Project Occupational Health & Safety Management Plan

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1. INTRODUCTION:

This PROJECT OCCUPATIONAL HEALTH & SAFETY MANAGEMENT PLAN describes the "OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM" going to be followed for 'Project'

This Project Safety Management plan will be implemented at Project Site

It demonstrates the ability to consistently provide concern intended for Safety and Health of its employees including safety of sub-contractor's employees, and to meet all applicable legal requirements and specifications.

This Plan aims to enhance health & safety practice at Project site and satisfactory performance through effective application of the system, including the processes for the continual improvement of system and the assurance of conformity to objectives set.

This Plan describes various OH&S Procedures, Guideline System Implementation Formats, Checklists and Work Instructions.

Site Management shall follow this plan, and if necessary modification shall be made as per site specific requirement.

2. SCOPE OF WORK

Detail engineering, procurement of materials and bought out components, shop fabrication, assembly, inspection, testing, surface preparation, painting, insulation, transport to site, erection, alignment and levelling .

REFERENCE PUBLICATION: -

- BS OHSAS 18001:2007, Occupational Health & Safety Management System Specification.
- Contracts Documents.
- HSE – Guide

3.0 TERMS AND DEFINITIONS

Acceptable risk: Risk that has been reduced to a level that can be tolerated by the organization having regard to its legal obligations and its own **OH&S policy**.

Audit: Systematic, independent and documented process for obtaining "audit evidence" and evaluating it objectively to determine the extent to which "audit criteria" are fulfilled.

Continual improvement: Recurring process of enhancing the Occupational Health and Safety Management System, in order to achieve improvements in overall Occupational Health and Safety performances, consistent with the organization's Occupational Health and Safety Policy.

Corrective action: Action taken to eliminate the cause of a detected nonconformity or other undesirable situation in order prevents recurrence.

Document: Information and its supporting medium.

Hazard: Source, situation, or act with a potential for harm in terms of human injury or ill health or a combination of these.

Hazard identification: Process of recognizing that a hazard (see 3.6) exists and defining its characteristics.

Ill health: Identifiable, adverse physical or mental condition arising from and/or made worse by a work activity and/or work-related situation.

Incident: Work-related event(s) in which an injury or ill health (regardless of severity) or fatality occurred or could have occurred.

Interested party: Person or group, inside or outside the work place, concerned with or affected by the Occupational Health and Safety Management System performance of an organization.

Non-conformance: Non-fulfillment of a requirement

Occupational Health and Safety: Conditions and factors that affect, or could affect the health and safety of employees or other workers (including temporary workers and contractor personnel), visitors and any other person in the workplace.

Occupational Health and Safety Management System: Part of an organization's management system used to develop and implement its Occupational Health and Safety policy and manage its Occupational Health and Safety risks.

Occupational Health and Safety objective: Occupational Health and Safety Goals, in terms of Occupational Health and Safety performance that an organization sets itself to achieve.

Occupational Health and Safety performance: Measurable results of an organization's management of its OH&S risks.

Occupational Health and Safety policy: Overall intentions and direction of an organization related to its OH&S performance as formally expressed by top management.

Organization: Company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

Preventive action: Action to eliminate the cause of a potential nonconformity, or other undesirable potentially situation.

Procedure: Specified way to carry out an activity or process.

Record: Document stating results achieved or providing evidence of activities performed.

Risk: Combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure.

Risk assessment: Process of evaluating the risk(s), arising from hazard(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable.

Work place: Any physical location in which work related activities are performed under the control of the organization.

4.0 OH & S MANAGEMENT SYSTEM ELEMENTS

4.1 GENERAL REQUIREMENTS:

Site Management should establish & maintain the OH&S Management System (OHSMS) that conforms to all of the requirements of Project.

4.2 PLANNING:

4.2.1 Planning for hazards identification, risk assessment & determining controls.

Hazards & risks shall be identified and feasible control measures to be proposed at planning stage by the Project HSE officer, project Manager and Works manager to eliminate, reduce or isolate the potential hazards in its each section with the help of procedure**.** Depending upon the risk level of each hazard, appropriate control measures will be proposed keeping in view of various legal, specifications and contractual requirements.

The site management should keep its documentation, data & records concerning the identification of hazards & the assessment & control of risks up –to –date in respect of its ongoing activities & also extends them to cover new developments & new or modified activities, before those are introduced.

Review of hazards identification, risk assessment & determining control:

The hazards identification, risk assessment, & determining control process should be reviewed at the pre-determined time or period. The period can vary depending upon the following considerations: -

1. The nature of the hazards.
2. Hazard having legal requirement
3. The magnitude of the risk.
4. Changes in work environment.
5. Changes/ addition in the processes/activities.
6. Changes in raw materials, chemicals etc.
7. After any incident or as a part of improvement made.

4.2.2 List of Equipment

1. EOT Crane (20MT)
2. Air compressor
3. Flame cutting machine
4. Welding machine

5. SAW machine
6. Welding generator
7. Welding rectifier
8. D.G. set
9. Telescopic crane (50 MT)
10. Bevelling machine
11. Shearing machine

4.2.3 OCCUPATIONAL HEALTH

Project shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.

- For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.
- To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.
- Appropriate respiratory protective devices shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.
- Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipments.
- For jobs like drilling/demolishing/dismantling where noise pollution exceeds the specified limit of 85 decibels, ear muffs shall be provided to the workers.
- To avoid upper limb disorders and backaches, Display Screen Equipments workplace stations shall be carefully designed & used with proper sifting postures. Power driven hand-field tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good circulation in hands.
- The project shall arrange health check up for all the workers at the time of induction. Health check may have td be repeated if the

nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. EIL/Owner reserves the right to ask the contractor to submit test reports. Regular health cheek-ups are mandatory for the workers assigned with Welding, Radiography, Blasting, Heavy Lift and Height (>2m) jobs. All the health check-ups shall be conducted by registered Medical practitioner and records arc to be maintained.

- The project shall ensure vaccination of all the workers including their families.

4.2.4Legal & Other Requirements:

The site management should identify and follow the various legal and other statutory requirements applicable during the course of execution and keep up date in the form of "Register of Regulation" (ROR) to ensure the compliance with all applicable statutory regulatory and other requirements.

The site should also identify and follow other than specified legal and other contractual requirements applicable at site during course of execution.

4.2.5Objectives and Programmes:

In order to meet the requirements of the Occupational Health & Safety Policy the following objectives have been set.

1. Minimize risk to our employees and other interested parties who may be exposed to OH & S risks associated with our activities.
2. Continual improvement of the OH & S Management System.
3. Reducing the frequency of all incidents and minimizing/eliminating loss of man days.
4. Train and retrain the Site Personnel for enhancing their competence and expertise with the view to reduce accidents/incidents.

5. Procure best quality and ensure use of Personal Protective Equipment (PPE) thus minimizing the exposure to physical risks.
6. Integrate OH & S with other business processes.

The site management should establish their objectives & Programmes in the line with Corporate OH&S Objectives as per procedure for finalizing & periodical review of OH &S Objectives. The site management should prepare target plan with a reasonable & achievable time scale considering its legal & other requirements, OH&S hazards & risks, operational control measures etc. Suitable indicators should also be defined for each OH&S objectives. These indicators should allow for the monitoring of the implementation of the objectives & targets.

4.2.6 OH&S Management Programme:

As per IMS procedure for OH & S Management Programme, the Site Management should establish OH & S Management Programme for achieving its Objectives & Targets. In OH & S Management Programme the site management should identify the individuals who are responsible for delivering the OH & S objectives (at each relevant level) and also identify the various tasks, which need to be implemented in order to meet each of its OH & S Objectives.

4.3 IMPLEMENTATION & OPERATION:

4.3.1 Resources, Roles, Responsibilities accountability and authority: -

As per procedure for Structure & Responsibility**,** implementation of this project safety management plan along with other project requirements would be the responsibility of every individual working in the project site. It will also be the responsibility of AC personnel to educate his partners / suppliers / sub contractors etc in successful implementation of this plan. It shall be the collective responsibility to create and maintain safe and healthy work environment within the project area. The responsibility and authority matrix of the site personnel are as given below.

Responsibility and Authority Matrix

Sr .No.	Activity	Project Manager	PCH, PEM, PEE & SIC	HSE-Incharge	Store Manager	Site Engineer/ Supervisor
1	Implementation of OH&S Management System	X	X	P	X	X
2	Hazard identification, Risk assessment & Risk control.	X	P	P	P	P
3	All applicable Legal and contractual requirements	X	P	P	P	P
4	Setting of OH&S Objectives and target to achieve the objective.	X	X	P	X	X
5	Implementation of OH&S management Programs to achieve the above safety objectives.	X	X	P	X	X
6	Implementation of operational control in each activity as per risk assessment.	X	P	P	P	P
7	Impart safety training, awareness, induction and toolbox talks.	X	P	P	P	P

8	Implementation of consultation and communication at site, safety committee etc.	X	P	P	P	P
9	Documentation /Document and data control	X	X	P	X	X
10	Preparation and implementation of Emergency Preparedness & Response	X	X	P	X	X
11	Accidents, incidence investigation, reporting and implementation of corrective & preventive action	X	X	P	X	X
12	Performance monitoring and measurements.	X	X	P	X	X

X – Responsibility P – Performer

4.3.2 Competence, Training & Awareness:

Site Management should establish and impart a systematic programme of safety induction & ongoing training for safety as per procedure for training to all the employees including contractors, temporary workers, visitors etc. Site Management should also conduct training for performing hazards identification, risk assessment & risk control measures. Daily tool box talks must be delivered to all workmen in each shift to ensure the system implementation and make them aware the hazards and risk associated with their day to day operations.

