

NTPL BASIC SAFETY RULES

NTPL BASIC SAFETY RULES

I. REPORT INCIDENTS.

1. Immediately report all work related injuries/illnesses or vehicle collisions, no matter how slight, to your supervisor.
2. Immediately report all fires, spills, and releases, no matter how small, to your supervisor.
3. Immediately report any unsafe condition, practice, near miss, or incident to your supervisor.

II. FOLLOW SAFE PRACTICES.

1. Operators of vehicles shall comply with all traffic requirement, particularly speed limits.
2. All persons in vehicles shall wear seat belts at all times.
3. When ascending or descending stairways, use the hand rail and take only one step at a time.
4. Erect barricades / flagging around hazardous work areas, such as holes in floor surfaces, trenches, road crossings, and overhead hazardous work.
5. Use only proper tools and equipment maintained in a safe working condition. Home made tools are prohibited.
6. Maintain good housekeeping in your work area at all times.
7. Smoking is permitted in designated areas only. Matches and lighters are prohibited in restricted areas.
8. Eating or resting is permitted in designated areas only.
9. Use proper manual lifting techniques, or obtain assistance or mechanical lifting aids when lifting loads.
10. All operating machinery and electrical switchgear shall have all safety guards, switches and alarms in place and functional.
11. Whenever a safety device is removed from service and/or defeated, the appropriate supervisor and affected parties shall be notified, the device tagged, and the action properly documented.
12. All block valves on pressure relief systems in service shall be in good condition, inspected regularly, and kept clear of any obstruction.
13. All chemical or hazardous material containers shall be properly labelled and stored. Drums shall be stored in secondary containment areas or on drum containment pallets.

III. AVOID UNSAFE ACTIVITIES.

1. Climbing or standing on equipment, piping, valves, or unstable surfaces to perform work is prohibited.

2. Approved fall protection shall be used if the working height is greater than 1.8 M or 6 ft from floor or platform level.
3. Running in work areas is prohibited, except during emergencies.
4. Finger rings, wristwatches, jewellery, loose clothing, unsecured long hair, and other loose accessories shall not be worn within an arm's reach of rotating equipment, conveyor or electrical switchgear.
5. Do not apply compressed air or other gases to yourself or others.
6. Horseplay or fighting on NTPL premises is prohibited.
7. Non-approved electrical/electronic devices shall not be used for work.

IV. PROTECT YOURSELF.

1. Approved hard hats without defects shall be worn in field operations, process areas, and all work place.
2. Approved safety footwear shall be worn in field operations, process areas, and all work place.
3. Approved safety eyewear with side protection shall be worn where designated.
4. Approved additional hazard specific eye/face protection shall be worn where foreign objects may injure the eye or face (e.g. grinding, welding or scraping).
5. Proper personal protective equipment (PPE) shall be worn when handling chemicals or hazardous materials.
6. Approved hearing protection shall be worn in high noise areas. (e.g. 85 decibels or higher).

V. FIRE PREVENTION GUIDELINES.

1. Class A fire materials (e.g. Paper and waste material) storage shall be avoided in process and electrical areas.
2. Trained personnel shall visually inspect all fire equipment monthly.
3. Do not use gasoline as a cleaning agent.
4. Do not smoke or use cellular phones and other electrical devices while refuelling or within electrically classified area.
5. Only trained personnel shall operate fire extinguishers and equipment.
6. In case of fire, isolate all fuel sources and/or threatened facilities and close doors.
7. Good housekeeping shall be ensured in all areas.

VI. VEHICLE SAFETY.

1. Drivers of vehicles are responsible for the safe operation of their vehicles.
2. All drivers shall hold a valid driving license.
3. Drivers shall regularly inspect and maintain tyre pressure as per manufacturer's recommendation.
4. Drivers shall observe speeds in accordance with posted speed limits and driving conditions.
5. The use or being under influence of intoxicants or medications which cause impairment while operating a vehicle is prohibited.
6. Using a cell phone, eating, or drinking is prohibited.
7. Drivers shall not leave vehicles unattended while the engine is running.
8. Vehicles shall only be operated or parked in designated operations areas.
9. Vehicles shall not be fuelled with the engine running or during use of any electrical device.
10. Drivers shall report all vehicles collisions and moving violations immediately, no matter how minor.

GENERAL CHECKLIST/SOP FOR VARIOUS ACTIVITIES:-

I. EXCAVATION:-

1. Carrying out ground investigations (including soils and services etc.)
2. Planning for shoring and work system.
3. Providing means for removal of water and soil.
4. Carrying out site inspection and prevention of excessive loading from the excavation edges.
5. Providing Gangways for crossing trenches
6. Providing safe access in excavations
7. Ensuring no children are left at excavation sites.
8. Providing fencing and warning lights
9. Providing means for rescue in the event of earth collapse.
10. Providing effective supervision.

II. PILE DRIVING:-

1. Inspecting piling machines for firm grounding

2. Carrying out inspection of machine for machine guarding
3. Taking precautions in hoisting piles into position.
4. Providing tight fitting clothes and personal protective equipment's to employees.

III. WORKING AT HEIGHTS:-

1. Covering all floor openings.
2. Providing railings on open sides and lift openings.
3. Securing access staircase/ladders.
4. Providing scaffolds.
5. Inspecting hoists, lifts, and cranes & lifting gear.
6. Co-ordination between the working teams is being done .
7. Guarding dangerous parts of machines.
8. Providing safe foothold for form work construction.
9. Providing safety belts, helmets and other PPEs and ensuring their use.
10. Providing provision for tying up safety belts.
11. Providing effective supervision to ensure safe operation and practice.
12. Welding/cutting is permitted only after taking safety precaution.
13. Providing means of protection against fall of objects.
14. Providing means of protection against fall of persons.
15. Providing means of access to higher elevations.
16. Providing refuse disposal means.
17. Providing lighting, emergency lights and ventilation.
18. Inspecting all the ladders and staircases.
19. Providing safe access to move around the floor.
20. Providing fire protection means.

