



APM TERMINALS

CIVIL CONSTRUCTION SAFETY GUIDELINES

APMT TERMINALS PIPAVAV

CIVIL CONSTRUCTION SAFETY GUIDELINES

CONTENTS

- 1.0 INTRODUCTION
- 2.0 SCOPE
- 3.0 GENERAL DUTIES
 - 3.1 GENERAL
 - 3.2 GENERAL DUTIES OF CONTRACTORS
 - 3.3 GENERAL DUTIES OF OWNERS
- 4.0 SAFETY PRACTICES AT WORK PLACES
 - 4.1 GENERAL PROVISIONS
 - 4.2 MEANS OF ACCESS AND EGRESS
 - 4.3 HOUSE-KEEPING & STORAGE OF MATERIALS
 - 4.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS AND PERSONS AND COLLAPSE OF STRUCTURES
 - 4.5 PREVENTION OF UNAUTHORISED ENTRY
 - 4.6 FIRE PREVENTION AND FIRE FIGHTING
 - 4.7 LIGHTING
 - 4.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS
- 5.0 CONSTRUCTION ACTIVITIES
 - 5.1 EXCAVATION
 - 5.2 SCAFFOLDING, PLATFORMS & LADDERS
 - 5.3 STRUCTURAL WORK
 - 5.4 REINFORCEMENT WORK
 - 5.5 CONCRETE WORK
 - 5.6 ROAD WORK
 - 5.7 CUTTING/WELDING
 - 5.8 WORKING IN CONFINED SPACES
 - 5.9 WORKING AT HEIGHTS
 - 5.10 HANDLING AND LIFTING EQUIPMENT
 - 5.11 VEHICLE MOVEMENT
 - 5.12 ELECTRICAL
 - 5.13 DEMOLITION
 - 5.14 SAND/SHOT BLASTING/SPRAY PAINTING
- 6.0 CONSTRUCTION OF DEMOLITION WASTE
- 7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS
- 8.0 FIRST AID
- 9.0 DOCUMENTATION
- 10.0 SAFETY AWARENESS & TRAINING
- 11.0 REFERENCES

SAFETY PRACTICES DURING CONSTRUCTION

1.0 INTRODUCTION

Safety in Construction Management deserves utmost attention especially in the Construction industry. Construction is widely recognized as one of the accident-prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel; same needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behavior, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality of materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to in built safety in the system.

The objective of this standard is to provide practical guidance on technical and educational framework for safety and health in construction with a view to:

- (a) prevent accidents and harmful effects on the health of workers arising from employment in construction;
- (b) ensure appropriate safety during implementation of construction;
- (c) provide safety practice guidelines for appropriate measures of planning, control and enforcement.

2.0 SCOPE

This document specifies broad guidelines on safe practices to be adhered to during construction activities. However, before commencing of any job, specific hazards and its effects should be assessed and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. The scope of this document does not include the design aspects and quality checks during construction.

3.0 GENERAL DUTIES

3.1 GENERAL

- The Contractor shall strictly comply & follow up “Contractor’s Safety Guidelines” and “Consequence Management” of Gujarat Pipavav Port Limited and all other local regulations which may be in force from time to time. Contractor shall strictly follow up Port security rules.

Contractor shall arrange and responsible for all securities of their work site, workers, staffs, materials etc in port area. Contractor shall responsible for taking necessary permission for the execution of work from respective state/central government authority as required.

- Contractors shall submit risk assessment of this work & taken approval from HSSE Department GPPL before execution of work.
- Contractors shall arrange and fix galvanize sheet metal barricading upto 3 mtrs height surrounding worksite for safety in his risk and cost.
- Contractors shall arrange and fix fall protection safety net as per safety standard inside & surrounding of building for safety in his risk and cost.
- Contractor shall arrange diversion as per site condition including all required necessary arrangement like manpower, equipments, material etc.
- Contractor shall arrange and fix proper metal scaffolding for staging for the work as per APMT Guidelines and conform the latest IS standard.
- Contractor shall responsible for the security of the work site during the whole work period & taking all necessary steps to prevent any loss, theft, damage, accident etc of own equipments, construction materials, manpower, store etc. Gujarat Pipavav Port shall not liable to any losses or damages or accident for the same.
- Contractor shall take all essential steps, on his own responsibility and at his expense, to ensure that existing structures and installations alongside the road are protected, preserved and maintained
- During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required. The Contractor shall be responsible for site maintenance, cleaning and waste management in accordance with the detailed requirements of the Specification.
- Prior to the submittal of the Contractor's application for a Taking-over Certificate for a Section, the Contractor shall undertake final cleaning of all completed permanent Works to remove all surplus material, construction debris, wreckage and rubbish. Drainage elements shall be flushed clean to remove any accumulated material and all other service pits shall be cleaned out with attention to any pit drainage or weep holes. The frames of all cast iron service pit access covers shall be cleaned and greased. The final cleaning of the site shall be to the satisfaction of the Engineer.
- Stickily prohibited to carry out any un-authorized activities like storage & delivery of un-authorized materials, depute shelter to criminal person at site, doing un-professional & un-authorized business or activities etc in Port area by the Contractor.

3.1.1 Work Site Barricades

- The **Contractor** shall erect and maintain barricades required in connection with his operation to guard or protect:
 - Excavation
 - Construction areas
 - Areas adjudged hazardous by the **Contractor's** or the **Owner's** inspectors.
 - **Owner's** existing property liable to damage by **Contractor's** operations, in the opinion of Engineer-in-Charge.
 - Materials loading-unloading area.
- The **Contractor's** employees and those of its sub-contractors shall become acquainted with the **Owner's** barricading practices and shall respect the provisions thereof.
- Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red flasher lanterns at nights.
- Materials used for barricades should be only metal sheet with proper support with reflective safety sign & board. No bamboo or single tap or rope allowed for barricades.

3.1.2 Safety Equipments

- All necessary personal safety equipment as considered adequate by the Engineer-in-charge should be made available for the use to the persons employed on the site and maintained in a condition suitable for immediate use, and the CONTRACTOR should take adequate steps to ensure proper use of equipment by those concerned.
- Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective gloves.
- Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.
- Those engaged in welding and cutting works shall be provided with protective face and eye shields, and gloves, etc.
- Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- When workers are employed in sewers and manholes, which are in use, the **Contractor** shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident.
- The **Contractor** shall not employ men below the age of 18 years and women on the work of painting or products containing lead in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken:
 - No paint containing lead product shall be used except in the form of paste or readymade paint.