4.3.3 Communication, Participation and Consultation:

To ensure the effective two way communication of information related to occupational health and safety to personnel, the site management should establish **Site HSE Committee** as per procedure for consultation and communication**.** The safety committee meeting will be held minimum once in a month. The Project Manager will be the chairman and OH&S in charge will be the secretary of site safety committee.

The site safety committee should have the representatives from both management and employees. The safety suggestion boxes and feedback /suggestion register should also be provided at different locations for the suggestions from all interested parties for continual improvement in existing system.

Construction HSE Committee shall also be formed as per contract requirements and held at least once in a week.

4.3.4Documentation:

Site needs to follow this project safety management plan as a document for the implementation of the OH&S Management System. This plan describe the inter relation between the various safety procedures & the requirements.

4.3.5Document & Data Control:

The documentation & data should be available & accessible when required, under routine & non – routine conditions including emergencies. For examples this should include Material Safety Data Sheet, Layout & Instructions for the operators.

4.4.6 Operational Control

As per safety procedure for Operational Control, we have the safety work instructions for different activities for safe operation, which has been listed in annexure. The major activities and their operational control are.

1. **Civil Work**
   - Survey.
   - Excavation
   - Egress & access
   - Demolition
   - Working at height
   - Concreting
   - Material Handling and storage
2. **Electrical Installation and Lighting arrangement**
3. **Plant & Machinery, Equipment & vehicle, tools and tackles.**
4. **Hot Job**
   - Storage and handling of gas cylinders
   - Gas cutting operation
   - Backfire and flash back
   - Welding operation
5. **others**
   - Fire prevention and protection.
   - Heat stress
   - House keeping
   - Welfare measures
   - Weather protection

OPERATIONAL CONTROL

1. Civil Works.

Survey

- A survey team working on a roadway should be scheduled during times when traffic is the lightest. Work during rush hour on a highway, for instance, would be so dangerous as to be not feasible.
- Adequate markers, cones, and traffic warning signs, such as "Survey team Ahead", "Drive Slowly", "Single Lane Ahead", should be placed where they will be highly visible and most effective in warning drivers approaching or entering the work zone. If possible, detour traffic away from the survey party. If detouring requires two-way traffic on a single lane, a flag person must be posted at each end of the lane. Follow state and local laws.
- Signs, barriers, and survey equipment in use should be made as conspicuous as possible by the attachment of brightly colored bunting. All members of a survey party should make themselves as conspicuous as possible by wearing fluorescent colored shirts, vests, or jackets.
- If crews are placed in a situation where a vehicle may strike the survey equipment, one may have a strong impulse to attempt to rescue it. Do not attempt to rescue the instrument. An instrument can be repaired or replaced. Crew safety is far more important than the instrument.
- Exposure to extreme cold or heat, resulting in frostbite and heatstroke. Burns to exposed skin areas from prolonged exposure to wind or sun also present a hazard.
- For all weather hazards, the best preventive measure is to wear adequate protective clothing. Ears, fingers, toes and face are most susceptible to frostbite. When the weather is cold enough to cause frostbite, a hat or face mask which covers ears, gloves or mittens, and woolen socks are essential. Always layers of clothing shall be worn.

- A hat will help when exposed to the sun for long periods and keep as much of skin protected from prolonged exposure. Nobody is immune to sunburn. Even persons, who tend to tan, rather than burn, can and will burn eventually. Also everyone is susceptible to a form of skin cancer caused by prolonged and repeated exposure to sunlight.
- Poisonous Reptiles and Insects - A Basic First Aid Training shall be provided to survey team. A Basic First Aid Training Course explains how, after being bitten by a poisonous reptile or insect, one can tell from the bite whether or not the reptile or insect was poisonous.
- To avoid being bitten in the first place, the best rule is to assume that any member of the reptile family (i.e.: snakes) may be poisonous, and that any insect one can't recognize as a non-poisonous variety may be poisonous (i.e.: bees, wasps, Lyme ticks, spiders, etc.). One should be aware of signs of allergic reactions and respond appropriately & should be conscious of local warnings.
- To avoid contact with poisonous plants personnel should wear gloves and long sleeves shall be worn and all skin area shall be kept covered. While removing clothes, one should not allow the skin to come into contact with the exposed clothing.
- Survey equipment should be inspected periodically to determine if repairs or replacements are necessary.
- Only tools in good condition should be used. There should be no loose heads on any hand tools. Edged tools should be kept sharp. All tools should be stored safely when not in use.
- If tools with sharp blades or points are laid down temporarily, they should be placed in such a way that no injury can result to anyone.
- Sheaths or guards are desirable when carrying edged or pointed tools. If sheaths are not available, a tool should be carried with an edge or point away from the body and care shall be taken not to injure others with it.
- Survey rods and poles shall be carried vertically against the body so that another person's head or eyes will not be stuck and

injured. Stake or bull point shall not be held with hand around the shank while another person is driving it with a hammer. A tape, sounding line, or plumb bob line shall not slide fast through hands.

- Always setup the survey equipment a safe distance from construction equipment, and stand at a safe distance while observing its operation. Never stand on a piece of construction equipment to speak with its operator. Allow the operator to idle or shut the equipment down and dismount.
- Be aware of overhead electrical lines and electric fences. This is especially important with survey rods and poles that are made from metal. While working near overhead electrical lines proper care shall be taken and suitable distance shall be maintained.

Excavation

- Drawing showing all existing underground utilities is required for all excavations.
- Any time an unknown/unidentified subsurface utility is encountered the activity shall be stopped until the exact nature and condition of the utility can be determined through such means as additional drawing review, utility locating, and interviews.
- In the place, where excavation is to be made, the type of soil and the ground water table level shall be identified before commencing excavation.
- In case of presence of ground water at the level of excavation, dewatering shall be done by suitable method lower the water table to a level below that to which excavation is to be made.
- No excavation or earthwork below the level of any foundation of building or structure shall be commenced or continued unless adequate steps are taken to prevent danger to any person employed, from collapse of the structure or excessive settlement, which is detrimental to structure.
- Foundations, adjacent to and below which excavation is to be made, shall be supported by proper shoring, as long as the trench remains open.

- For excavation work a permit shall be issued to carry out excavation.
- Excavation work shall be carried out under the supervision of competent person only.
- All excavations greater than five feet in depth shall be shored or benched. Excavations less than five feet in depth that are not shored must be examined by a competent person and found to have no potential for cave in prior to entry.
- All excavations greater than four feet in depth must have proper access and egress. Access and egress can be in form of pathways, gangways or ladders. Two or more means of exit shall be provided if the depth of excavation is more than 20feet.
- All the excavation shall be adequately fenced, guarded or barricaded to avoid the exposure to local public.
- Excavation areas shall be adequately lighted for night work. During night hours public side walks and walkways shall be adequately illuminated.
- Warning and Danger signs shall be posted to all approaches and exits of the sites of excavation.
- Care shall be taken to keep toots or material, such as wheelbarrows, shovels, picks, tiles, cement and lumber, far enough from the edge of the trench to prevent their fall into the trench.
- No material or load shall be placed or stacked or removed near the edge of any excavation, shaft, pit or opening in the ground as it may endanger the persons employed below.
- The vehicle shall not be permitted to be driven near the lip of the excavation.
- Heavy equipment, such as excavating machinery and road traffic shall be kept back from the excavated sides at a distance not less than the depth of trench or at least 6m for trench deeper than 6m.
- Adequate and well anchored stop block shall be provided on the surface to prevent operating vehicles from falling accidentally into excavation pit.

- They shall be warned to guard against the danger arising through the sudden movement of material, which might throw them off-balance or cause them to come in path of dislodged boulders or other falling objects.
- Excavations must be clear of suffocating, toxic or explosive gases. These can seep through soil and can accumulate at the bottom of an excavation. Adequate ventilation shall be ensured.
- In places where inflammable substances are stored or present all electrical installations shall be explosion proof. Portable lamps/flash lights, if used, shall be of approved explosion proof type. Hand lamp used in such atmosphere shall be of 24V.
- All loose stones, projecting clumps of earth, pockets of unstable material which might come down on the workers in trench shall either be removed or excavated sides adequately braced and trench suitably guarded.
- Stockpiles of these materials shall be so located, as to provide easy access for withdrawing and shall not be located in immediate vicinity of overhead power-lines. Material shall not be piled against the walls as this may endanger the walls.
- Ensure that barricades, walkways, lighting and signs are used to protect the public during excavation work.
- Guardrails, fences or barricades shall be used at excavation sites next to walkways or driveways used by pedestrians or vehicles.
- Warning lights and area lighting shall be used from sunset to sunrise as needed to protect the public and employees.
- Wells, holes, pits, shafts and similar excavations shall be barricaded or covered and posted as needed to prevent unauthorized access. All temporary excavations of this type shall be backfilled as soon as possible.
- Walkways or bridges with guardrails shall be used where the general public is permitted to cross over excavations.
- The Section-in-Charge will ensure that employees are protected from loose rock or soil that could fall or roll from an excavation area.