IV. ELECTRICAL SYSTEMS:-

1. Ensuring safe component/equipment's are used.
2. Providing earth leakage circuit breakers on all electrically operated power tools/equipment's.
3. Inspecting power tools before use and ensuring defective tools are discarded.
4. Using 3 core cable and 3 pin plugs for all portable tools and ensuring its earthing.
5. Authorized electrician is only attending all electrical job.

6. Ensuing double earthing to all equipment's.
7. Ensuring all the electrical system are as per Indian Electricity Rules.
8. Disconnecting and removing all unwanted cables and wires from electrical system.
9. Identification Marks and Numbers are clearly being marked on all electrical distribution boards, switchboards, motors etc.
10. All electrical system components being protected against damage.
11. All electrical joints are being tested to meet the standards.
12. Hand lamps are providing with suitable guards.
13. Providing personal protective equipments including electrical safety shoes, rubber gloves etc.
14. Ensuring unauthorized person shall not have access to electrical system.
15. Protecting all live parts.
16. Ensuing all fuses are replaced with actual current rating.
17. All the joints are being properly insulated and protected against mechanical damages.

V. WELDING AND CUTTING:-

1. Providing required personal protective equipments to welders and ensuring their use.
2. Ensuring to protect fall of welding sparks down on the persons working below and combustible material.
3. Combustible material near vicinity of welding / cutting work being protected.
4. Fire extinguisher are kept ready for use in case of emergency.
5. Adequate precautions being taken while welding/cutting operation is done in confined space.
6. Inspecting all the gas cylinders and ensuing the storage, handling and transportation for safety.
7. Inspecting all welding machines and ensuring their cables are properly connected.
8. Inspecting electrode holders.
9. Frames of arc welding machines are effectively earthed.
10. Providing refusal boxes to keep refused electrodes and other waste material.

VI. LIFTING MACHINES AND TACKLES:-

1. All the lifting equipments are tested and certified by competent person.
2. Safe working load marked on all lifting equipments and tackles.
3. Record for all lifting equipments are being maintained.
4. Ensuring only authorized person are using lifting machine.

5. Checking lifting equipments before use.
6. Ensuring safe working load does not exceed.
7. Assessing the load to be lifted.
8. Ensured that lifting and placement of material is done properly.
9. Ensuring standard signals are followed.
10. Inspecting all hoists and lifts & cranes.

VII. DEMOLITION:-

1. Inspection the area and structure to be dismantled.
2. Disconnecting all the service lines example electricity, water, gas etc.
3. Supporting the uncontrolled collapse of walls, pillars and other structure.
4. Proper means such as chutes are provided to carry the waste material from floor to ground level.
5. The area is fenced and caution boards are provided.
6. Personal protective equipments are issued to the workers and ensuring their use.
7. Effective supervision is provided till completion of the demolition and ensured demolition is done systematically.

VIII. CHECKLIST FOR SCAFFOLDS:-

The following points should be checked and complied with before & during the use of scaffold.

1. Scaffold is erected only under the supervision of a competent person.
2. Scaffold is free from visible defects and loose joints. Parts of a scaffold that are damaged or Weak ended are immediately removed from service.
3. Scaffold is checked for its firmness and stability before its use by a competent person daily and after any occurrence that could affect its structural integrity.
4. Scaffold is secured with cross bracings and ties.
5. PTW(Person to be worked) for working at height is signed by authorised person.
6. The maximum intended load of the scaffold is displayed.
7. The scaffolding is erected on firm and level ground with base plate and sole plate to support the loaded scaffold without settling or displacement.
8. Safe access (i.e. ladders with vertical anchorage line & fall arrestor or stair case with hand rails) is provided to all work platforms.
9. Guardrails, midrails and toe boards are in place on all open sides.

10. Working levels on scaffold are fully planked and planks are in good condition.
11. Safety nets are used wherever required and maintained.
12. The distance between the scaffold and the face of work shall be safe to avoid fall of a person through the gap.
13. The erected scaffold shall be moved, dismantled or altered only under the supervision and direction of a competent person qualified in scaffold erection, moving, dismantling or alteration.
14. Working on scaffold during storms or high winds shall be prohibited.
15. For support scaffold poles, legs, posts, frames, uprights and braces shall be such to prevent swaying and displacement.
16. The walkways and working platforms of scaffold are free from oil, grease & debris.
17. The scaffold shall not be overloaded beyond its rated capacity.
18. Use of full body safety harness and anchoring of lanyard with separate lifeline/ rigid support shall be ensured before start of work & during execution of job.
19. Provision of tagging of scaffold: Green colour tag for ready to use, Red colour tag for under construction/ prohibition of use.

IX. CHECKLIST FOR EOT CRANE:-

(To be implemented before the start of unit overhaul)

1. Checking the load test certificate.
2. Operation of auxiliary hoist, main hoist, cross travel & longitudinal travel.
3. Checking the operation of brake drum and thrusts brakes. Checking the tightness of clamping bolts of main hoist drum and Auxiliary hoist drum.
4. Checking the rails of longitudinal travel and cross travel.
5. Checking of wear/ damages to wheels & flanges of longitudinal travel and cross travel.
6. Check for wear of hook block & its safety latch.
7. Check for play, damage and smooth rotation of hook block & transmission pulleys.
8. Check functioning of motors for lifting, longitudinal travel & cross travel.
9. Check for wear and damage to the rope drum and rope guide.
10. Check for general appearance of wire ropes.
11. Check correct functioning of brakes and braking distances of lifting, longitudinal travel & cross travel.
12. Functional checks of electrical push buttons and switches.
13. Functional checks for limit switches.