- Suitable face masks shall be supplied for use by the workers when paint is applied in the form of spray or if a surface having lead paint dry rubbed and scrapped.
- Overalls shall be supplied by the **Contractor** to workmen and adequate facilities shall be provided to enable the working painters to wash during and on cessation of work.

3.1.3 Maintenance of Safety Devices

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near the place of work.

3.1.4 Display of Safety Inductions

These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at the job site. The person responsible for compliance of the safety code shall be named therein by the **Contractor**.

3.1.5 Enforcement of Safety Regulations

To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the **Contractor** shall be open to inspection by the Welfare Officer, Engineer-in-charge or Safety Engineer of the **Owner** or their representatives.

3.1.6 No Exemption

- The works throughout including any temporary works shall be carried on in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpaths at the site or in the vicinity thereof or with any existing works whether the property of the **Owner** or of a third party.
- In addition to the above, the **Contractor** shall abide by the safety code provision as per mentioned in reference clause Safety Code framed from time to time.
- The **Contractor** shall also arrange to obtain valid Entry passes/gate passes for his men and equipment from the concerned authorities of **Owner & Government Authorities**.
- No man/material/equipment not covered by valid passes shall be permitted within Port premises area and no material/equipment shall be permitted to be taken out of Port Premises area, unless authorized by the concerned authorities of Owner & its Representative. The **Contractor** shall be held fully responsible for any or all delays/ losses/ damages that may result consequent on any lapse(s) that may occur on the part of his sub-contractors/ employees in this regard.

3.1.7 Port Entry Passes

- The **Contractor** must apply for photo Entry Passes for his workers and staff and the workers and staff of his sub-Contractors in a prescribed proforma provided by the **Owner**. The Application shall be accompanied by a Statement and Declaration in the form prescribed by the **Owner** signed by the employees for whom the Entry Passes are sought and confirmed by the employer. The photo Entry Passes shall be issued by the **Owner** for a maximum period of 30 (Thirty) Days, which will be extendable upon the **Contractor's** application. As a special case, Temporary Passes may be issued for a maximum period of 5 (five) days.
- If work execution under Port Custom Bonded area, Contractor should be getting entry passes approval from Custom Department – Pipavav Port & follow up Custom rules & regulation.
- Unutilized/expired Entry Passes/Identity Cards shall have to be immediately surrendered to the **Owner**.
- In case of the loss of an Entry Pass/Identity Card, the **Contractor** shall immediately lodge an FIR with the local police station and inform the Engineer-in-Charge of the loss of passes. and shall pay

a charge of Rs.150/- against Entry Pass/Identity Card lost.

- The **Contractor** is required to keep an account and track of all Entry Passes issued and surrendered. Gate Passes/Identity Cards issued by the Security Section should always be displayed by the **Contractor's** or Sub-contractor's employees while working inside the Plant.

3.1.8 Gate Passes

- To bring materials, equipment, tools and tackle and other things inside the Port Premises for construction Work, the **Contractor** has to produce proper documents of title or authority relative thereto for inspection by the **Owner's** personnel at the gate.
- These shall be checked thoroughly by the **Owner's** personnel at the Gate and recorded in their Register before permitting the same to be brought inside the Port Premises. It is the **Contractor's** responsibility to see that the entry is duly recorded in the Register with proper Entry Number, date and signature of **Owner's** authorized representative and that the supporting challans/documents are stamped and signed by the **Owner's** personnel at the gate at the time of entry.
- Any materials, equipments, tools & tackles, vehicles not related to works are not allowed to entry, stock, loading-unloading, transfer from one vehicle to another vehicle is strictly not allowed & taking necessary action on **Contractor** by **Owner**.
- Those materials which need repairing/ replacement as per site condition will be allowed to move beyond **Owner's** battery limit only after exchange of good equivalent material.

3.1.9 Work Permit

- The Work shall be carried out inside the Port Area limits to conform to the **Owners** safety section and in accordance with any instructions of the Engineer-in-Charge issued from time to time. Sometimes working hours may be drastically reduced or increased to satisfy safety requirements and the **Contractor** shall meet these requirements without any time and cost implications. No claim for idling of machinery, plant, manpower or equipment shall be entertained for reason of delay in the issue of a Work Permit and it
- In order to keep the **Owner** informed of the various jobs being undertaken within the Port Premises and to enable the **Owner** to regulate the same to ensure the observance of safety regulations relative thereto, when Work is to be carried out in hazardous areas, a Hot Work Permit is to be obtained by the **Contractor** from the **Owner** before start of Work on jobs which are capable of generating a flame, spark or heat e.g., gas cutting, grinding, welding, use of any electrical, diesel, petrol or battery operated prime mover, machine, tool or equipment or generator set, mixer machine, drilling machine, pump, crane, fork lift or hand truck or trailer or chipping or breaking of rocks or concrete or hacksaw cutting and drilling. Similarly, the **Contractor** shall obtain a Cold Work Permit from the **Owner** for jobs which do not come under the category of hot work and in respect of which there is no risk of fire, e.g., transportation, backfilling of ordinary soil by manual process, pile testing, hydrotesting, shuttering, fixing of reinforcement, hand mixed concreting, plastering and brickwork.
- Depending on the nature of the Work and the equipments and tools involved, the **Contractor** shall take work Permit in a prescribed format at prior to start the work.
- No Work Permit shall be issued by the **Owner** unless proper arrangement is made by the **Contractor** to ensure safe performance of the Work inside the Port Premises. Job-wise and area-wise permits shall be issued to the **Contractor**.

- All Work Permit shall be valid only for 12 hours on issue day OR prescribed hours in Work Permit.
- Thereafter the validity of the Permit must be renewed for each shift (morning & evening) by the shift in-charge/ shift representative of the **Owner**.
- The permit may be renewed for a maximum period of one month from the date of issue and if extension is required, the CONTRACTOR has to apply for a fresh permit.
- A permit is not valid for Work on holidays unless special permission of the OWNER is obtained for the purpose.
- Contractor shall depute at least One post of Construction Engineer and one post of Safety Supervisor at site for day to day work supervision.