- Installation of barricades such as wire mesh or timber as needed to stop and contain falling material or Benching may be used (when practical).
- Employees shall not work above one another in an excavation where the danger of falling rock or earth exists.
- Do not place spoils within 2 feet from edge of excavation & place it such that the rainwater runs away from excavation.
- All trenches in soil more than 1.5m deep shall be securely shored and timbered depending upon type of soil and water table.
- A competent person must make daily inspections of excavations, areas around them and protective system, before work starts and as needed.

Egress and Access

- Ramps and runways **-** If planks are used for construction, they shall be laid parallel to the length of gangway and fastened together against displacement. Planks shall be uniform in thickness and shall be provided with cleats to ensure safe walking. They shall be kept clear of excavated material or other obstruction. Wherever pathways and gangways are suspended, these must have guardrails and side supports on both sides to prevent fall of workmen into the excavation.
- Slope of Ramps **-** Slope of ramps used within the job should be in no case steeper than 1 in 4 and the total rise of continuous ramp shall not exceed 3.7 metres.

  Ramps or Runways if used for movement of vehicles into and out of an excavation must have a clear width of at least 3.7 metres and must be provided with substantial wheel guards where there is any risk of vehicles slipping sideways into the excavation.

  Every runway or ramp used for wheel-barrows shall be not less than one metre in width and is constructed of not less than 50 mm thick planking and is supported and braced suitably.

Every runway or ramp located more than 3 metres above the floor or ground shall be provided on the open sides with suitable guard rails of adequate strength.

They shall be non-slippery, strong enough & of adequate width not less than 75 cm when used for movement for men.

- Crossover **-** All trenches over which men or equipment are required to cross shall be provided with walkways with guardrails or bridges. Guardrail shall be of height 900-1200mm, with middle rail and toe board.
- Ladders **-** Excavations shall have at least one ladder per 15m of length or fraction thereof in case of hazardous work and per 30 m of length or fraction thereof in case of relatively less hazardous works. Ladders shall extend at least one metre above the top of the cut to provide a hand hold when stepping on or off the ladder.
- Lifeline - When a workman is required to enter a hazardous trench (the sides of which shall be properly braced) or to scale rock from the side slopes of a trench a safety rope (lifeline) shall be securely lied to the safety belt worn by him so that, if necessary, he may be assisted or drawn to safety.

  Lifelines shall be secured to at least two substantial anchorages or structural members. Lifelines of Polypropylene rope, used for supporting personnel on safety belts, shall be at least 20 mm in diameter.

Demolition

- Proper sequence of demolition activity must be followed.
- Relevant permit to work system (PTWS) and lock out & tag out (LOTO) must be followed.
- All roads and open areas adjacent to the Work Site shall either be closed or suitably protected.
- Any electrical cable or apparatus which may be a source of danger shall be disconnected.
- No floor, roof or other part of any building shall be over-loaded with debris or materials as to render it unsafe.

- Prior to demolition it shall be ensured that the information which is provided is sufficiently detailed to allow identification of any structural problems and the risks associated with any flammable or hazardous substance. The presence of adjoining or adjacent properties, e.g. hospitals, where noise, dust or vibration might restrict the method of demolition.
- Before demolition a detailed method statement shall be prepared and must be agreed & understood by all the employees such as:- The sequence and method of demolition, with details on means of access, working platforms and plant and equipment requirements.
- Arrangements for the protection of persons employed on site and members of the public.
- Details of the removal or making safe of electric, gas or other services.
- Methods for dealing with flammable materials and gases which may remain from previous processes or storage.
- Methods of determining the presence of hazardous substances, the means of disposal of such substances and the requirement of any protective equipment.
- Arrangement for controlling transport used for removal of waste.
- Identifying the persons with special responsibilities for the control and coordination of safety arrangements.
- On every demolition job, danger signs shall be conspicuously posted all around the structure and all doors, openings giving access to the structure shall be kept barricaded or manned except during the actual passage of workmen or equipment. However, provision shall be made for at least two independent exits for escape of workmen during any emergency.
- During nights, red lights shall be placed on or about all the barricades.
- Workmen shall be provided with the necessary safety appliances and to be educated on the use of the same. It shall be ensured that the workmen are using all the safety appliances while at work.

- If the removal of a member may weaken the sidewall of an adjoining structure and to prevent possible damage, these walls shall be supported until such time as permanent protection is provided. In case any danger is anticipated to the adjoining structure, the same shall be got vacated to avoid any danger to human life.
- The power on all electrical service lines shall be disconnected before the demolition work is started. Prior to cutting of such lines, the necessary approval shall be obtained from the electrical authorities concerned. The only exception will be any power lines required for demolition work itself.
- All the gas, water and other service lines shall be shut off and capped or otherwise controlled at or outside the building line, before demolition work is started.
- If the structure to be demolished has been partially wrecked by fire, explosion or other catastrophe, the walls and damaged roofs shall be shored or braced suitably.
- Walkways and passageways shall be provided for the use of the workmen who shall be instructed to use them and all such walkways and passageways shall be kept adequately lighted, free from debris and other materials.
- Except where the roof of a sidewalk shed solidly abuts the structure the face of the sidewalk shed towards the building shall be completely closed by providing sheathing / planking to prevent falling material from penetrating into the shed.
- Sidewalk shed opening, for loading purposes, shall be kept closed at all times except during actual loading operations.
- All existing fixtures required during demolition operations shall be well protected with substantial covering to the entire satisfaction of the rules and regulations of the undertakings or they shall be temporarily relocated.
- Before demolition work is started, glazed sash, glazed doors and windows, etc, shall be removed. All fragile and loose fixtures shall

be removed. The lath and all loose plaster shall be stripped off throughout the entire building. This is advantageous because it reduces glass breakage and also eliminates a large amount of dust producing material before more substantial parts of the buildings are removed.

- All well openings, which extend down to floor level, shall be barricaded. This provision shall not apply to a storey after structural demolition has barricaded to a height of not less than one meter above the floor level.
- The demolition shall always proceed systematically storey-by-storey in descending order and the work on the upper floors shall be completely over before any of the supporting members or other important portion on the lower floor is disturbed. These requirements shall not prohibit the demolition of structure in sections, if means are taken to prevent injuries to persons or damage to property.
- The stability of structure depends on the interaction of its component parts. An incorrect sequence in the removal of these parts can result in a premature and unplanned collapse.
- Walls shall be removed part by part. If the walls are very thin and dangerous to work by standing over them Stages/Work-platforms shall be provided for the men to work on.
- No section of wall whose height is more than 15 times of thickness, shall be permitted to stand without lateral bracing unless such wall is in good condition and was originally designed to stand without such lateral bracing or support.
- Structural or load supporting members on any floor shall not be cut or removed until all the storeys above that floor have been demolished and removed.
- Before demolishing any interior or exterior wall within 3m of the opening in the floor, immediately below, such opening shall be substantially planked over, unless access is denied to workmen to that portion of the area of the floor immediately below the opening,

in the floor of the storey being demolished, where any debris pieces passing through this opening may fall.

- In framed structures, the steel frame may be left in place during demolition of masonry work. Where this is done, all steel beams, girders, etc, shall be cleared of all loose materials as the demolition of masonry work progresses downward, provided it is still strong enough to stand as an independent structure.
- Walkways shall be provided to enable workmen to reach or leave their work on any scaffold or wall. Such walkways shall be not less than 3 planks, nor less than 0.8 m in width.

Working at height

- Approved drawing must be followed for scaffolding.
- The metal platform MUST NOT have more than 6 mm of the curvature & must be non-slip type.
- The minimum width of the walkways for the scaffold must be 60 cm. It should be 90 cm in the areas where the personnel deposits material also.
- The plank used as a work surface in the scaffolds & platforms must have the following dimensions: -
  a. A minimum thickness of 5 cm.
  b. Width minimum 23 cm & maximum 30 cm.
  c. Bay or length: maximum value 1.80 meter.
- The platform provided shall have a guardrail of at least 900mm height.
- Platform more than 6m height shall be provided with safety nets and lifeline for safety belt.
- All scaffolds or working platforms of any nature shall be securely fastened to the building or structure, or if independent of the building shall be braced or guyed to prevent sway.
- Men shall not be allowed to work from scaffolds during storms or high winds.