14. Check for general cleanliness & lubrication of rope, hook, gear boxes etc.
15. Check for oil leakages.
16. Any other relevant aspect.

X. CHECKLIST FOR CONVEYOR AND BUNKER AREA:-

(To be checked before start the work)

1. Availability of Dust extraction/Ventilation system.
2. Healthiness of dust extraction/Ventilation system.
3. Grizzly hole condition.
4. Cleanliness of Cable tray / Electrical panel.
5. Cleanliness of walkway.
6. Availability of Limit switch at tipper/conveyer.
7. Availability of stopper at both end of each Rail.
8. Use of PPE by workers.
9. Availability of Spray system over conveyor.
10. Healthiness of Spray system over conveyor.
11. Availability of Fire hydrant point at different locations.
12. Healthiness of Fire hydrant point at different locations.
13. Statutory testing of Hoist.
14. SWL (Safe working Load) written on Hoist.
15. Test date written on Hoist.
16. Healthiness of floor end railing.
17. Availability of Pull cord at whole length of conveyor at its both sides.
18. Healthiness of Pull cord.
19. Availability of sway switch at different locations.
20. Healthiness of sway switch at different locations.
21. Availability of Fire Extinguishers at required location.
22. Availability of Tail Pulley / Head Pulley Guard.
23. Availability of Coupling guard.
24. Illumination in Bunker area.
25. Availability of Emergency Push Button at head pulley.
26. Working of PA (Public address) System at different floors.

XI. CHECKLIST FOR COAL YARD INCLUDING STACKER, RECLAIMER AND CONVEYORS :-

1. Illumination.
2. Tightness of Rail Track.
3. Availability of stopper at both end of each Rail.
4. Availability of Emergency stop button at lower level of Stacker / Reclaimer.
5. Healthiness and laying arrangement of power cables.
6. Hand Rail conditions where ever is required at Reclaimer and Stacker.
7. Approach to Reclaimer / Stacker up to Operator's cabin.
8. Provision of Fire hydrant and their healthiness in piles.
9. Availability of Sufficient / Required water pressure in hydrant line.
10. Availability of Pull cord for whole length of conveyor on both sides.
11. Healthiness of operation of Pull cord.
12. Condition of Drainage system in piles.
13. Any spontaneous fire.
14. Housekeeping of the area.
15. Water sprinkler system in pile.
16. Use of PPEs by working personnel.
17. Availability of Fire Extinguishers at Reclaimer and stackers.
18. Availability of sway switch in different location along the conveyor.
19. Healthiness of sway switch in different location along the conveyor.
20. Availability of Phone / PA System at Reclaimer and Stacker.
21. Healthiness of Phone / PA System at Reclaimer and Stacker.
22. Writing of SWL on Hoist.
23. Writing of Test Date on Hoist.
24. Guard for Head pulley, Tail pulley and coupling of conveyors

I. SAFE OPERATING PROCEDURE FOR WORKING AT HEIGHT:-**PURPOSE:**

To define the sequence of activities for Working at Height to prevent Risk of injury

SCOPE:

Applicable to all the processes where personnel are working at height and have the potential risk of personnel falling from height and the tools falling from height and thus injuring the personnel moving below the work place.

RESPONSIBILITY:

HOD, Incharge of the process and the personnel engaged for the activity are responsible for effective implementation of the procedure

PROCEDURE:

1. The main focus of the procedure is to prevent any fatal injury or injuries caused by falls at work.
2. A place is 'at height' if a person could be injured falling from it, even if it is at or below ground level. 'Work' includes moving around at a place of work.
3. A Simple Hierarchy for managing and selecting equipment for work at height.
 - a. Avoid work at height where they can
 - b. Use work equipment or other measures to prevent falls where they cannot avoid working at height
 - c. Where they cannot eliminate the risk of a fall, use work equipment or other measures to minimise the distance and consequences of a fall should one occur

PLANNING: The HOD to :

- a. Properly plan and organise the work
- b. Take account of weather conditions that could endanger health and safety
- c. Use only trained and competent personnel for work at height
- d. Ensure that the place where work at height is done is safe
- e. Ensure that equipment for work at height is appropriately inspected
- f. Ensure that the risks from fragile surfaces are properly controlled such as False Roof, temporary platform, working with any breakable surface
- g. Ensure that the risks from falling objects are properly controlled.
- h. Ensure that no work is done at height if it is safe and reasonably practicable to do it other than at height
- i. Plan for emergencies and rescue
- j. Postpone the work while whether conditions endanger health or safety (but this does not apply to emergency services acting in an emergency)

STAFF TRAINING:

- a. Ensure that everyone involved in the work is competent (or, if being trained, is supervised by a competent person)
- b. Where other precautions do not entirely eliminate the risk of a fall occurring, train those who will be working at height on how to avoid falling, and how to avoid or minimise injury to themselves should they fall.