3.1.10 Vehicle Permit

- Permits are to be obtained separately for entry/use of vehicles/trailers and other mobile equipment inside the Port Premises. All the **Contractor's** vehicles should have a valid 'PUC Certificate'. The following requirements are to be met to obtain vehicle permit :
 - Vehicle/Equipment shall be in good condition and fitted with spark arrestor.
 - Vehicles should carry, wherever applicable, valid Road Tax Certificate and Fitness Certificate from the Competent authority and insurance policy.
 - Valid operating/driving license of driver/operator.

3.2 GENERAL DUTIES OF CONTRACTORS

3.2.1 Execution agency should:

- Provide means and organization to comply with the safety and health measures required at the workplace.
- Provide and maintain workplaces, plant, equipment, tools and machinery and organize construction work so that, there is no risk of accident or injury to health of workers. In particular, construction work should be planned, prepared and undertaken so that:
 - Dangers, liable to arise at the workplace, are prevented;
 - Excessively or unnecessarily strenuous work positions and movements are avoided;
 - Organization of work takes into account the safety and health of workers;
 - Materials and products used are suitable from a safety and health point of view;
 - Working methods are adopted to safeguard workers against the harmful effects of chemical, physical and biological agents.
- Establish committees with representatives of workers and management or make other arrangement for the participation of workers in ensuring safe working conditions.
- Arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.
- Provide such supervision to ensure that workers perform their work with due regard to safety and

health of theirs as well as that of others.

- Employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.
- Satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.
- Ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.
- Organize for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.
- Establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.
- Provide appropriate first aid, training and welfare facilities to workers as per various statutes like the Factories Act, 1948 etc. and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement as per safety standard. They should also provide access to workers to occupational health services.
- Educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect safety and health.
- Ensure that except in an emergency, workers, unless duly authorized, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.
- Ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorized to operate, maintain or use.
- Ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, near container stake, Below Equipment, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment etc.
- Obtain the necessary clearance/Work permits as required and specified by owner.
- Ensure & comply with all statutory requirements under the Labour laws, the Provision of Factory Act, Wages Act, Workers Compensation Act, Provident Fund and other applicable statutes, rules, regulations, laws, bye laws of the Government of Gujarat and Government of India. The Contractor has to comply and submit all documents such as Labour License, Workman Compensation Insurance policy, Proof of Provident Fund of manpower, wages register etc before starting the work.
- Ensure that following facilities are to be provided by contractor at site :
 - Arrangement for drinking water
 - Toilet facilities
 - A creche where women workers are having children below the age of 6 years
 - Transport arrangement for attending to emergencies.
 - Transport arrangement for Labour, staff pick & drop upto work site.
 - Proper Rest area for Labour & Staff.

- Should deploy a safety officer at site

3.3 GENERAL DUTIES OF OWNERS

3.3.1 Owners should:

- Co-ordinate or nominate a competent person to co-ordinate all activities relating to safety and health on their construction projects;
- Inform all contractors on the project of special risks to health, safety & Environment;
- Ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to safety practices before starting the job.

4.0 SAFETY PRACTICES AT WORK PLACES

4.1 General Provision

- 4.1.1 All openings and other areas likely to pose danger to workers should be clearly indicated.
- 4.1.2 Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.
- 4.1.3 Never use solvents, alkalis and other oils to clean the skin.
- 4.1.4 Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.
- 4.1.5 Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles.
- 4.1.6 No loose clothing should be allowed while working near rotating equipment or working at heights.

4.2 MEANS OF ACCESS

Adequate and safe means of access (atleast two, differently located) to and from all workplaces should be provided. Same should be displayed and maintained.

4.3 HOUSE-KEEPING & STORAGE OF MATERIALS

4.3.1 Ensure:

- All contraction materials shall be proper storage, stack & segregate at site.
- All storage materials should be identified with sign & specification.
- All materials storage site should be identified & proper steel barricaded.
- Hazardous materials should be storages separate & identified.
- removal of scrap, inflammable material, waste and debris at appropriate intervals.

4.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.

4.3.3 Workplaces and passage ways, that are slippery owing to oil, grease or other causes, should be

cleaned up or strewn with sand, sawdust, ash etc.

4.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES

- 4.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.
- 4.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- 4.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.
- 4.4.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.

4.5 PREVENTION OF UN-AUTHORISED ENTRY

- 4.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorized persons & vehicle.
- 4.5.2 Visitors should not be allowed access to construction sites unless accompanied by or authorized by a competent person and provided with the appropriate protective equipment.

4.6 FIRE PREVENTION AND FIRE FIGHTING

- 4.6.1 All necessary measures should be taken by the executing agency and owner to:
 - Avoid the risk of fire;
 - Control quickly and efficiently any outbreak of fire;
 - Bring out a quick and safe evacuation of persons.
 - Inform unit/fire station control room, where construction work is carried out within existing operating area.
- 4.6.2 Combustible materials such as packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place.
- 4.6.3 Places where workers are employed should, if necessary to prevent the danger of fire, be provided with:
 - suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
 - an adequate water supply at sufficient pressure meeting the requirements of various Oil Industry Safety Directorate (OISD) standards.

- 4.6.4 To guard against danger at places having combustible material, workers should be trained in the action to be taken in the event of fire, including the use of means of escape.
- 4.6.5 At sites having combustible material, suitable visual signs should be provided to indicate clearly the direction of escape in case of fire.
- 4.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected particularly in high structures and where access is restricted.

4.7 LIGHTING

- 4.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.
- 4.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.
- 4.7.3 Artificial lighting should not produce glare or disturbing shadows.
- 4.7.4 Lamps should be protected by guards against accidental breakage.
- 4.7.5 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

4.8 PLANT, MACHINERY, EQUIPMENT AND HANDTOOLS

4.8.1 General Provisions

- Plant, machinery and equipment including hand tools, both manual and power driven, should:
 - be of proper design and construction, taking into account health, Safety and ergonomic principles.
 - be maintained in good working order;
 - be used only for work for which they have been designed.
 - be operated only by workers who have been authorized and given appropriate training.
 - be provided with protective guards, shields or other devices as required.
- Adequate instructions for safe use should be provided.
- Safe operating procedures should be established and used for all plant, machinery and equipment.
- Operators of plant, machinery and equipment should not be distracted while work is in progress.
- Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.
- Where trailing cables or hose pipes are used they should be kept as short as practicable and not allowed to create a hazard.
- All moving parts of machinery and equipment should be enclosed or adequately guarded.

- Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.
- Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

4.8.2 Hand tools

- Hand tools should be repaired by competent persons.
- Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.
- When not in use and while being carried or transported sharp tools should be kept in sheaths, shields, chests or other suitable containers.
- Only insulated or nonconducting tools should be used on or near live electrical installations.
- Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

4.8.3 Pneumatic Tools

- Operating triggers on portable pneumatic tools should be:
 - So placed as to minimise the risk of accidental starting of the machine.
 - so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.
- Hose and hose connections for compressed air supply to portable pneumatic tools should be:
 - designed and tested for the pressure and service for which they are intended;
 - fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.
- Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel.
- Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

4.8.4 Electrical Tools

- Low voltage portable electrical tools should generally be used.
- All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.
- All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

5.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

- Excavation
- Scaffolding, Platforms & Ladders
- Structural Work,
- Reinforcement Work

- Concrete Work
- Road Work (Laying of roads)
- Cutting/ Welding
- Working in Confined Space
- Working at Heights
- Handling & Lifting Equipments
- Vehicle Movement
- Electrical
- Demolition
- Sand/shot blasting/ spray painting

The safe practices to be followed during the implementation of above construction activities are given below:

5.1 EXCAVATION

5.1.1 All excavation work should be planned and the method of excavation and the type of support work required should be decided considering the following:

- The stability of the ground;
- The excavation will not affect adjoining buildings, structures or roadways;
- To prevent hazard, the gas, water, electrical and other public utilities should be shut off or disconnected, if necessary;
- Presence of underground pipes, cable conductors, etc.,
- The position of culvert/bridges, temporary roads and spoil heaps should be determined;

5.1.2 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required decided.

5.1.3 All excavation work should be supervised.

5.1.4 Sites of excavations should be thoroughly inspected:

- Daily, prior to each shift and after interruption in work of more than one day;
- After every blasting operation;
- After an unexpected fall of ground;
- After substantial damage to supports;
- After a heavy rain, frost or snow;
- When boulder formations are encountered.

5.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth upto 3.0m should be maintained. Based on site conditions, provide proper slope, usually 45 degree and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.

5.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or

depth of trench whichever is greater.

- 5.1.7 Don't allow vehicles to operate too close to excavated area. Maintain at least 2m distance from edge of excavation or depend of soil strata. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.
- 5.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.
- 5.1.9 If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.
- 5.1.10 Barricade at 1m height (with red & white band/self-glowing reflective caution board) should be provided for excavations beyond 1.5m depth. Provide two entries/exits for such excavation.
- 5.1.11 Necessary precautions should be taken for underground utility lines like cables, sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.
- 5.1.12 Water shall be pumped/bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.
- 5.1.13 During rains, the soil becomes loose. Take additional precaution against collapse of side wall.
- 5.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.
- 5.1.15 In case of mechanized excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. The mechanized excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.
- 5.1.16 In case of blasting, follow strictly IS:4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation.

5.2 SCAFFOLDING, PLATFORMS & LADDERS

- 5.2.1 Only MS 'H' frame scaffold should be use for scaffolding in construction work
- 5.2.2 A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.
- 5.2.3 Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.
- 5.2.4 Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.
- 5.2.5 Every scaffold and part thereof should be constructed:

- In such a way so as not to cause hazards for workers during erection and dismantling;
 - In such a way so as guard rails and other protective devices, platforms, ladders, stairs or ramps can be easily put together;
 - With sound material and of requisite size and strength for the purpose for which it is to be used and maintained in a proper condition.
- 5.2.6 Boards and planks used for scaffolds should be protected against splitting.
- 5.2.7 Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.
- 5.2.8 Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.
- 5.2.9 Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.
- 5.2.10 Scaffolds should be designed for their maximum load as per relevant code.
- 5.2.11 Scaffolds should be adequately braced.
- 5.2.12 Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.
- 5.2.13 A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.
- 5.2.14 Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.
- 5.2.15 Scaffolds should be inspected and certified by competent authorities & approved by HSSE Department:
- Before being taken into use;
 - At periodic intervals thereafter as prescribed for different types of scaffolds;
 - After any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.
- 5.2.16 Inspection should more particularly ascertain that:
- The scaffold is of suitable type and adequate for the job;
 - Scaffold materials used in its construction are sound and of sufficient strength;
 - It is of sound construction and stable;
 - That the required safeguards are in position.
- 5.2.17 A scaffold should not be erected, substantially altered or dismantled except by or under the supervision of Safety Officer.
- 5.2.18 Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be displaced in consequence of normal use.

5.2.19 Lifting appliances on scaffolds

When a lifting appliance is to be used on a scaffold:

- The parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
- Any movement of the scaffold members should be prevented;
- If practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

5.2.20 Pre-fabricated scaffolds

- In the case of pre-fabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.
- Frames of different types should not be intermingled in a single scaffold.
- Scaffolding shall be erected on firm and level ground.
- All members of metal scaffolding shall be checked periodically to screen out defective/ rusted members. All joints should be properly lubricated for easy tightening.
- Entry to scaffolding should be restricted.
- Erection, alteration and removal shall be done under supervision of experienced personnel.
- Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.
- Each supporting member of platform shall be securely fastened and braced
- Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.
- Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided.
- The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.
- Erect ladders in the "four up-one out position"
- Lash ladder securely with the structure.
- Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladderfoot, rubber wheels at ladder top, fixing wooden battens, cleats etc.
- When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in "four up-one out position."
- Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.
- The width of ladder shall not be less than 300mm and rungs shall be spaced not more than

300mm.

- Every platform and means of access shall be kept free from obstruction.
- If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.
- Workers shall not be allowed to work on scaffolds during storms or high wind. After heavy rain or storms, scaffolds shall be inspected before reuse.
- Don't overload the scaffolding. Remove excess material and scrap immediately.
- Dismantling of scaffolds shall be done in a pre-planned sequential manner.