- When work is being performed above a scaffold platform a protective overhead covering shall be provided for the men working on the scaffold.
- All the scaffolding should be inspected and allowed for work as per the Scaf –tag system
- All activity carried out at a height of 2m or more shall be considered as working at height.
- Competency & medical certificate shall be check before deployment of personnel for working at height.
- Ensure that the persons required to work at height are of sound health and other phobia of working at height.
- The personnel will work from a fully completed approved scaffolding or approved man cage.
- Facilities to work at height and means to reach the work place at height i.e. (access & egress) safety shall be provided.
- The passageways, platforms and other working surface and area free from dust, debris, water, grease ,oil and other obstacles that may cause slip or trip.
- Ensure working platform provided with hand rails and toe boards.
- Check tools and tackles are attached with safety slings are secured against fall.
- Ensure adequate illumination at work place.
- Related training and tool box talks should be carried out site level
- All required PPE and safety equipments should be used as require.
- All the operation and driving trial test to be conducted by site PEM & HSE Dept.
- Follow permit to work for working at height.
- Ladders shall be securely fixed near the top or, if impracticable, near the bottom to prevent undue swaying.
- The width of ladder shall not be less than 300mm.
- On a firm level footing with wooden or metal wedge to prevent slip.

- Extend at least 1.00m above landing place, unless other suitable handhold is provided.
- Sufficient clear space of at least 300mm at each rung.
- They should be placed at an angle of approximately 75 degree or 1:4 ratio.
- Fixed ladder should be provided for flights above 4m.
- Fixed ladder should have landing of minimum 600mm extent at intervals not greater than 6m.
- Every ladder and stepladder shall be of good construction, sound material and adequate strength.
- Damaged ladder must be discarded immediately.
- No make shift arrangement to be followed inplace of ladder.
- Regular inspection must be done.
- All the components of ladder must be confirm to IS code / accepted standards.

Concreting

- During concrete placement all employees placing concrete should wear hard hats, gloves, and rubber boots with trouser legs outside.
- Men in good physical condition should be employed to operate vibrators.
- At each level of the chute where men work, landing platforms shall be provided and the chute shall be properly guyed.
- The area below the spout shall be barricaded when practicable to keep people out of the areas.
- All concrete buckets shall be equipped with safety catches that must be manually released before the concrete can be dumped.
- Drifting the bucket by swinging the crane shall be prohibited.
- Only those trained signalmen should be employed to direct the spotting of buckets.
- Workman/inspectors shall not enter a bin unless wearing a safety belt with lifeline attached and attended by another worker.
- All mixer gears, chains and rollers shall be guarded.

- The cable and sheaves should be inspected daily when the mixer is in continuous daily operation.
- During inside cleaning, repairs or inspection, the control switches shall be locked and notice to the effect pasted.
- LOTO system should be followed while cleaning, chipping for mixers.
- The scaffolding supporting the pipe shall be designed to carry the pipe when filled with concrete plus 100 percent overload, plus the estimated weight of the maximum number of workmen. A factor of safety of four shall then be used.
- Conduct daily pre-operational checks on all the equipment, including the hose, before starting work.
- Locate any nearby power lines and consider the height and reach of equipment and how it will be used – use a safe system of work.
- Consider setting up equipment in the optimal location for both safe use/operation of the equipment.
- The pipeline shall be anchored at all curves and near the end.
- The toggle and flange connections shall be inspected before each placement to ensure tight joints.
- Air release valves shall be installed at high points to release entrapped air.
- The work of cleaning a pipeline must be carefully done. Experienced workmen should be employed.
- Workmen must know the hazard associated and its severity.
- The pump operator should be trained and competent to use operational manuals and equipment.
- Ensure electrical safety including safeguards from nearby power lines.
- A leaking pipe, coupling, joint etc. present a high risk and should be reported immediately to the pump operator. If the leak is not fixed promptly, the situation should be reported to the foreman. No-one should be within 10 meters of a leaking pipe, connection etc. unless the pump is stopped.

- Persons must never place hands, heads or any other body part into a hopper.
- Pump operators should test pipes and other equipment monthly and record the results in a log book
- Pumps are required to display the range of safety sign stickers specified to warn persons of various hazards.
- mixer drivers should report any safety problems to the pump operator or foreman for action and should not discharge concrete into suspect pumps follow the precautions recommended
- The pump operator must stop pump operation if a blockage or leak cannot be fixed immediately.
- Water rather than air should be used for cleaning and only experienced and trained workers should carryout line cleaning.
- Stand clear of pump lines and couplings where practicable
- The pipeline must be free of internal pressure before disconnecting a pipeline connection or fitting and must not be left unattended until then-
- Workers should be removed from the discharge end while the concrete is under pressure and any workers involved should wear protective clothing.
- The pipeline must not be dismantled for cleaning or other purposes until pressure is relieved. An air relief valve as well as the air entry point to the pipeline is needed to relieve pressure from the system.
- No person should stand between the reversing concrete delivery truck and the hopper.
- Only pump operator is authorized to carry out cleaning of pump.
- Only trained & competent person must be deployed for cleaning activity.
- Appropriate tool must be used for cleaning purpose.
- Cleaning of pump must be done under the supervision of competent person
- .Permit To Work System must be strictly followed.

- While cleaning the pump all the power connections must be disconnected from power source.

Material Handling and storage

- Storage shall be planned to reduce the amount of materials handling, so as to reduce hazard and injury to workmen
- All materials in bags, containers, bundles or stored in tiers shall be stacked, blocked and limited in height so that it is stable and secured against sliding or collapse.
- Temporary and permanent storage of materials shall be secure, neat, and orderly to eliminate hazards and conserve space.
- All the exits and aisles shall be kept clear at all times.
- All the materials shall be labelled and stacked size wise.
- Bins and racks shall be used to facilitate storage and reduce hazards.
- Racks shall be secured to the floor, the wall, and to each other.
- Workmen shall not be allowed to climb on racks: Self-supporting Stepladders of adequate height shall be used to place or remove materials on racks.
- Adequate number of fire extinguishers and fire buckets shall be kept inside store building. Also, Battery operated Smoke Detectors may be provided depending on the volume and the value of materials stored.
- Materials shall be stacked in such a way that they do not block fire detection equipment mounted on the ceiling or wall.
- Storekeeper shall be trained on use of fire extinguisher.
- Materials shall be segregated as to kind, size and length and placed in neat, orderly piles that are safe against falling. If the piles are high, they shall be stepped back at suitable intervals in height. Piles of materials shall be arranged so as to allow a passageway of not less than 1 m width in between the piles or stacks for inspection and removal. All passageways shall be kept clear of dry vegetation.

- Materials shall be stacked on well drained, firm and unyielding surface. Material shall not be stacked so as to impose any undue stresses on walls or other structures,
- Materials shall be stacked in such a manner as not to constitute a hazard to passersby.
- When the materials have to be handled manually, each workman shall be instructed by his foreman or supervisor in the proper method of lifting heavy objects. Workmen shall be provided with suitable equipment for his personal safety as necessary. Supervisors shall also take care to assign enough men to each lifting job; the weight carried by each man shall be determined by the distance to be moved, difficulty of movement presented, time required, etc.
- Whenever any stack exceeds 1.5 m height, suitable and safe means of access shall be provided for the use of workmen and such means of access shall not disturb the stability of the stack.
- Appropriate signs shall be placed at all storage locations where special conditions exist or where special precautions are necessary.
- Timber shall be stacked on unyielding and level dunnage. Cross strips or cross piling shall be used where the pile is more than 1 m high.
- The top of each pile shall be kept as level as possible when timber is being removed.
- No nails shall be allowed to protrude so as to cause any injury.
- At least two men shall carry long boards, and care shall be exercised at corners and crosswalks.
- During cement handling ensure person wear protective clothing, respirators and goggles,
- Cement bags store in a building or a godown in which the walls, roof and floor are completely weather proof.
- Do not stack bags against the wall. Similarly don’t pile them on the floor unless it is a dry concrete floor. If not, bags should be stacked on wooden planks or sleepers.

- Ensure that pile should not more than 15 bags high and arrange the bags in a header and stretcher fashion.
- Bags shall be removed uniformly from the top of the piles to avoid tipping of the stack.
- Do not stack bags on the ground for temporary storage at work site. Pile them on a raised, dry platform and cover with tarpaulin or polythene sheet.
- Bulk cement stored in silos or bins may fail to feed to the ejections system. When necessary to enter a silo or bin for any purpose, the ejection system employed shall be shut down and locked out. When necessary for a workman to enter such storage area, he shall wear a lifeline, with another workman outside the silo or hopper attending the rope. Work permit system shall be implemented for carrying out this work.
- Pipe shall be stacked on solid, levels sills and contained in a manner to prevent spreading or rolling of the pile. Where high quantity storage is necessary, suitable packing shall be placed between succeeding layers to reduce the pressure and resulting spreading of the pile.
- Orderly storage as to sizes and lengths enhance access and removal operations.
- In loading pipe or transit, it shall be so secured as to insure against displacement.
- While handling piles or poles taglines shall be used to control movement of them.
- Reinforcement steel shall be labelled and stored on firm ground according to length, size and shape, and shall be piled in such a manner as to prevent tipping or falling.
- Steel shall be stored on a solid foundation with adequate number of wooden packing below.
- Adequate spacing shall be maintained between piles to ensure safe access.
- Structural steel shall be carefully piled to prevent sliding or tipping.