WORK PERMIT SYSTEM:

HOD to issue Work Permit for working at Height and should consider the following:

- a. Visual Inspection or more rigorous inspection for safety purposes such as checking the surface and every parapet, permanent rail, Platform, Ladder, scaffolding etc.
- b. Ensure that any platform used for (or for access to) construction work and from which a person could fall more than 2 m is inspected in place before use including mobile platform.
- c. Ensure that suitable platforms, coverings, guard rails, and the like are provided to minimise the risk
- d. Before start the work appraise the personnel on the danger while working near / at fragile surface
- e. Place sign boards regarding Fragile Surface, Falling Object, Personnel at Work, Do Not Disturb, Hard Hat Area
- f. Personnel are Wearing Safety Belt and have secured themselves before commencing the work
- g. The area is cordoned off / barricaded to prevent movement of personnel below the place of work to prevent injury due to any possible falling object.

On completion of the day's work, close the Work Permit. Issue fresh work permit for each day or whenever a new personnel is deployed within a day's work

DO'S AND DON'T'S WHILE WORKING AT HEIGHT:

- a. Ensure that the ladder is secured at the bottom to prevent any movement
- b. Ensure that the wheel of any mobile platform / ladder are locked
- c. Wear Helmet and Nose Mask while performing work
- d. Secure using Safety Belt to prevent fall.
- e. Where possible, secure the ladder at top to prevent any movement.
- f. Where appropriate, Wear Face Shield / Goggles, Hand Gloves
- g. Supervise the work at all times
- h. Ensure appropriate means of communication is made available between the personnel doing

the work and the person supervision

- i. Do not deploy any person for work at height if he has any vertigo problems
- j. Do not drop any items / tools from height
- k. Do not work without safety gadgets
- l. Do not leave the place un attended
- m. Do not carry any weight exceeding 5 Kgs while climbing the ladder

CHECK LIST:-**Points to be checked before the work permit is issued for Working at height**

Sl. No.	Points to be checked before the work permit is issued for working at height	Yes	No
1.	Whether scaffolding has been erected by competent person?		
2.	Whether access provided to the working platform is safe?		
3.	Whether the strength and stability of the working platform is ensured by the supervisor?		
4.	Whether guard rails and toe boards are provided in working platforms?		
5.	Whether the area below the work has been cordoned off?		
6.	Whether safety belts have been provided to all the workers who shall be working at heights above 2m?		
7.	Whether safety belts possess a valid test certificate issued by the competent person approved by Govt. of Tamil Nadu?		
8.	In case the work at height involves any hot work, whether the required fire precaution arrangements including the precautions specified in the checklist for hot works taken?		
9.	In case of electrical work at height, whether electrical safety precautions are taken?		
10.	Whether the workmen have been provided with the appropriate PPEs in line with the potential hazards prevailing?		

PROCEDURE FOR WORKING IN CONFINED SPACE:-**PURPOSE:**

To define the sequence of activities for Working in Confined Space to prevent the Risk of Ill Health to Personnel

SCOPE:

Applicable to all the processes where personnel are to work in confined space such as Boiler, Vessel, Pipe Line and have the potential risk of Ill Health / Suffocation.

RESPONSIBILITY:

HOD, Incharge of the process and the personnel engaged for the activity are responsible for effective implementation of the procedure

PROCEDURE:

The main focus of the procedure is to prevent Ill Health / Suffocation and that can lead to any fatal incident at work place.

Confined space means a space that has any of the following characteristics:

- ❖ limited openings for entry and exit;
- ❖ unfavourable natural ventilation;
- ❖ not designed for continuous worker occupancy.

It includes, but is not limited to, boilers, pressure vessels, cargo holds, cargo tanks, double bottoms, double hull spaces, fuel oil, lube oil, sewage-tanks, pump-rooms, compressor rooms, ducts.

Work in confined and enclosed space has a greater likelihood of causing fatalities, severe injuries and illness. The key hazards associated with confined spaces are:

- ❖ serious risk of fire or explosion;
- ❖ loss of consciousness from asphyxiation arising from gas, fumes, vapour or lack of oxygen;
- ❖ drowning arising from increased water level;
- ❖ loss of consciousness arising from an increase in body temperature;
- ❖ asphyxiation/suffocation arising from free flowing solid (engulfment) or the inability to reach a breathable atmosphere due to entrapment.

There may be physical constraints within the space which need to be considered, and the space itself may be cramped permitting only restricted mobility. This activity ideally should not be carried out by personnel suffering from phobias (e.g. claustrophobia) or who are susceptible to panic or anxiety attacks.

PLANNING AND GENERAL CONTROLS: The HOD to :

- i. Permit entry in to confined space only with a permit to enter has been issued and if you consider it is safe to do so
- ii. Ensure that the personnel only remain in the inside for as long as it is necessary to carry out the work.
- iii. Ensure that the confined space is safe to enter.

- iv. Not to permit entry until all safety requirements are met.
- v. Hold a Safety meeting prior to the permit to entry the space to discuss all aspects of safety measures
- vi. Use only trained and competent personnel for work at height
- vii. Ensure that the risks from falling objects are properly controlled
- viii. Plan for emergencies and rescue
- ix. Postpone the work while whether conditions endanger health or safety (but this does not apply to emergency services acting in an emergency)
- x. Ensure that safety guards are provided to the rotation equipment used for work in confined space to prevent hazard due to accidental contact with rotating parts
- xi. Appraise the personnel on the danger while working near / at fragile surface
- xii. Place sign boards regarding men at work in Confined Space
- xiii. Ensure the personnel are Wearing appropriate PPEs

STAFF TRAINING:

- a. Ensure that everyone involved in the work is competent (or, if being trained, is supervised by a competent person)
- b. The personnel to be trained on the procedure for entry and exit from confined space
- c. Importance of the use of appropriate PPE while working in confined space
- d. Procedure to be followed for rescue of the personnel from confined space
- e. DO's and DON'T's while working in confined space
- f. Training for the Rescue Operation at Confined Space

WORK PERMIT SYSTEM:

HOD to issue Work Permit for working in confined Space. The Work Permit contains:

- ❖ The work to be done, the location and the precautions to be taken
- ❖ Defines the precautions taken and their sequence
- ❖ Written authority for the confined space to be entered and the work to start and the time when the work must cease.