5.2.21 Strictly prohibited to use of suspended scaffold, Bamboo Scaffold, or any other unidentified materials use as scaffolding in construction work.

5.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

5.3.1 General provisions

- The erection or dismantling of buildings, structures, civil engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.
- Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.
- Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.
- Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilizing are easily fixed to the formwork structure.

5.3.2 Erection and dismantling of steel and pre-fabricated structures

- The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:
 - Ladders, gangways or fixed platforms;
 - Platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
 - Safety harnesses and lifelines, catch nets or catch platforms;
 - Power-operated mobile working platforms.
- Steel and pre-fabricated structures should be so designed and made that they can be safely transported and erected.

- In addition to the need for the stability of the part when erected, the design should explicitly take following into account:
 - The conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
 - Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them easily on the structural steel or prefabricated parts.

- The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:
 - to withstand with a sufficient margin the stresses to which they are subjected;
 - Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appliance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
 - To avoid imbalance or distortion of the lifted load.

- Store places should be so constructed that:
 - There is no risk of structural steel or prefabricated parts falling or overturning;
 - Storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions;
 - Racks are set on firm ground and designed so that units cannot move accidentally.

- While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.

- Every lifting appliance should:
 - Be suitable for the operations and not be capable of accidental disconnection;
 - Be approved or tested as per statutory requirement.

- Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.

- Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:
 - Be of such shape and dimensions as to ensure a secure grip without damaging the part;
 - be marked with the maximum permissible load in the most unfavorable lifting conditions.

- Structural steel or pre-fabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.
- When necessary to prevent danger, before they are raised from the ground, structural steel or pre-fabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.
- While structural steel or prefabricated parts are being erected, the workers should be provided with appliances for guiding them as they are being lifted and set down, so as to avoid crushing of hands and to facilitate the operations. Use of such appliances should be ensured.
- A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be imperiled, even by external agencies such as wind and passing loads before its release from the lifting appliance.
- At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.
- During transportation within the construction area, attachments such as slings and stirrups mounted on structural steel or prefabricated parts should be securely fastened to the parts.
- Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.
- When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.
- When adverse weather conditions such as snow, ice and wind or reduced visibility entail risks of accidents, the work should be carried on with particular care, or, if necessary, interrupted.
- Structures should not be worked on during violent storms or high winds, or when they are covered with ice or snow, or are slippery from other causes.
- If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.
- The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a strong support.

- Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.
- When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded
- Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.
- Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.
- Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.
- Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

5.4 Reinforcement Work

- Ensure that workers use Personnel Protective equipment like safety helmet, safety shoes, gloves etc.
- Don't place the hand below the rods for checking clear distance. Use measuring devices.
- Don't wear loose clothes while checking the rods.
- Don't stand unnecessarily on cantilever rods.
- To carry out welding/cutting of rods, safety procedures/precautions as mentioned in Item No. 6.5 to be followed.
- For supplying of rods at heights, proper staging and/or bundling to be provided.
- Ensure barricading and staging for supplying and fixing of rods at height.
- For short distance carrying of materials on shoulders, suitable pads to be provided.
- While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not extend 1/3rd of deck length or 1.5M whichever ever is less and tied with red flags/lights.

5.5 Concreting

- Ensure stability of shuttering work before allowing concreting.
- Barricade the concreting area while pouring at height/depths.
- Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.
- Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may effect their integrity.

- Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.
- Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.
- Earthing of electrical mixers, vibrators, etc. should be done and verified.
- Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.
- Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.
- Don't allow unauthorized person to stand under the concreting area.
- Ensure adequate lighting arrangements for carrying out concrete work during night.
- Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.
- During pouring, shuttering and its supports should be continuously watched for defects.

5.6 ROAD WORK

- 5.6.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.
- 5.6.2 Filled and empty bitumen drums shall be stacked separately at designated places.
- 5.6.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.
- 5.6.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.
- 5.6.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate, shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.
- 5.6.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal sheet, to prevent anything falling in it,
- 5.6.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.
- 5.6.8 For cement concrete roads, besides site barricading and installation of warning signs for traffic diversion, safe practices mentioned in the chapter on "Concreting", shall also be applicable.

5.7 CUTTING/WELDING

- 5.7.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken: -

- A dry chemical type fire extinguisher shall be made available in the work area.
- Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.
- Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.
- All covers and panels shall be kept in place, when operating an electric Arc welding machine.
- The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipments etc.
- The welding receptacles shall be rated for 63 A suitable for 415V, 3-Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.
- All cables, including welding and ground cables, shall be checked for any worn out or cracked insulation before starting the job. Ground cable should be separate without any loose joints.
- Cable coiling shall be maintained at minimum level, if not avoidable.
- An energized electrode shall not be left unattended.
- The power source shall be turned off at the end of job.
- All gas cylinders shall be properly secured in upright position.
- Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.
- Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.
- When not in use, valves of all cylinders shall be kept closed.
- All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed
- Forced opening of any cylinder valve should not be attempted.
- Lighted gas torch shall never be left unattended.
- Store acetylene and oxygen cylinders separately.
- Store full and empty cylinders separately.
- Avoid cylinders coming into contact with heat.
- Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.
- If cylinders have to be moved, be sure that the cylinder valves are shut off.
- Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.
- Do not use matches to light torches, use a friction lighter.
- Move out any leaking cylinder immediately.
- Use trolleys for oxygen & acetylene cylinder and chain them.
- Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.
- Ensure that hoses are free from burns, cuts and cracks and properly clamped.
- Avoid dragging hoses over sharp edges and objects
- Do not wrap hoses around cylinders when in use or stored.

- Protect hoses from flying sparks, hot slag, and other hot objects.
- Lubricants shall not be used on Ox-fuel gasequipment.
- During cutting/welding, use proper type goggles/faceshields

5.8 WORKING IN CONFINED SPACES

5.8.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.