- Tag lines shall be used to control the movement of the load during handling Reinforcement or structural steel when a crane is employed.
- As far as possible, lifting and carrying of heavy materials manually shall be avoided.
- During loading and unloading of heavy items workman shall stand clear of material being moved by crane.
- The slings and the ropes used shall be of adequate load carrying capacity.
- During loading and unloading from the motor vehicles ensure vehicle shall be properly blocked while being loaded or unloaded; Ladder shall be used to climb up/down the vehicle.
- Load on the vehicle shall be secured adequately so that the load does not slide down. If the width of the load exceeds that of the vehicle, red lights/flag shall be provided on all the corners of the vehicle to caution other vehicles on the road.
- Unloading shall be started from top.
- When motor vehicles are being loaded or unloaded near passageways or walkways, adequate warning signs shall be placed on each end of the Vehicle to warn pedestrians and the drivers of the other vehicles.

Storage and handling of Oxygen and Fuel-gas cylinders

- Floor of the storage area shall be level and free from undulations.
- Gas cylinders shall be kept away from sources of heat / direct sunlight /sparks.
- Cylinders shall be stored in a well-protected, well-ventilated, dry location, well away from highly combustible materials.
- Cylinders shall be stored in definitely assigned places away from stairs or passageways. Assigned storage spaces shall be located where cylinders would not be knocked over or damaged by passing or falling objects.

- Cylinders containing oxygen and combustible gases, such as acetylene and hydrogen should not be stored in the same room.
- All Gas Cylinders shall always be stored upright and chained to prevent from falling down.
- Particular care shall be exercised while handling oxygen cylinders because if a full cylinder falls and its valve is damaged, it will effectively become a deadly flying missile with a potential to knock off a brick wall. Hence these cylinders should be moved with their valve caps tightly screwed in place.
- All cylinders shall be protected against excessive rise in temperature. Cylinders may be stored in the open, provided they are protected against inclemency of weather. During winter, cylinders stored in the open shall be protected against accumulation of ice or snow. Warm (not boiling) water shall be used to thaw ice in cylinder valve outlets.
- Cylinders stored in the open shall be screened against the continuous direct rays of the sun.
- Cylinders containing oxygen shall be stored separate from cylinders fuel-gases. Minimum 20 feet distance shall be maintained between the storage areas.
- Valve protection caps, when provided for, shall always be in place, hand-tight, except when cylinders are in use or connected for use.
- Sufficient number of fire extinguishers and Fire Buckets of sand shall be kept at the storage shed.
- If cylinders are unloaded from truck manually a strong wooden ramp shall be used.
- Cylinders may be moved by tilting and rolling them on their bottom edges; dragging and sliding shall be avoided. When cylinders are transported on a hand truck, they shall be secured in position. Cylinders shall not be dropped or struck, nor shall they be permitted to strike each other violently.
- Valve-protection caps shall not be used for lifting cylinders. Valve-protection caps are designed to protect cylinder valves from damage. Before raising cylinders provided with valve-protection caps from a

horizontal / an inclined position to a vertical position, the cap shall be turned clockwise to see that it is hand-tight, then the cylinder shall be raised by grasping the cap.

- A suitable cylinder truck shall be used to keep cylinders from being knocked over while in use.
- Cylinder valves shall be closed before moving cylinders and when work is finished.
- Cylinders shall be kept sufficiently far away from the actual Welding or cutting operations so that sparks, hot slag, or flames might not reach them.
- Cylinders shall not be placed where they might become part of an electric circuit or earthing layouts.
- Cylinders shall never be used as rollers or supports, whether 'full' or 'empty'.
- The numbers and markings stamped on cylinders shall not be tempered with.
- Empty cylinders shall be marked 'empty' segregated from full cylinders and promptly returned to the supplier with valve-protection caps in place. Valves of the cylinders shall be closed.
- No one shall tamper with the safety devices provided in cylinders or valves.
- When transporting cylinders by a crane or derrick, a cradle shall be used. Slings or electric magnets shall not be used for this purpose
- Cylinder Trolley / Hand Carts shall be used to shift a set of Oxygen & Fuel Gas Cylinders along with the other accessories.

Handling and storage of flammable materials

- Paints, varnishes, thinners and other flammable materials shall be kept in property sealed or closed containers. The containers shall be stored in a well ventilated, free from excessive heat, smoke, sparks or flame. A separate shelter shall be provided for storing these materials.

- Paint materials in higher quantities other than required for daily use shall be kept stocked under regular storage place.
- Paint scrapings and paint-saturated rags and debris shall be removed daily from the premises and, preferably, destroyed by burning at a safe place.
- Ventilation adequate to prevent the accumulation of flammable vapours to hazardous levels of concentration shall be provided in all areas where painting is done. When electric lights, switches or electrical equipment are necessary, they shall be of explosion-proof design.
- Fire Buckets and foam type shall be kept ready for use in case of fire.
- No smoke or open fire, exposed heating elements, or other sources of ignition of any kind shall be permitted in areas or rooms where spray painting is being done.
- In general, flammable materials must not be stored near exits, electrical equipment or heating equipment. They should always be stored in a separate, well-ventilated storage area, away from potential sources of ignition. if the material is removed from its original container, it must be placed into a container that is appropriate for flammable materials.
- A separate shelter shall be provided for storing flammable materials.
- Flammable materials shall be stored in accordance with the relevant regulations and rules so as to ensure the desired safety during storage. Explosives like detonators shall be stored in accordance with the existing regulations of Indian Explosives Act.
- Operations in connection with handling, storage and issuance of flammable liquids shall be under the supervision of qualified and experienced persons.
- Workmen shall be required to guard carefully against any part of their clothing becoming contaminated with flammable fluids. They shall not be allowed to continue work when their clothing becomes so contaminated.

- Petroleum products delivered to the job site and stored there in drums shall be protected during handling to prevent loss of identification through damage to drum markings, tags, etc. Unidentifiable petroleum products may result in improper use, with possible fire hazard, damage to equipment, or operating failure.
- Bulk delivery and storage of petroleum products requires the same care in identification, and particular attention to fire hazards during handling.
- Outdoor storage of drums requires some care to avoid contaminations. Moisture and dirt in hydraulic brake and transmission fluid, gasoline, or lubricants may easily cause malfunction or failure of equipment, with possible danger to personnel. The storage area should be free of accumulations of spilled products, debris and other hazards.
- Compressed gases and petroleum products shall not be stored same building or close to each other.
- For bulk storage of petroleum (petrol, diesel etc.) and the like, the storage shall comply strictly with the specifications given in the Petroleum Rules (and with the relevant act).
- Protect hoses, connections and containers from damage and inspect them regularly for signs of wear.
- To prevent fires, flammable materials must be properly managed in the workplace. There are three main ways to prevent fire.
- Do not let hazardous waste, used at the work site in proper container.
- Keep flammable materials separate from other processes and storage areas.
- Provide proper ventilation to ensure flammable vapours do not accumulate.
- Install properly designed ventilation in storage area.
- Ensure that processes that use or make flammable materials do not exhaust back in the work site.

- Ventilation system must be properly maintained and comply with the building codes.
- Ground and bond all work and ignition proof equipment.
- Ensure that there is smoking in work areas where flammable materials are stored or used.
- Never store flammable materials near hot equipments or open flames.
- Use intrinsically safe and non sparking tools.

2. Electrical Installation and Lighting

- Employ qualified electrician who have competency certificates from statutory authority
- Display electrical equipment & cable routing layout
- All electrical installation to be tested & commissioned as per BIS codes and IER.
- Have all conductors of adequate current carrying capacity and all joints in conductors should be properly soldered and insulated inline to the industrial use.
- Be earthed/grounded properly from at least two distinct earthing sources
- Be not liable to be damaged by water, dust or electrical, thermal or chemical action, to which they may be subjected
- Be installed at such a location that dumpers or wagons do not come on contact with same.
- Usage of ELCB / RCCB is mandatory for distribution of power supply from the panels for foolproof safety of the personal.
- All electric wires carrying voltage 440 volts and above installed underground should be in the form of insulated lead covered cables, armored effectively against abrasion and effectively grounded.
- Each electrical equipment in use should bear the essential details of voltage, amperage and short circuit dia, etc.

- All places where electrical apparatus is installed should be adequately ventilated in order to ensure proper cooling of the apparatus and dilution of flammable gases.
- Protection of electrical circuits

  Current operated ELCB/RCCB are to be installed in all distribution boards and their final sub-circuits. The sensitivity of such ELCB/RCCB should be 30 mA

  i. Semi enclosed fuse units are prohibited
  ii. Where compressed air work is carried out, dry- type transformers should be used.
- ELCB / RCCB test kit must be used on regular basis to check the effectively of ELCB / RCCB.
- Safe access shall be provided for D.G room, DBs and SDBs.
- Rain protection shall be given for all electrical installation.
- Double Earthing shall be provided for all electrical installations like DBs and SDBs.
- Rubber mat shall be provided in D.G room / Electrical Panel Room.
- Wastage bin shall be provided near D.G room to collect oil immersed cotton wastages.
- Covers shall be provided for all temporary electrical installations to prevent accidental contact with electrical circuits.
- Electrical Engineer shall make sure that electrical equipment is in safe operating condition and to have it repaired, or replaced when necessary.
- Maintenance or repair of any electrical tool or machinery shall be done when the power is OFF.
- When working in wet condition, make sure that cords/db are not lying in water.
- Damaged tools shall be removed from service until repaired or replaced.
- Electrical equipments/machineries shall be guarded adequately.
- Workmen shall not wear swinging watch or key chains while working on electrical or moving machinery.