The permit should only be issued after tests have been done to ensure that the atmosphere is safe to breathe. On completion of the day's work, close the Work Permit. Issue fresh work permit for each day or whenever a new personnel is deployed within a day's work

CONFINED SPACE ATMOSPHERE:

The atmosphere in a confined space may be extremely hazardous because of the lack of natural air movement. This characteristic of confined spaces can result in:

- ❖ oxygen-deficient atmosphere,

- ❖ flammable atmospheres, and/or
- ❖ toxic atmospheres.

OXYGEN-DEFICIENT ATMOSPHERE

The health effects and consequences because of lack of oxygen in a confined space are listed in the table below. These effects will take place without any warning such as odour or physical symptoms.

Health effects from lack of oxygen

O₂ level Effects

22 % - Oxygen enriched atmosphere

20.8% - Normal level Safe for Entry (± 0.2%)

19.5% - Oxygen deficient atmosphere

16% - Impaired judgement and breathing

14% - Rapid fatigue and faulty judgement

11 % - Difficult breathing and death in a few minutes

Lack of oxygen leads very quickly to unconsciousness and death. Lack of oxygen may be a problem in all kinds of confined spaces, it is therefore considered as the most dangerous factor when considering dangers in a confined space. The oxygen level in a confined space can decrease because of work being done, such as welding, cutting, or brazing; or, it can be decreased by certain chemical reactions like: rusting, paint drying or through bacterial action (fermentation).

INERT GAS, N₂ AND EXHAUST

Pure nitrogen is not poisonous itself, but it causes displacement of the natural breathing environment. Exhaust for activities such as Gas Cutting, Welding, Painting contains hundreds of chemical compositions. Main components are: carbon monoxide, oxygen, nitrogen, water vapour, sulphur dioxide, nitrogen oxides and hydrocarbons. The exhaust as described above may cause reduced lung capacity and increased respiratory in addition to irritating mucous membrane in eye, nose and throat. Total dilution of oxygen by another gas, such as carbon dioxide, will result in unconsciousness, followed by death.

FLAMMABLE ATMOSPHERES

Two things make an atmosphere flammable:

- ❖ the oxygen in air, and
- ❖ a flammable gas, vapour, chemical reaction or dust in a proper mixture.

Flammable Gas in confined space may occur due to leak of Oxygen and Acetylene while carrying out welding inside confined space. The welding sparks into a space containing a flammable atmosphere will cause explosion. An oxygen-enriched atmosphere (above 22%) will cause flammable materials, such as clothing and hair, to burn violently when ignited. Therefore, never use pure oxygen to ventilate a confined space. Ventilate with normal air.

TOXIC ATMOSPHERE

Toxic substances may range from fast acting poisons to long term cancer causing carcinogens. Toxic substances can come from the following:

- ❖ the product stored in the space;
- ❖ the work being performed in a confined space;
- ❖ areas adjacent to the confined space.

HAZARD DUE TO CHEMICALS STORED IN CONFINED SPACE

While entry in to tank that contained chemicals, Health effects as a result of exposure from chemicals in general may cause immediate headache, nausea, fainting and possible death. Chemicals can be absorbed into the structure and/or tank coatings and give off toxic gases at a later stage. When removed or when cleaning out the residue of a stored product, toxic gases can be given off.

It is very important to follow the marking and recommendations as given in the Data Sheet to reduce immediate damage as well as the risk for long term damage.

EXPOSURE TO HYDROGEN SULPHIDE - H₂S

Hydrogen sulphide is highly toxic and also flammable and is created by the decay of organic matter that is found in sewers and sewage treatment plants. H₂S may also be found in void spaces and other tanks that have been empty and decomposition of organic material has taken place.

Hydrogen sulphide is heavier than air and has no colour but does have a strong “rotten egg” odour at low concentrations. Hydrogen sulphide can affect when inhaled and when passed through the skin. Contact can irritate the eyes. Long-term exposure to low levels can cause pain and redness of the eyes with blurred vision. Breathing hydrogen sulphide can irritate the nose, throat and irritate the lungs causing coughing and/or shortness of breath.

Higher exposures can cause a build-up of fluid in the lungs (pulmonary oedema), a medical emergency with severe shortness of breath. Exposure can cause nausea, dizziness, confusion, headache and trouble with sleeping. Very high levels can cause immediate death.

Hydrogen Sulphide is a **HIGHLY FLAMMABLE GAS** and a **DANGEROUS FIRE HAZARD**. At high concentrations H₂S paralyses neurons inside the nose and the odour cannot be smelled, hence smelling should not be used as an indicator that the tank is free from hydrogen sulphide.

Example: Removal of sludge or mud from a tank-decomposed material can give off deadly hydrogen sulphide gas and/or methane gas.

EXPOSURE TO METHANE

Methane is an odourless, colourless gas, or liquid under pressure. Methane is a **HIGHLY FLAMMABLE GAS** and a **DANGEROUS FIRE** and **EXPLOSION HAZARD**.

In addition to being an explosion hazard, very high levels of methane can cause suffocation from lack of oxygen.