- Shut down, isolate, depressurize and purge the vessel as per laid down procedures.
- Entry inside the vessel and to carry out any job should be done after issuance of valid permit only in line with the requirement of HSSE Department.
- Ensure proper and accessible means of exit before entry inside a confined space.
- The number of persons allowed inside the vessel should be limited to avoid overcrowding.
- When the work is going on in the con fined space, there should always be one man standby at the nearby manway.
- Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel.
- Ensure requisite O2 level before entry in the confined space and monitor level periodically or other wise use respiratory devices.
- Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.
- Ensure adequate ventilation or use respiratory devices.
- Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, gas masks shall be used by everyone while entering.
- Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.
- Use 24V flameproof lamp fittings only for illumination.
- Use tools with air motors or electric tools with maximum voltage of 24V.
- House keeping shall be well maintained.
- Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.
- Don't wear loose clothing while working in a confined space.
- In case of the vessels which are likely to contain pyropheric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyropheric substances. Otherwise, these should be always kept wet by suitable means
- The cutting torches should also be kept outside the vessel immediately after the cutting.
- The gas cylinders used for cutting/welding shall be kept outside.

- All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.
- To the extent possible sludge shall be cleared and removed from outside before entering.
- No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.
- Communication should be always maintained between the worker and the attendant.

5.9 WORKING AT HEIGHTS

5.9.1 General Provision

- While working at a height of more than 2 meters, ISI approved safety belt shall be used.
- While working at a height of more than 2 meters, permit should be issued by competent person before commencement of the job.
- Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.
- All tools should be carried in tool kits to avoid their falling.
- If the job is on fragile/sloping roof, roof walk ladders shall be used.
- Provide lifeline wherever required.
- Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.
- Keep working area neat and clean. Remove scrap material immediately.
- Don't throw or drop material/equipment from height.
- Avoid jumping from one member to another. Use proper passageway.
- Keep both hands free while climbing. Don't try to bypass the steps of the ladder.
- Try to maintain calm at height. Avoid overexertion.
- Avoid movements on beam.
- Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

5.9.2 Roof Work

- All roof-work operations should be pre-planned and properly supervised.
- Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.
- Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.

- Roofing brackets should fit the slope of the roof and be securely supported.
- Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.
- On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.
- All covers for openings in roofs should be of substantial construction and be secured in position.
- Roofs with a pitch of more than 10 should be treated as sloping.
- When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.
- During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off the roof.
- Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.
- A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

5.10 HANDLING AND LIFTING EQUIPMENT:

5.10.1 General Provisions

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

- There should be a well-planned safety programme to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;
- All lifting appliances shall be examined by competent persons at frequencies as specified in "The Factories act".
- Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.
- Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.
- Check periodically the oil, brakes, gears, horns and tire pressure of all moving equipments like cranes, forklifts, trailers etc as per manufacturer's recommendations.
- Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.
- Allow lifting slings as short as possible and check packing at the friction points.
- While lifting/placing of the load, no unauthorized person shall remain within the radius of the

boom and underneath the load.

- While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.
- Control longer jobs being lifted up from both ends.
- Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.
- During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.
- Allow crane to move on hard, firm and leveled ground.
- When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.
- Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.
- Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.
- No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.

5.11 VEHICLE MOVEMENT

- Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.
- Don't overload the vehicle.
- Obey speed limits and traffic rules.
- Always expect the unexpected and be a defensive driver.
- Drive carefully during adverse weather and road conditions.
- Read the road ahead and ride to the left.
- Be extra cautious at nights. Keep wind screens clean and lights in working condition.
- All vehicles used for carrying workers and construction materials must undergo predictive / preventive maintenance and daily check.
- Driver with proper valid driving license shall only be allowed to drive the vehicle
- Routes shall be leveled, marked and planned in such a way so as to avoid potential hazards such as overhead power lines and sloping ground etc.
- While reversing the vehicles, help of another worker should be ensured at all times
- An unattended vehicle should have the engine switched off
- Wherever possible one-way system shall be followed
- Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle
- Load should be properly secured
- The body of the tipper lorry should always be lowered before driving the vehicle off.
- Signs/signals/caution boards etc. should be provided on routes.

5.12 ELECTRICAL

5.12.1 General

- Trained and certified licenses holder persons shall be allowed to work on electrical work.
- No person should be allowed to work on live circuit. The same, if unavoidable, special care and authorisation need to be taken.
- Treat all circuits as "LIVE" unless ensured otherwise.
- Electrical "Tag Out" procedure "MUST" be followed for carrying out maintenance jobs.
- Display voltage ratings prominently with "Danger" signs.
- Put caution/notice signs before starting the repair works.
- All electrical equipment operating above 250V shall have separate and distinct connections to earth grid.
- Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.
- Make sure that electrical switchboards, portable tools, equipments (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry and then only use them. Check proper earthing. All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.
- Don't work wet on electrical system.
- Don't overload the electrical system.
- Use only proper rated HRC fuses.
- Industrial type extension boards and Plug sockets are only to be used.
- ELCB for all temporary connections must be provided. Use insulated 3-pin plug tops.
- All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.
- All Power cables to be properly terminated using glands and lugs of proper size and adequately crimped.
- Use spark-proof/flame proof type electrical fittings in Fire Hazard zones as per area classification as per BIS standard.
- Check installations of steel plates/pipes to protect underground cables at crossings.
- Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.
- Maintain safe overhead distance of HT cables as per Indian Electricity Rules and relevant acts.
- Don't connect any earthing wire to the pipelines/structures.
- Don't make any unsafe temporary connections, naked joints/wiring etc.
- Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.

- Check at periodic intervals that pins of sockets and joints are not loose.
- Protect electrical wires/equipments from water and naked flames.
- Illuminate suitably all the work areas.
- All switchboards should be of MS structure only and incoming source should be marked.
- Hand lamps should not be of more than 24V rating.
- Fire extinguishers (DCP/CO2/Sand buckets) should be kept near temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.
- Insulating mats shall be provided in the front and back end of switch boards.
- All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and external explosion. Periodic checking/certification of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed along with maintaining a register at site signed by competent authority.
- A notice displaying following, should be kept exhibited at suitable places:
 - prohibiting unauthorized persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;
 - containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;
 - specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.
- No other cables/pipes to be laid in trench used for electrical cables.
- Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.
- Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.
- A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per Indian Electricity Rules

5.12.2 Inspection and maintenance

- All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.
- At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.
- Apart from some exceptional cases, work on or near live parts of electrical equipment should be forbidden.
- Before any work is begun on conductors or equipment that do not have to remain live:
 - the current should be switched off by a responsible authorised person;
 - precautions should be taken to prevent the current from being switched on again;
 - the conductors or the equipment should be tested to ascertain that they are dead;
 - the conductors and equipment should be earthed and short-circuited;

- neighboring live parts should be adequately protected against accidental contact.
- After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person after the earthing and short-circuiting have been removed and the workplace reported safe.
- Electricians should be provided with approved and tested tools, and personal protective equipment such as rubber gloves, mats etc.
- All conductors and equipment should be considered to be live unless there is a proof of the contrary.
- When work has to be done in dangerous proximity to live parts the current should be cut off. If for operational reasons this is not possible, the live parts should be fenced off or enclosed by qualified staff from the sub-station concerned.