- Workmen shall avoid wearing rings on the hands or metal on the arms if there is danger that such metals might make contact with energized circuit.
- The lines/ equipments required to be brought under shutdown shall be planned and approved by the concerned authority.
- Work permit shall be taken from the authorized issuer by the authorized receiver. The work permit shall indicate all the relevant information.
- After receiving the work permit, the receiver will witness that the Line/ Equipment is isolated and properly earthed. Also it is to be ensured that the proper tags/ interlocks provided are kept in position throughout the work. The receiver portion of the Tag is to be kept with the receiver at the time of working.
- After the shutdown, the line crew shall conduct Voltage detection testing to confirm that the Line / Equipment is completely De-Energized.
- “MEN ON LINE" caution board shall be hung on the controlling switch.
- The line crew shall install Discharge Rods/ Protective grounds prior to the start of the job for passing the residual current to earth. The earth terminal of the Discharge Rod/ Protective grounds is to be connected at the line/ equipment of which shutdown is availed.
- The job shall be executed as per the applicable standard safety norms.
- After the job is completed, it shall be checked that all tools / equipments used are taken out of the area and no body is close to the area. The discharge rod shall be removed, first from the line/ equipment under shutdown and then from the earth.
- Now the receiver of the Work permit / Tag slip shall check the work spot and after ensuring that it is fully safe to charge the line/ equipment, he shall go to the issuer and hand over the same with clearance for charging the line / Equipment.
- After charging the line/ equipment the work shall be closed with the issuing authority.

- Line clearance permit shall be obtained from authorized person if the controlling switch is operated by client or others.
- Caution board shall be hung in the FDBs indicating the circuit number where the fuses shall not be inserted.

Lock Out & Tag Out (LOTO) Procedure

- A safe lockout and tagging procedure shall be established prior to work on or near electrical equipment or lines, mechanic, pressure systems, and lines or equipment containing dangerous or hazardous material which can be energized, pressurized, activated, or released remotely or inadvertently.
- A safe lockout and tagging procedures is an operating procedures by which a person, action individually or as a member of a maintenance crew, may have a machine or part of a machine or equipment removed from and held out of service until released by that person. A tag indicating **"Danger! Do not operate"** or the equivalent shall be placed at the power source of the equipment being serviced.
- A safe lockout and tagging procedure shall be strictly followed in securing electrical systems, machinery, pressure systems, and rotating equipment.
- Power shall be turned off, tagged, and locked in the open position at the master switch or at the main breaker. Gears, agitators, or transmissions shall be mechanically locked out or disconnected.
- Padlocks shall be used and the person working on the equipments shall be in possession of a key.
- A safe lockout and tagging procedure shall be required on all systems and equipments if the unauthorized removal or return to service could result in injury, damage, or loss.
- Any required safe lockout and tagging procedures shall be included in an activity hazard plan. Safety meetings shall be held to familiarize designed persons on the site with the procedure, including person responsibilities, and the system for safe lockout and tagging

procedures. This shall include all signs, tags lockout, and other devices to be used.

- A lockout device that only accommodates one padlock shall not be used as the lockout may involve more than one system.
- No key shall fit more than one lock.
- The person issued with a lock shall only be issued with one key. The spare key and the master key shall be held in a secure place by the supervisor and kept well apart from the primary lock and key storage box.
- Locks shall be distinctly numbered and no repetition of numbers allowed. Locks can, also be colour coded to identify the user's department (i.e. electrical, mechanical, etc.)
- The most basic form of safe lockout and tagging is given below- Removing the keys from vehicle ignition locks and placing warning signs instructing employees that the vehicle is under repair.
- Locking - off the power supply to equipment, such as carpentry machinery, to prevent unauthorized use or to ensure complete safety when repairing the machine and power supply point.
- Locking the doors and posting warning signs on areas or locations which present hazards to unauthorized personnel.
- After the switching operation has been performed, the switchmen shall, whenever possible, lockout the controller and /or attach Hold Tags as the case may be. The purpose of Lockouts and Hold Tags is to make sure the Controller remains open while work is being done and protect the personnel working on the portion of the system being protected by the controller.
- Hold Tags shall not be removed from any device unless authorized.
- Each disconnecting device shall be properly tagged with an approved Hold Tag.
- The individual key(s) will be designated with the serial number tag.
- The key(s) will be kept in a locked box called “Key box” and this “Key Box” will be kept at PEM Manager office.

- The key (called as “Master Key”) of the “Key Box” will be kept only with the designated person (PEM Manager) who is responsible for giving clearance for withdrawing LOTO.
- There will be a set of duplicate keys, which will be exclusively kept under control of PEM In-charge

Lighting arrangements

- Artificial lighting shall not produce glare or disturbing shadows. The height of the fixtures shall be so arranged to avoid direct glare. This will also ensure proper illumination as well.
- Wherever necessary to prevent danger, lamps shall be protected by suitable guards against accidental breakage. Only Sodium Vapour lamps with approved fittings from the electrical department are to be used.
- The cable of portable lighting equipment shall be of adequate size and characteristic for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.
- Electrical lighting equipments and systems shall be earthed and provided with ELCB/RCCB of 30 mA sensitivity.

Lighting Standard			
S. No.	Construction Work Areas	Foot candles	Lux
1	General construction area lighting	5	54
2	General construction areas, concrete placement work places, excavation and waste storage areas, access ways, loading and unloading areas, refueling areas and field maintenance areas.	3	32
3	Indoors: warehouses, corridors, hallways, and exit.	5	54
4	Tunnels, shafts, and general underground work areas: (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling.	5	54
5	General Construction Plants and Workshops: (e.g., batch plants, crusher Plants, Mechanical and Electrical Equipment Rooms, Carpentry Shops, Rigging Areas, and active store rooms, mess halls, and indoor toilets and workrooms.)	10	108
6	First aid stations and offices.	30	333

3. Plants & Machinery, Equipment & vehicle, tools & tackles and lifting devices-

- All the Plant and Machinery, Equipment and Vehicles which are required for the project whether new / old or hired from outside shall be logged in the Plant and Machinery List as soon as they reach the project. For hired / other sub contracted equipment a separate register may be maintained.

- Before any machinery or mechanized equipment is put into use on the job, it shall be inspected by a competent person.

- It is compulsory for the HSE I/c and PEM to inspect the Plant and Machinery, Equipment and Vehicles and if fit certify the same for deployment with issue of "**Green Card**". This is to be done prior to deployment of any Plant and Machinery, Equipment and Vehicles. The equipment log register shall contain this data of green card permit & next date of issue.

- HSE I/c shall select the date of periodic inspection and the periodicity (preference is once in a month but not exceeding 3 months) and as per validity of existing Green Card inspection may be done in batches or based on location.

- HSE I/c and PEM shall carry out the joint inspection as per checklist. The Green Card shall be continued by reissuing the same with next validity if the equipment is found in order.

- HSE I/c shall, in writing, highlight the unsafe condition(s) of any Plant and Machinery, Equipment and Vehicles to the PEM for corrective action.

- HSE I/c shall record his findings in "Plant and Machinery, Equipment and Vehicles inspection report" and forward the same to PEM with copy to PM/ Dy PM and Works Manager / Section In-charge.

- During the day to day operation 'daily checklist' procedure has to be followed for the safe and productive operation of the following:
    - Cranes (moveable or stationery), Lift and Reach Equipment.
    - Vehicles
    - Winches
    - Material hoisting equipment
    - DG set
    - Rolling or bending m/c
    - Compressors & air receivers

- The vehicle or equipment has to be checked daily at the beginning of each shift / shift change) as per the check list by the respective operator / driver and then only it is to be engaged for productive activity.

- The P&M supervisor has to have periodic supervisory review (at-least once a week) on this checklist and he/she has to countersign on the Checklist. This is to be monitored by PEM or HSE I/C or regular basis.

- The Photo of the driver / operator who is authorized to drive / operate vehicle/equipment shall be displayed on the equipment in a plastic pouch to prevent unauthorized operation.

- Only qualified and authorized personnel shall operate machinery and mechanized equipment.

- Machinery or equipment requiring an operator shall not be permitted to run unattended.

- Minimum clearance of 3 meters shall be maintained from exposed high voltage live lines.

- An operator shall not be permitted to operate any machinery or equipment for more than 8 hours in any one day without a consecutive 8 hours interval of rest.

- Only correct type of nuts, bolts, washers, cotter pins, etc. shall be used. The maintenance crew shall ensure that bolts / nuts, etc. are fully tightened to the required torque (wherever torque is specified).

- Unsafe machinery shall be tagged at the operator's position, labeled “Out of order” “Do not Use”.

Tools & tackles and lifting devices.

- Procured slings & other lifting tools & tackles shall be stored as per manufacturer recommendation / guideline. They shall generally be hung from the wall or on rigid stands.