EXPOSURE TO SOLVENTS

Many solvents, such as kerosene, gasoline, paint strippers, degreasers, are not only flammable, but if inhaled at high concentrations can cause central nervous system (CNS) effects. CNS effects can include dizziness, drowsiness, lack of concentration, confusion, headaches, coma and death.

EXPOSURE TO CO₂

CO₂ is natural occurrence in exhaled air, however high concentrations can be hazardous. CO₂ is odourless and is heavier than normal air. Concentrations may occur in the lower part of the tanks, close to the bottom. Low concentrations below 5% are not considered as hazardous. Concentrations above 5% may lead to increased breath intensity and death. Also long term exposure may lead to unconsciousness and death.

WORK BEING PERFORMED IN A CONFINED SPACE

Examples of such include welding, cutting, brazing, painting, scraping and degreasing. Toxic atmospheres are generated in various processes. For example, cleaning solvents are used for cleaning/degreasing. The vapours from these solvents are very toxic in a confined space. It is also important to be aware that hot work carried out consumes oxygen.

WELDING

Hot work on all surfaces with coating will create several gases which may be very toxic. This gas may come from hot work being carried out in a tank adjacent to the Confined Space.

COATING / PAINTING

Special attention should be paid when spray coating is carried out in the confined space. Spray coating where small size particles are mixed with air will lead to high toxic exposure if inhaled.

GRINDING

Grinding may cause miscellaneous compositions of dust. Absorption of metal dust into the body through inhalation is dependent on the physical and chemical properties and the size of the particles. Dust like this may cause metal fume fever and bronchitis.

NOISE

Noise within a confined space can be amplified by the design and acoustic properties of the space. Excessive noise cannot only damage hearing, but can also affect communication, such as causing a shouted warning to go unheard.

FALLING OBJECTS

Workers in confined spaces should be mindful of the possibility of falling objects, particularly in spaces, which have a topside opening for entry, and where work is being done above the worker.

SLICK/WET SURFACES

Slips and falls can occur on a wet surface causing injury or death to workers. Also, a wet surface will increase the likelihood for and effect of electric shock in areas where electrical circuits, equipment, and tools are used.

OPERATION CONTROLS - PREPARATION FOR ENTERING CONFINED SPACES**VENTILATION**

Fix the blower in the manhole and run the blower for 2 hours for flushing any hazardous gases from the space. While the work is in progress, ensure that the ventilation is continuous. Open all “openings” / Man Holes for ventilation including emergency exit. The air intake should be placed in an area that will draw in fresh air only.

TESTING OF THE ATMOSPHERE:

It is important to understand that some gases or vapours are heavier than air and will settle to the bottom of a confined space. Also, some gases are lighter than air and will be found around the top of the confined space. Therefore, it is necessary to test all areas (top, middle and bottom) of a confined space with properly calibrated testing instruments to determine what gases are present.

Atmospheres may be different in individual bays of the same tank. If testing reveals oxygen-deficiency, or the presence of toxic gases or vapours, the space must be ventilated and re-tested before entering.

If in doubt whether the gas to be measured is lighter or heavier than air, consider the properties for the possible gas in question and compare it with the molecule weight of air.

Weight of air: 28.8 mol

Methane, CH₄ is lighter than air.

All gases from liquids under normal conditions are heavier than air (except ammonia).

Testing instruments for oxygen and flammability read in percent. The oxygen meter should indicate between 20.8% and 22% oxygen in the space being tested. Where appropriate, test the presence of Flammable Gas and the Flammability Indicator should show the percent within a safety range of 0-10% of the Lower Explosive Limit (LEL) and, ideally, should read 0%.

Enter the condition of the atmosphere in the Work Permit before entry. Measure the atmosphere once in two hours to ensure that it is safe to work in the Confined Space.

OPERATION CONTROLS AND EMERGENCY PREPAREDNESS - STANDBY / RESCUE**STANDBY**

A standby person should be assigned to remain on the outside of the confined space and be in constant contact (visual or two-way voice communication e.g. walkie-talkie) with the personnel inside. Communication intervals with the personnel inside the space should be established atleast once in 30 minutes.

The standby person:

- i. should not have any other duties than to serve as standby and know who should be notified in case of emergency
- ii. should never leave his post even after help has arrived and is a key communication link to others
- iii. should be able to communicate sufficiently in a relevant common language.

The Incharge of the Area Under Operation Should atleast visit once in four hours to review the implementation of the controls for Safe Operation in the Confined Space and make entries in the Work Permit.

RESCUE

Rescuers must be trained in and follow established emergency procedures and use appropriate equipment and techniques (such as lifelines, respiratory protection, standby persons). Emergency and evacuation procedures should be agreed and understood by all parties involved in a potential rescue operation.

Before the commencement of the rescue operation, test the atmosphere of the space to be entered and use appropriate PPE and Breathable Apparatus for the rescue operation.

Perform Emergency Preparedness Drill on Rescue Operation from Confined Space once in two years and initiate necessary action based on the findings.

Note: Unplanned rescue, such as when someone instinctively rushes in to help a downed co-worker, can easily result in a double fatality or even multiple fatalities if there is more than one would-be rescuer.

workers. An unplanned rescue could be the last!

OPERATION CONTROLS USE OF PERSONNEL PROTECTION EQUIPMENT (PPE)

PPE is traditionally regarded as the last line of protection with the emphasis being placed on avoidance and appropriate managerial control methods. However, the potentially hazardous nature and isolated position of those entering a confined space means that, PPE may be the first line of protection.

Each confined space will present different hazards and degrees of risk to health and safety, the final provision of PPE should therefore be based on an assessment of risk.