5.12.3 Testing

- Electrical installations should be inspected and tested and the results recorded.
- Periodic testing of the efficiency of the earth leakage protective devices should be carried out.
- Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

5.12.4 Fire Prevention And Control

- Provision be made for safe handling and storage of dirty rags, trash, and waste oil. Flammable liquids and chemicals applied on platform should be immediately cleaned.
- Paint containers and hydrocarbon samples, gas cylinders for welding and cutting should be stored properly. Cylinders should be transported in hand-cart.
- Smoking should be restricted and no smoking area should be identified.
- Special attention should be given to crude oil pump seals, diesel and gas engines which are potential source of ignition in the event of failure.
- Fire and smoke detectors i.e. ultraviolet heat, thermal and smoke detector should be function tested once in three months.
- Fire is controlled in offshore by water spraying, Halon, CO2 flooding, DCP and sprinkler system.
- Foaming agent is applied for controlling fire in liquid hydrocarbon. The system is not effective in gas fire.
- Light weight breathing system should be used.
- The fire control plan at offshore should reveal control station, fire alarms and fire detectors, deluge valves and sprinkler, fire extinguishing appliances, fireman outfit and ventilation system.
- Fire fighting equipment should be maintained in ready to use condition.

5.13 DEMOLITION

5.13.1 General provisions

- When the demolition of any building or structure might present danger to workers or to the public:
 - necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;
 - the work should be planned and undertaken only under the supervision of a competent person.
- Before demolition operations begin:
 - structural details and builders' drawings should be obtained wherever possible;
 - details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;
 - an initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;
 - a method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;
- All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.
- If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.
- As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.
- The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.
- Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.
- The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.
- Care should be taken not to demolish any parts, which would destroy the stability of other parts.
- Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.
- To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.
- Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.
- Where a deliberate controlled collapse technique is to be used, expert engineering advice should be obtained, and:

- it should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;
- it should only be used on sites that are fairly level and where there is enough surrounding space for all operatives and equipment to be withdrawn to a safe distance.
- When equipment such as power shovels and bulldozers are used for demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.
- If a swinging weight is used for demolition, a safety zone having a width of at least one- and-a-half times the height of the building or structure should be maintained around the points of impact.

5.13.2 Demolition of structural steelwork

- All precautions should be taken to prevent danger from any sudden twist, spring or collapse of steelwork, ironwork or reinforced concrete when it is cut or released.
- Steel construction should be demolished tier by tier.
- Structural steel parts should be lowered and not dropped from a height.

5.14 SAND/SHOT BLASTING/ SPRAY PAINTING

- Sand blasting should be used only after approval from competent person.
- Air Compressor used for sand/shot blasting/painting should have guard and positioned away from the work place.
- Exhaust of the prime mover, if IC engine is used, should be directed away from the work place.
- In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.
- The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.
- The operator of sand/shot blasting/painting should wear suitable PPE's including mask.
- Adequate measures to be taken to suppress dust/sprayparticle.
- Sand used for sand blasting should be suitably covered & protected from rain/moisture.
- When these activities are done in confined places, adequate measure to be taken for proper ventilation.

6.0 CONSTRUCTION & DEMOLITION WASTE (C & D Waste)

- The Contractor shall remove all construction and demolition waste and clean the work area time to time and deposit these wastes to the dedicated area within the Port premises earmarked as "C & D wastes storage Area.
- The Contractor shall get the collected waste transported to dedicated site of Port for storage through own resources and with weight measurement
- The Contractor shall ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains
- The Contractor shall ensure that other waste (such as solid waste) does not get mixed with

this waste and is stored and disposed separately as mentioned above.

- The Contractor shall ensure safe disposal of construction and demolition waste contaminated with industrial hazardous or toxic material if any; at Waste management cell of the Port.
- Contractor shall have proper storage of construction & demolition Waste (C &D Waste) at site.
- Hazardous & Chemical waste should be stored at separate place as identified from other Waste & Man moved area.
- Storage of C & D Waste should have proper display sign board and barricading.
- Contractor shall dispose of Civil waste like Concrete, brick, stone etc at landfill area designated by the Engineer in charge.
- Contractor shall remove solid waste like steel, aluminum, wooden, cable & electrical, e-waste, pipe etc. at User storage scrap yard with proper storage & as per instruction of Engineer in charge.
- Contractor shall dispose Hazardous waste like chemical, glass wool, glass etc through Government authorized disposal service area only.
- While transportation of C & D Waste from work site, Contractor shall have proper loading, unloading facility & cover the truck and strictly follow up the GPCB, CPCB & Environment rule.
- Contractor shall maintain all records of waste like waste generate, disposed off, transport & its weight.
- Contractor shall obtain proof of waste disposed certificate from Government Authorized disposal service provider as directed by Engineer In Charge.
- Contractor shall submit all records related to C & D to the Engineer In Charge.
- Contractor shall strictly follow up & comply Guidelines of Environment Management of C & D Waste, CPCB March 2017 and maintain all records in terms of the same.