- All slings and other lifting tools & tackles (old and existing) shall be subjected to periodic inspection.

- Joint inspection & check shall be done by PEM, Store-Ic & HSE I/c

- They should check that the load test certificates are available as per the standard for each and every sling & other lifting tools & tackles.

- Colour code and identification mark shall be provided only to the accepted items. List of tested items shall be available at store with identification mark & colour code.

- Identification number shall be embossed on the metallic part i.e. crimple, in case slings, top cover in case C.P. Block, body of D-Shackle etc and the tag shall be tied.

- A 3rd party physical load test by competent person shall be arranged at site in the presence of PEM, Store-Ic & HSE I/c.

- The load test shall be conducted as per procedure. The Load Test detail shall be recorded while mentioning – Date and time of Load Test ; Load detail ; Name & detail of agency ; deflection detail etc. and the same detail must be signed by the PEM & HSE I/c.

- load tested slings and other lifting tools & tackles which are passing the load test shall be marked with color code & punched with identification number on the crimple in case of slings, on body of D-shackle, etc. and tie the tag .

- The register of tested items should be available with store & copy to be given to all the users.

- Damaged / faulty slings and other rejected lifting tools & tackles shall be quarantined & stored together in one place and disposed off at the earliest as per stores operating manual.

- In every quarter the color code of slings and other lifting tools & tackles shall be changed. This shall be ensured by HSE in-charge.

Inspection Criteria

- Damaged
- Kinking
- Crushing
- Bird Caging
- Core Protrusion
- Strand Displacement
- Corrosion
- 5 % visible broken wire in any length of ten diameters remove immediately

Load test criteria for lifting tools & tackles:-

- Lifting & hoisting machinery including all parts and necessary gear whether fixed or movable before being taken into use shall be tested and examined by a competent person for specified ratings and for safe operation at least once in twelve months, and shall be re-tested and re-examined after any substantial alteration or repair.

Every lifting appliance with its accessory gear shall be subjected to a test load, which shall exceed the safe working load (SWL) as specified in the following table:

Sl. No.	Safe Working Load	Test Load
1	Upto 20 tonnes	25 per cent in excess of safe working load
2	20 to 50 tonnes	5 tonnes in excess of safe working load.
3	Over 50 tonnes	10 per cent in excess of safe working load

- Lifting gears like hook, chain, shackle, swivel, eyebolt, plate clamp, or pulley block {except single sheave block) shall be subjected to a test load, which shall not be less than the load as specified in the following table

Sl. No.	Safe Working Load	Test Load
1	Up to 25	2 x safe working load
2	Above 25	(1.22 x safe working load) + 20

- In the case of a single sheave block, a test load not less than four times the proposed safe working load shall be applied to the head of the block. In the case of a multi sheave block, the test load shall not be less than the load as specified in the following table:

Sl. No.	Safe Working load (in tonnes)	Test load (In tonnes)
1	Up to 25	2 x safe working load
2	25 to 160	(0.9933 x safe working load) + 27
3	Above 160	1.1 x safe working load

In the case of hand-operated pulley blocks used with pitched chains and rings, hooks, shackles, or swivels, prematurely attached thereto, a test load not less than 50 percent in excess of the safe working load shall be applied.

- Every lifting beam, lifting frame, container spreader, bucket. Tub, or other similar devices shall be subjected to a test a load which shall not be less than the load as specified in the following table:

Sl. No.	Proposed safe working load (In tonnes)	Test load (In tonnes)
1	Up to 10	2 x safe working load
2	10 to 160	(1.04 x safe working load) + 9.6
3	Above 160	1.1 x safe working load

- A lifting gear is initially tested for the manufacturer a competent person before taking into use or after undergoing any substantive alterations in a manner specified in schedule – 1 BOCW act and such gear which alters such test shall subsequently be retested for the use of its owner at once in every five year.
- A lifting gear in use is thoroughly examined once at least in every 12 months by a competent person
- A chain in use is thoroughly examined once at least every month by a responsible person for its use.

Batching Plant:

- Walkways, platforms, stairways and ramps to reach the hopper shall be well built and protected.
- The operations of the plant shall be co-ordinate by signals or interlocking devices (Limit switch) as may be necessary to ensure the safety of all workmen.
- An air exhaust system shall be installed to remove cement and other dusts from the inside of the plant. Respirators should be worn when necessary.

Crushing Plant

- All the walkway, platforms, stairways approach shall be adequate and protected
- Crushing jaw should be well guarded
- Hopper, bins, conveyor assembly should be inspected and maintained regularly

- Proper screening and protection should be made to avoid entering of explosives and other materials into the crusher
- All the area is properly barricaded and inspected periodically
- Dust mitigation facilities should provided
- Require PPE should be compulsory

4. Hot Job work

Gas Cutting Operation

- Protective clothing and eye protection shall 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 the 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.
- Adjust the regulator screw on the Acetylene regulator to the required pressure and then do the same for the oxygen line, in both the cases the Cutogen valves on the torch are closed.
- Now open the Acetylene cutogen valve, purge the hose and close it. Then do the similar exercise for the oxygen.
- Close the oxygen line valve on the torch and ignite the torch
- Adjust the oxygen to the required pressure
- While closing, close the oxygen cylinder and regulator then the Acetylene cylinder and regulator.
- Close the oxygen torch valve then the Acetylene valve
- Correct gas pressure and for the nozzle size shall be used.
- Acetylene pressure should be set in all cases at 0.15kg/cm^2 depending on material property.
- During Gas cutting, eyes are exposed to infrared rays. Infrared rays may dry outer surface of the eyes causing irritation in the eyes. For protecting eyes from infrared rays goggles with appropriate filter glasses shall be used.

Backfire or flash back

Backfire occurs when the flame burns back into the blowpipe often with a sharp bang. This may happen when the blowpipe is held too close to the work-piece, or if the nozzle is blocked or partly blocked. The flame may go out or it may re-ignite at the nozzle. Sometimes the flame burns back into the blowpipe, and burning continues at the mixing point. Backfires do not usually cause serious injury or damage but they indicate a fault in the equipment.

Flashbacks are commonly caused by a reverse flow of oxygen into the fuel gas hose (or fuel into the oxygen hose), producing an explosive mixture in the hose. The flame can then burn back through the blowpipe, into the hose and may even reach the pressure regulator and the cylinder. The consequences of a flashback are potentially very serious. They can result in damage or destruction of equipment, and could even cause the cylinder to explode. This could end in serious injury to personnel and severe damage to property.

The following precautions will help to prevent flashbacks:

- The hoses shall be purged before lighting the blowpipe to remove any potentially explosive gas mixtures. Spark igniter shall be used to ignite the gas quickly after turning it on.
- Flashback arresters shall be provided at both ends of the hoses to prevent backflow of gas towards cylinders
- Correct gas pressure and for the nozzle size shall be used.

If a backfire does occur:

- The blowpipe valves shall be shut off, oxygen first and then the fuel gas.
- Oxygen and fuel gas cylinder valves shall be shut off.
- The blowpipe shall be cooled with water, if necessary.
- The equipment shall be checked for damage or faults, particularly the nozzle.

If a flashback does occur:

- Cylinder valves of both fuel gas and oxygen shall be closed immediately, if it is safe to do so. The flame should go out when the fuel gas is shut off. If the fire cannot be put out at once, the area shall be evacuated and emergency fire services shall be called.
- The blowpipe, hoses, regulators, flashback arresters and other components may have been damaged. The damaged ones shall be replaced before reuse.

If an acetylene cylinder catches fire or gets heated due to severe back fire or external heat source, it shall be dealt with promptly as follows:

- The valve shall be shut.
- Try to extinguish the fire using suitable extinguisher
- Regulator or other fittings shall be detached.
- It shall be immersed in water or water shall be applied copiously at the bottom half of the cylinder.
- The valve shall be opened for few minutes and the cylinder, kept cool in water until it becomes empty.
- No one shall stand in the direction of the fusible safety valve fixed at the bottom of the cylinder.

Welding operation

- For individual welding machines, the rated current-carrying capacity of the supply conductors shall be not less than the maximum primary current of the welding machines.
- All the moving and rotating parts of the welding equipment shall be guarded.
- In case of Engine-run welding machines, refueling shall not be done while the machine is running and spilling of oil shall be avoided.
- All welding cables shall be of completely insulated, flexible type, capable of handling the maximum current requirements of the work in progress.
- When it becomes necessary to connect or splice the cables, substantial insulated connectors of a capacity at least equivalent to that of the cable, shall be used.

