Lifting & erection plan explained to the team members Yes / No

Name and Signature of IGL Project Engineer /PMC/TPI
Name and Signature of Contractor In charge

[II] TYPICAL CHECK LIST FOR MATERIAL LOADING & UNLOADING

[A] MATERIAL LOADING

Site/Location: **Date:**

Vehicle No: **Farana Crane No:**

S.N.	GENERAL CHECKPOINTS	YES	NO
1	Is the truck/trailer correctly positioned and level on ground? क्या ट्रक / ट्रेलर सही ढंग से जमीन पर तैनात / खड़े और सतह पर है		
2	Are wheel chocks in place? क्या व्हील चॉक्स जगह पर हैं?		
3	Is there any physical damage to the truck or trailer? क्या ट्रक या ट्रेलर को कोई शारीरिक क्षति हुई है?		
4	Are all the safety features of vehicle like horn, reflectors and lights in condition? क्या वाहन की सभी सुरक्षा विशेषताएं जैसे हॉर्न, रिफ्लेक्टर और लाइट्स हालत में हैं		
LOADING OPERATION			
5	Are the appropriate people and equipment available for loading? क्या लोडिंग के लिए उपयुक्त लोग और उपकरण उपलब्ध हैं?		
6	Does the product require special lifts or a crane to handle the load? क्या उत्पाद को लोड को संभालने के लिए विशेष लिफ्टों या क्रेन की आवश्यकता होती है?		
7	Has the driver been moved to the safe zone? क्या ड्राइवर को सुरक्षित क्षेत्र में ले जाया गया है?		
8	Are all helpers in sight of the forklift/crane operator? क्या सभी सहायक फोर्कलिफ्ट / क्रेन ऑपरेटर की दृष्टि में हैं?		
9	Are the load restraints suitable to secure the load? क्या लोड प्रतिबंध सुरक्षित लोड के लिए उपयुक्त हैं?		
10	Does the total weight of the material exceed the truck's carrying capacity? क्या सामग्री का कुल वजन ट्रक की वहन क्षमता से अधिक है		
11	Is the load of the cargo well distributed over the length of the truck/ trailer? क्या ट्रक / ट्रेलर की लंबाई पर अच्छी तरह से वितरित कार्गो का भार है		
12	Is the material securely fastened to the body of the truck/ trailer? As a rule of thumb is at least one tie down used for 10 feet of cargo? क्या सामग्री सुरक्षित रूप से ट्रक / ट्रेलर के शरीर में बांधी जाती है? अंगूठे के एक नियम के रूप में कम से कम एक टाई 10 कार्गो के लिए उपयोग किया जाता है		
13	Is a red flag or a red light used to mark the loads that extend beyond the length of the truck/ trailer? क्या एक लाल झंडा या लाल बत्ती का उपयोग उन भारों को चिह्नित करने के लिए किया जाता है जो ट्रक / ट्रेलर की लंबाई से अधिक होते हैं		
14	Has the driver double-checked all restraints for specific load requirements? क्या ड्राइवर ने विशिष्ट लोड आवश्यकताओं के लिए सभी प्रतिबंधों की दोहरी जांच की है?		
15	Has every loose material used during loading cleared off from the truck board? क्या लोडिंग के दौरान उपयोग की जाने वाली प्रत्येक ढीली सामग्री को ट्रक बोर्ड से हटा दिया गया है?		

Inspected By:

Name and Signature of the person **(IGL Concerned Doer Department).**

[B] MATERIAL UNLOADING

Site/Location: **Date:**

Vehicle No: **Farana Crane No:**

S.N.	GENERAL CHECKPOINTS	YES	NO
1	Is the truck/trailer correctly positioned and level on ground? क्या ट्रक / ट्रेलर सही ढंग से जमीन पर तैनात / खड़े और सतह पर है		
2	Has the Driver applied the Brakes and turned off the engine? क्या ड्राइवर ने ब्रेक लगाया है और इंजन बंद कर दिया है?		
3	Are wheel chocks in place? क्या व्हील चॉक्स जगह पर हैं?		
4	Is there any physical damage to the truck or trailer? क्या ट्रक या ट्रेलर को कोई शारीरिक क्षति हुई है?		
5	Is the area free from overhead electrical lines? क्या क्षेत्र ओवरहेड विद्युत लाइनों से मुक्त है?		
6	Is the area free from other traffic and people movement? क्या क्षेत्र अन्य यातायात और लोगों के आवागमन से मुक्त है?		
UNLOADING OPERATION			
7	Are the appropriate people and equipment available for unloading? क्या उपयुक्त लोग और उपकरण उतराई के लिए उपलब्ध हैं?		
8	Does the product require special lifts or a crane to handle the load? क्या उत्पाद को लोड को संभालने के लिए विशेष लिफ्टों या क्रेन की आवश्यकता होती है?		
9	For inspection on the truck / trailer has a safe platform being used? ट्रक / ट्रेलर पर निरीक्षण के लिए एक सुरक्षित मंच का उपयोग किया जा रहा है?		
10	Are load straps in good condition (not frayed, worn or torn)? क्या लोड पट्टियाँ अच्छी स्थिति में हैं (बिना फटे, खराब या फटे हुए)?		
11	Has any freight moved while in transit? क्या कोई भाड़ा पारगमन के दौरान चला गया है?		
12	Are all items effectively secured to a pallet, cradle or flatbed trailer? क्या सभी आइटम प्रभावी रूप से एक फूस, पालने या फ्लैटबेड ट्रेलर के लिए सुरक्षित हैं?		
13	Are top-loaded items stable? Is Inspection done using a safe platform? क्या टॉप-लोडेड आइटम स्थिर हैं? क्या निरीक्षण एक सुरक्षित मंच का उपयोग किया जाता है?		
14	Could any freight move or become unstable when the load restraints are removed? क्या कोई मालवाहक चल सकता है या अस्थिर हो सकता है जब लोड प्रतिबंध हटा दिए जाते हैं?		
15	Has the driver moved to the safe zone? क्या ड्राइवर को सुरक्षित क्षेत्र में ले जाया गया है?		
16	Are all helpers in sight of the forklift/hydra/ crane operator? क्या सभी सहायक फोर्कलिफ्ट / हाइड्रा / क्रेन ऑपरेटर की दृष्टि में हैं?		
17	Is the opposite side of the truck clear of people when unloading is taking place from other side? क्या ट्रक का विपरीत पक्ष लोगों के लिए स्पष्ट है जब दूसरी तरफ से उतराई हो रही है		
18	Have the assigned people for unloading wearing the appropriate PPEs? क्या उपयुक्त PPE पहनने के लिए नियत लोगों को सौंपा गया है?		

Inspected by –

Name and Signature of the person

(IGL Concerned Doer Department)

[III] Equipment fitness report for cranes and crane inspection checklist

TYPICAL EQUIPMENT FITNESS REPORT FOR CRANES			
Name of Project		Make/Model	
Identification/Reg No.		Asset code (if applicable)	
Date		owned by	
Inspected Team			
Sr. No.	**Check Points**	**Observation**	**Remarks**
1	Hook and Hook Latch		
2	Over-Hoist Limit switch		
3	Boom-Limit Switch		
4	Boom Angle Indicator		
5	Boom-Limit cut-off switch		
6	Over load limit switch		
7	Condition of Boom		
8	Condition of Ropes		
9	No. of load Lines		
10	Swing Brake & Lock		
11	Propel Brake & Lock		
12	Hoist brake & Lock		
13	Boom brake & Lock		
14	Swing Alarm		
15	Main clutch		
16	Leakage in hydraulic cylinders		
17	Out riggers fully extendible		
18	Tyre pressure		
19	Condition of Battery and Lamps		
20	Guards of moving and rotating parts		
21	load chart provided		
22	Numbers, position and size of pendant ropes		
23	Reverse horn & Rear-view mirror		
24	Validity of Certification by competent authority		
25	Operators Fitness		
26	Fire Extinguisher in operator's cabin		
27	Caution Boards		
28	Validity of PUC certificate (for tyre mounted)		
29	Validity of Fitness certificate (for tyre mounted)		
This Crane has been checked for the above points and			
Found **FIT** for deployment			
Found **UN FIT** for deployment			
	(P&M Engineer)		EHSO

[IV] TYPICAL CRANE INSPECTION CHECKLIST			
Name of Project			
Job No.			
Inspected By			
Date			
Sl No.	Check Points	Observation	Remarks
1	Hook and Hook Latch		
2	Over-Hoist Limit switch		
3	Boom-Limit Switch		
4	Boom Angle Indicator		
5	Boom-Limit cut-off switch		
6	Over load limit switch		
7	Condition of Boom		
8	Condition of Ropes		
9	No. of load Lines		
10	Size and condition of the sling		
11	Stability of crane		
12	Soil Condition		
13	Swing Brake & Lock		
14	Propel Brake & Lock		
15	Hoist brake & lock		
16	Boom brake & Lock		
17	Swing Alarm		
18	Main clutch		
19	Leakage in hydraulic cylinders		
20	Out riggers fully extendible		
21	Tyre pressure		
22	Condition of Battery and Lamps		
23	Guards of moving and rotating parts		
24	load chart provided		
25	Numbers, position and size of pendant ropes		
26	Reverse horn & Rear-view mirror		
27	Validity of Certification by competent authority		
28	Operators Fitness		
29	Fire Extinguisher in operator's cabin		
30	Caution Boards		
31	Validity of PUC certificate (for tyre mounted)		
32	Validity of Fitness certificate (for tyre mounted)		