As a general rule, The Basic PPE should include:

- ❖ Foot protection (steel toecaps, good grip, oil resistant);
- ❖ Head protection (hard hat with chinstraps)
- ❖ Hand protection (hard wearing gloves);
- ❖ Eye protection (protective glasses, goggles);
- ❖ Ear protection (ear defenders or ear plugs worn subject to communication system);
- ❖ Lighting (hand held / Mines Head Torch with appropriate beam width)

OPERATION CONTROLS - LIGHTING

Whenever possible, natural lighting is provided in the confined space during the work by opening all possible doors / manholes. In addition, DC Lamps are made available in the Work Place to ensure safe operation. The lighting in the space is measured using Lux Meter and light intensity of > 50 Lumens is ensured in the workplace. The location of the lamps are chosen such a way that it douse not pose additional hazard to the personnel. The light intensity is recorded in the Work Permit.

DO'S AND DON'T'S WHILE WORKING AT CONFINED SPACE:

- a. Ensure that the Ventilation System is continuously Operating while the personnel are in the confined space
- b. Wear suitable PPE as directed by Incharge while performing work
- c. Supervise the work at all times
- d. Ensure Standby personnel is always present at the place of work
- e. Standy personnel should always keep the communication with the personnel in the Confined Space.
- f. Inform the Incharge in case of emergency.
- g. Do Not attempt rescue without suitable training and precaution
- h. Do not deploy any person if he has any vertigo problems
- i. Do not work without safety gadgets
- j. Do not leave the place unattended.

CHECKLIST:-**CHECKLIST FOR WORKING INSIDE CONFINED SPACE**

The following points should be complied with before start of Work / Repair inside confined space.

1. The valves on inlet pipes to tank/ vessel are in closed condition.
2. The closed valves on inlet pipes are locked.
3. Manholes in tank/vessel are in open condition and are cordoned.
4. Oxygen content is checked for the space inside tank /vessel and oxygen content is more than the minimum specified (20%).
5. The space inside tank /vessel is free from toxic / poisonous gases.
6. Forced Ventilation arrangements for Air Circulation inside Tank/vessel has been provided.
7. For Height works inside confined space
8. Diagonal /lateral bracings are provided to pipe scaffold to ensure stability.
9. Access ladder is provided to reach the work location.
10. Planks /sheet used in temporary platform are in good condition and are tied properly using wires.
11. Workers are wearing Helmet/Shoe / Safety belt in good condition.
12. Dust mask / respirator is provided to workers for protection against dust / fumes.

13. Experienced workers are engaged for work.
14. Portable electrical equipment /fibre body checked, for its healthiness including earthing .
15. Workers are briefed on Safety Precautions to be taken (Do's/Dont's) .
16. 24 volts hand lamps provided for inside at work location.
17. Supervisory staff of agency is available.

SOP FOR ELECTRICAL WORKS :-

The following points should be checked and complied with before start of work involving electrical power supply.

1. Electrical equipment /tools are in sound condition and inspected /tested for its healthiness.
2. Body earthing is provided to machine / electrical hand tool.
3. The switches / Fuses/ Plug top used are of appropriate rating.
4. The power cable is having three cores in case of single phase and four cores in case of 3 phase supply.
5. The joints in power cables are properly insulated.
6. For Welding cable, job earth and joints are proper.
7. Electrical machine/tools cables are free from obstruction , contact with water and hot sparks.
8. ELCB is provided in the supply system.
9. Use of 24 volts hand lamp in confined space /vessel.
10. Permit to work has been taken.
11. Proper access and illumination are available to switch boards and work location
12. Safety tags are provided.
13. Engagement of experienced and authorised workers for doing the work.
14. Workers are briefed on safety precautions to be taken.
15. Use of Helmet, Shoes, Gloves, Face shield and Safety belt (height work) by worker.
16. Worker is not exposed to rain and not standing on wet /water logged location.
17. Second person is available with the engaged worker.
18. Tag the lock with a DANGER ,DO NOT OPERATE TAG
19. Agency supervisor deployed.

SOP FOR HYDROGEN GAS CYLINDERS

USING HYDROGEN GAS CYLINDERS

The following are some safe-handling guidelines that have been established by the Compressed Gas Association for using hydrogen gas cylinders. By following these guidelines you can help assure the safety of your hydrogen gas operations.

- ❖ It is very important to secure all compressed gas cylinders in an upright position so that they cannot be knocked over.

- ❖ Hydrogen gas cylinders should never be used if pressure has not been reduced by a suitable regulator at the cylinder, or at the outlet of the header valve of a cylinder manifold. Use only regulators intended to be used with hydrogen and never force connections that do not readily fit together.
- ❖ Never crack a hydrogen cylinder valve to remove dust or dirt from fittings prior to attaching a regulator. While this practice may be acceptable for other gases, with hydrogen there is a risk of self-ignition.
- ❖ Once the regulator is attached, be sure that the regulator adjusting screw is in the closed position before opening the cylinder valve. When opening the valve, turn the hand wheel slowly so that the hydrogen does not enter the regulator suddenly. Never use a wrench, hammer, or other tool to open or close the hand wheel.
- ❖ When opening the cylinder valve to extract content, turn the hand wheel all the way open and then back toward the closed position one quarter turn. When the work is finished, turn the cylinder valve off and be sure to bleed off all remaining hydrogen from the regulator before removing it from the cylinder.