- If connections are effected by means of cable lugs, then these lugs shall be securely fastened together by means of bolts to give good electrical contact.
- The exposed metal parts of the lugs shall be completely insulated.
- The work lead (welding lead) shall be attached firmly to the work.
- Work lead shall be as short as possible.
- The lugs should be of correct size and need to be properly crimped by the crimping tool.
- Any current-carrying parts passing through the portion of the holder, which the welder grips in his hand shall be fully insulated against the maximum voltage encountered to ground. Insulation of all, metallic or current carrying parts, including the jaws, which grip the electrodes, is recommended wherever service conditions permit.
- The cable shall be free from repair or splices up to a minimum distance of 3.0 m from the electrode holder.
- Electrode holders shall be provided with discs or shields to protect the hands of the operator from the heat of the arcs.
- Welding current should be returned to the welding machine by a single, cable from the work to the welding machine. Connection of a cable from the welding machine to a common conductor or structure on which the work rests, or to which the work is connected may be permitted.
- Pipelines containing gases or flammable liquids or conduits carrying electrical conductors shall not be used for a ground return circuit. Wire rope, reinforcement rods, etc. shall not be used to carry welding current.
- All earth connections shall be checked to determine that they are mechanically strong and electrically adequate for the required current.
- When, in the course of work, a welding cable becomes worn out, exposing bare conductors, the portion thus exposed shall be adequately insulated with heat resistance tape.

- Welding cables shall be kept dry where practicable, and free from grease and oil to prevent premature breakdown of the insulation.
- When it becomes necessary to carry cables some distance from machines, they shall be substantially supported overhead, if practicable. If this is not possible, and cables are laid on the floor or ground, they shall be protected in such a manner that they would not be damaged, entangled or interfere with safe movement of people. Special care shall be taken to see that welding supply cables are not in proximity to power supply cables or other high-tension wires.
- Also, lying of cables shall be so as not to create tripping hazard in the work place.
- Printed rules and instructions covering operation and maintenance of welding equipment supplied by the manufacturers shall he strictly followed.
- When the welder has occasion to leave his work or stop work for any appreciable time, or when the machine is to be moved, the power supply switch in the equipment shall be open. The equipment shall be disconnected from the source of power when not in use.
- Welding equipment shall be maintained in good mechanical and electrical condition to avoid unnecessary hazards. Commentators shall be kept clean to prevent excessive flashing. Gasoline and other flammable liquids shall not be used for cleaning commentators. Fine sandpaper or commentator polish shall be used.
- Welding in wet, damp or humid conditions reduces the skin resistance of the body and insulating properties of accessories. Hence no welding shall be done unless suitable protection is provided.
- If there is a risk of heavy rain, a cover for the welder, equipment and work piece should be in place.
- Workmen/welders designated to operate arc-welding equipment shall have a thorough knowledge of requirements with regard to

safety. They shall be educated about the causes of electric shock and avoiding the same.

- Voltages required for arc welding are low. Hence, welding cables, electrode holders and other parts of welding machines are liable to be handled carelessly. These voltages are, nevertheless, sufficiently high that under certain circumstances they may be dangerous to life. This danger is particularly marked in very hot weather, when the welder is sweaty or when he is damp.
- Welder shall develop the habit of always keeping his body insulated from both the work and the metal electrode and holder. He shall always wear shoes, gloves and apron.
- Electrode shall be removed from holders when not in use to eliminate danger of electrical contact with persons or conducting objects. Electrode holders when not in use shall be so placed that possibilities of electrical contact between them and persons or conducting objects are eliminated.
- PEM shall check welding machine regularly to ensure that electrical connections and insulation on the holders and cable are in good order.
- Anything that appears unsafe shall be promptly reported to PEM and use of such welding equipment shall be discontinued until its safety has been assured. Only qualified personnel shall make repairs.
- Skin Burns may result from metal spatter or from touching hot work pieces. The face, hands, arms, leg and feet are particularly vulnerable, so shall be protected by face shields, gloves, hand guards, leg guards, apron and safety shoes.
- Prolonged exposure to heat from welding leads to reddening of face. This can be avoided by use of face shield.
- During welding process, eyes are exposed to ultraviolet rays and penetrated by sparks, spatter, slag and other foreign bodies. Ultra violet rays cause damage to the retina of eyes. These hazards can be avoided by using welding screen with appropriate filter glass.

Please refer to the Chapter, Personal Protective Equipment for selection of filter glasses.

- Welder helper also shall use welding screen to protect his eyes from ultraviolet rays.

5. Others

Fire prevention and protection

- Either the work-piece shall be moved to a safe location for carrying gas-cutting work or Combustible materials and flammable materials shall be removed from the work place.
- Spaces where welding fumes could accumulate shall be ventilated.
- If combustible materials that cannot be moved shall be protected from close contact with flame, heat, sparks or hot slag. Suitable guards or covers such as metal sheeting, mineral fibre boards or fire retardant blankets shall be used; in such case hot work permit shall be obtained.
- Guards or covers shall be used to prevent cylinders from hot particles passing through openings in floors and walls;
- Fire extinguishers, fire buckets with water shall be kept nearby and maintain fire watch during the work.

House Keeping

- All surplus earth and debris are removed / disposed off from the working areas to designated location(s)
- Unused/surplus cables, steel items and steel scrap lying scattered at different place within the working areas are removed to identified location(s).
- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified location(s).
- Roads shall be kept clear and materials like pipes, steel, boulders, concrete, chips and bricks etc shall not be allowed on the roads to obstruct free movement of men & machineries.

- Fabricated steel structure, pipes 7 piping materials shall be stacked properly for erection.
- Water logging on roads shall not be allowed.
- No parking of trucks/trolleys, cranes and trailers etc shall be allowed on roads, which may obstruct the traffic movement.
- Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.
- Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant area/ or these materials shall be transported with top surface wet.
- The contractor shall ensure that the atmosphere in the plant area and on roads is free from particulate matter like dus. Sand, etc. by keeping the top surface wet for ease in breathing.
- At least two exits for any unit area shall be assured at all times.

Radiation Exposure

- All personnel exposed to physical agents such as non-ionizing radiation, ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.
- For ionizing radiation, requirements of Bhabha Atomic research centre (BARC)/Atomic energy regulatory Board (AERB) shall be followed.

Heat Stress: Longer the duration of hot works, hotter the surroundings. Prolonged hot works in confined space may intensify heat stress causing workmen to faint. If heat stress is envisaged, ventilation shall be introduced in the work place and a second person shall be kept on stand by for tackling emergencies

Welfare Measures

- A crèche at site where JO or more female workers are having children below the age of 6 years.

- Reasonable canteen facilities at site and in labour camps at appropriate location depending upon site conditions.
- Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers)
- Toilets, drinking water, adequate lighting at site and labour camps, commensurate with applicable Laws! Legislation

Weather Protection : Contractor shall take appropriate measures to protect workers from severe storms, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs Like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging! planning the construction activities to suit the weather conditions.

4.4.7 Emergency Preparedness & Response:

For Emergency Preparedness & Response, the site Management needs to identify potential accidents & emergencies associated with their activities and accordingly proceed as follows.

1. Identification of person to take charge during the emergency on working hours & non working hours.
2. Details of actions to be taken by personnel during an emergency
3. Responsibilities, authorities & duties of personnel with specific roles during the emergency
4. Evacuation Procedures
5. Identification & Location of hazardous materials & emergency action
6. Communication with employees
7. Availability of necessary information during the emergency e.g. Site Layout, Hazardous material data, procedures, work instructions & Contact telephone numbers.
8. Establishment of Emergency control center with all necessary equipments and medical facilities.
9. Periodic Mock drill shall be conducted.

4.5.1 Performance Measurement & Monitoring:

For performance measurement and monitoring, the site should establish a performance monitoring system with some measurable indicator. The following are examples of methods that can be used to monitor OH &S performance: -

- Results of the hazards identification, risk assessment & risk control process.
- Systematic workplace inspection using checklists.
- OH & S inspection for e.g. daily safety observation
- Environmental Sampling
- Analysis of documentation & records like MSDS
- Benchmarking against good OH &S practices in other organizations

4.5.2 Evaluation of Compliance:

Procedure for Legal requirements & Compliance, project site should evaluate the legal compliance periodically with applicable legal requirements and maintain the records of the periodic evaluation.

4.5.3 Incidents investigation, Non-Conformity, Corrective & Preventive Action:

1. Site management needs to ensure that all the incidents & non-conformance are investigated & corrective and preventive actions initiated.
2. Site Management should reports all the incidents & non-conformance.
3. Should ensure that no employees suffer any hardship as a result of reporting a non-conformance, accident & incident.
4. Site management should use appropriate means to record the factual information & the result of the immediate investigation.
5. **Corrective Action: -** Corrective actions are taken to eliminate the root causes of identified non-conformances, accidents or incidents in order to prevent the recurrence. Some examples of elements to be considered in establishing & maintaining corrective action are; -

a. Identification & implementation of corrective & preventive measures for the short-term as well as long term.
b. Evaluation of any impact on hazards identification & risk assessment result & any need to update hazards identification, risk assessment & risk control reports.
c. Recording any required changes in procedures resulting from the action or hazards;

6. **Preventive action**: - Examples of elements to be considered in establishing preventive action procedures include: -

a. Identification of any problems requiring preventive actions.
b. Initiation & implementation of preventive action & the application of controls to ensure that it is effective.

7. **Follow – up**: - Corrective or Preventive action taken should be effective & permanent. Checks should be made on the effectiveness of corrective or preventive action taken. Outstanding actions should be reported to top management at the earliest.

4.6 MANAGEMENT REVIEW:

1. Site Management should review its OH & S performance in the Monthly HSE Committee Meetings.
2. The MOM should be sent to HO on monthly basis