HYDROGEN GAS CYLINDERS CONTINUED

MOVING HYDROGEN GAS CYLINDERS

When moving cylinders, the following general precautions should be observed:

- ❖ Replace cylinder valve cap before moving a cylinder from its secured, in-use position.
- ❖ Move cylinders on cylinder carts or with other approved cylinder-transporting devices.
- ❖ Never roll or drop cylinders. Severe foot injury or damage to the cylinder could result.
- ❖ Before moving cylinders, remove regulator and secure protective valve cap, unless cylinder is part of a mobile system (such as a cart-mounted set). If cylinder is part of a mobile system, close the cylinder valves and bleed the pressure from regulators and hoses.
- ❖ Never lift cylinders by their protective caps.
- ❖ Wear safety shoes or toe protection.

STORING HYDROGEN GAS CYLINDERS

The following points are important to follow for storing hydrogen gas cylinders that are awaiting removal or are anticipated for use.

- ❖ Hydrogen gas cylinders should be stored outside and away from doors, windows, and building air intakes. Indoor storage of hydrogen requires specially designed facilities.
- ❖ Cylinders must be protected against heat, corrosive atmospheres, rain, snow accumulation, and direct sunlight. The storage area should be paved and easily accessible to delivery trucks and users with cylinder carts. Cylinder storage areas should drain readily, which may require that cylinders be placed on pallets or otherwise raised above surrounding surfaces.
- ❖ Prevent cylinders from toppling by securing them with chains, cylinder racks, or other devices approved by Safety Division.
- ❖ Hydrogen must be separated from oxidizing gases when stored. Acceptable separation is a 5-ft-high fire barrier with a half-hour fire rating or a distance of at least 20 ft.

VENTILATION AND ALARMS

- ❖ Because of its small molecular size, hydrogen can leak from apertures through which other gases cannot pass. Ventilation with large quantities of air is vital to dilute small leaks of hydrogen to below the lower flammable limit of 4% in air. Whenever possible, hydrogen should be stored and used outside, with natural ventilation, or under a shed with a nonpeaked roof and no walls. Indoor locations must have ventilation adequate to handle the largest anticipated hydrogen leak or spill. Exhaust fans must be explosion-proof.
- ❖ Wherever hydrogen is used indoors, flammable gas detection systems must be set to go off when the hydrogen concentration reaches 30% of the lower flammable limit. Sensors should be placed on or at the height of the ceiling immediately above the point of anticipated leakage. The alarm should be calibrated annually (or more often, depending on risk) with a known hydrogen gas mixture.

EMERGENCY PROCEDURES

IN AN EMERGENCY

COLD BURNS

Exposure to cryogenic materials may result in serious injury to body tissues similar to heat burns. If a worker comes in contact with liquid or cold gaseous hydrogen, he/she should be transported to the Occupational health centre for treatment. If transportation for medical treatment is not available, the affected area can be thawed with tepid water; however, the area should not be rubbed.

IF A LEAK IS DETECTED

When a hydrogen leak is discovered or when an alarm sounds, take the following steps:

- ❖ Evacuate the immediate area of all nonessential personnel.
- ❖ Shut off the hydrogen source immediately and vent all hydrogen to a safe outside location.
- ❖ Increase indoor ventilation with emergency explosion-proof exhaust fans, if possible.
- ❖ Initiate the emergency plan and make the required emergency contacts.

IN AN EMERGENCY CONTINUED

IN CASE OF FIRE

To detect a small, local hydrogen fire (the flame is nearly invisible), use a piece of tissue paper on a stick; the paper will readily ignite when it contacts a flame. If fire is present, perform the following:

1. Shut off the hydrogen source.
2. Let the fire burn itself out. (If the flame is snuffed out, it may reignite and cause greater damage.)
3. If you have received hands-on training in the proper operation of a water fire extinguisher then you may use water spray to thermally protect people and equipment if the fire is hot enough to warrant it. However, a venting hydrogen flame cannot normally be extinguished with water.

4. Initiate the emergency plan (which should include calling the fire department) and make the required emergency contacts.

Ultraviolet/infrared detectors and alarms should be installed on systems with the potential for large leaks.

PROCEDURE FOR PERFORMING HOT WORK INSIDE FUEL OIL TANK

1. Bring down the oil level inside the tank to minimum
2. Empty the oil inside the tank completely.
3. Isolate all the incoming & outgoing valves & provide dummies
4. Open the top & bottom manholes.
5. Provide fans at the bottom & top man holes
6. Allow sufficient air circulation till all the toxic gases are removed.
7. Take air samples at top & bottom and conduct air analysis & oxygen deficiency tests. Ensure that no combustible gases are present and oxygen content is more than 20.5%.
8. Grant permission to personnel to enter inside the tank to remove the sludge. The person should be physically fit. Adequate work rest intervals should be planned to prevent fatigue. The person should wear gumboot. A person should be posted as standby outside the tank, till the completion of the work so as to rescue the person inside the tank in the event of an emergency, preferably the outside person holding the life line of the safety belt harness worn by the person inside the tank.
9. Remove the sludge completely
10. Purge the inside of the tank with steam.
11. Clean the sides & bottom of the tank with cleaning agent, followed by hydro wash.
12. Take air analysis & oxygen deficiency test.
13. Sprinkle sand at the bottom.
14. Ensure proper earthing of the tank.
15. Use only 24V supply for illumination
16. Ensure the area in the vicinity of the tank free of combustible material
17. Keep first aid fire extinguishers ready for operation
18. Post one fire man for emergency.
19. Ensure proper ventilation of air through bottom & top man holes.
20. Grant permission to the gas cutter / welder for work.
21. Ensure the supervision of an experienced & qualified person at site throughout the period of work.
22. Inspection by fire monitoring staff before the commencement of the work and surveillance after the completion of the work is suggested.