7.0 FIRST AID

First aid facilities should be provided in line with various statutory regulations like factory act etc. However following care should be taken:

- First aid, including the provision of trained personnel should be ensured at work sites.
- Arrangement should be made for ensuring the medical attention of the injured workers.
- First aid box should be as per the Factory rules.
- Suitable rescue equipment, like stretchers should be kept readily available at the construction site.
- First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.
- First-aid kit or boxes should not keep anything besides material for first aid in emergencies.
- First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and stocked.
- Where the work involves risk of drowning, asphyxiation or electric shock, first aid personnel should be proficient in the use of resuscitation and other life saving techniques and in rescue procedures.
- Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

- The Contractor shall maintain first aid facilities for its employees, workers and those of its sub - contractors.
- The Contractor shall make outside arrangements for ambulance service and for the treatment of injuries. Names of those providing these services shall be furnished to the Engineer-in-Charge prior to start of construction, and their telephone numbers shall be prominently posted in Contractor's field office.
- All critical injuries shall be reported promptly to the Engineer-in-Charge, and a copy of Contractor's report covering each personal injury requiring the attention of a physician shall be furnished to the Owner.
- Carrying/Striking of matches, lighters inside the Refinery area, smoking within the Port area are strictly prohibited. Violators of the "No Smoking" rules shall be discharged immediately. Within Port area, no hot work shall be permitted without valid gas safety/fire permits. The Contractor shall be held liable and responsible for all lapses of his subcontractors/ employees in this regard.

8.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s). All accidents should be reported as per APMT Guidelines and Factories act, 1948.

All accidents (major, minor or near miss) should be investigated, analyzed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

9.0 SAFETY AWARENESS & TRAINING

Safety awareness to all section of personnel ranging from site-in-charge to workmen helps not only preventing the risk but also build up the confidence. Time and expenditures also get saved as a result.

Safety awareness basically seeks to persuade/inform people on safety besides supplementing skill also. Awareness programme may include followings:

- **Poster:** Posters with safety slogan in humorous, gruesome demonstrating manner may be used to discourage bad habits attributable to accidents by appealing to the workers' pride, self-love, affection curiosity or human aspects. These should be displayed in prominent location(s).
- **Safety Sign Boards:** Different type of message of cautioning, attention, notice etc. should be displayed at the appropriate places for learning/ awareness of the workmen while working at site.
- **Films & Slides:** Film(s) narrating the accident including the causes and possible remedial ways of preventing the recurrence of a similar accident should be displayed at regular intervals. Slides consisting main points of the film show may also be shown to workers.

- **Tool Box meeting, lectures & conferences:** The success of these events would depend much on audience's understandings of the speaker (s). The speakers are to be knowledgeable and good presenter. Speakers should know to hold the attention and to influence the audiences.
- **Competitions:** Organize competition(s) between the different departments/categories of workers. The sense of reward/recognition also will improve safety awareness and result in enhancing safety levels.
- **Exhibitions:** Exhibitions also make the workers acquainted with hazards and means of preventive measures.
- **Safety Publication:** Safety publications including pocket books dealing with ways of investigation and prevention in the field of safety and so on, may be distributed to workers to promote the safety awareness.
- **Safety Drives:** From time to time, an intensive safety drive by organizing a safety day or a safety week etc. should be launched.
- **Training:** Training for covering the hazards for different trade should be imparted. Training should also include the specific hazards related to a job in addition to the general safety training as has been dealt in various chapters and should include all workers as per APMT guidelines.

10.0 REFERENCES

The Contractor shall be comply & follow up the following Rules, regulations, standard, guidelines & its latest amendment for the Construction work.

1. Factory Act, 1948
2. Indian Electricity Rules
3. Safety & Health in Construction by ILO
4. The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996
5. (IS : 818) Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
6. (IS : 875) Code of practice for Structural safety of buildings: Masonry walls
7. (IS : 933) Specification for Portable Chemical Fire Extinguisher, Foam Type - Second Revision.
8. (IS : 1179) Specification for Equipment for Eye and Face Protection during Welding - First Revision.
9. (IS : 1904) Code of practice for Structural safety of buildings: Shallow foundations
10. (IS : 1905) Code of practice for Structural safety of buildings: Masonry walls
11. (IS : 2171) Specification for Portable Fire Extinguishers, Dry Powder Type -Second Revision.
12. (IS : 2361) Specification for Building Grips - First Revision.
13. (IS : 2750) Specification for Steel Scaffoldings.
14. (IS : 2925) Specification for Industrial Safety Helmets - First Revision.
15. (IS : 3016) Code of Practice for Fires Precautions in Welding and Cutting Operations - First Revision.
16. (IS : 3521) Industrial safety belts and harnesses
17. (IS : 3696 - Part I) Safety Code for Scaffolds and Ladders : Part I - Scaffolds.
18. (IS : 3696 - Part II) Safety Code for Scaffolds and Ladders : Part II - Ladders.
19. (IS : 3764) Safety Code for Excavation Work.
20. (IS : 4014 -Part I & II) Code of practice for Steel tubular scaffolding
21. (IS : 4081) Safety Code for Blasting and Related Drilling Operations.
22. (IS : 4082) Recommendations on staking and storage of construction materials at site
23. (IS : 4130) Safety Code for Demolition of Buildings - First Revision.
24. (IS : 4138) Safety Code Working in Compressed Air-First Revision
25. (IS : 4756) Safety code for Tunneling works
26. (IS : 4912) Safety requirements for Floor and Wall Openings, Railings and toe Boards -First Revision.
27. (IS : 5121) Safety Code for Piling and other Deep Foundations.
28. (IS : 5916) Safety Code for Construction involving use of Hot Bituminous Materials.
29. (IS : 5983) Specification for Eye Protectors - First Revision.
30. (IS : 6922) Structures subject to underground blasts, criteria for safety and design
31. (IS : 7155) Code of recommended practices for conveyor safety

32. (IS : 7205) Safety Code for Erection on Structural Steel Works.
33. (IS : 7069) Safety Code for Handling and Storage of Building Materials.
34. (IS : 7293) Safety Code for Working with Construction Machinery.
35. (IS : 7323) Guidelines for operation of Reservoirs
36. (IS : 7969) Safety code for handling and storage of building material
37. (IS : 8758) Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals.
38. (IS : 8989) Safety Code for Erection of Concrete Framed Structures.
39. (IS : 9706) Code of Practices for construction of Arial ropeways for transportation of material
40. (IS : 9759) Guidelines for de-watering during construction
41. (IS : 9944) Recommendations on safe working load for natural and manmade fibre roap slings
42. (IS : 10291) Safety code for dress divers in civil engineering works
43. IS :10386 - Part I) Safety Code for Construction, Operation and Maintenance for River Valley Projects.
44. (IS :10386 - Part II) Safety Code for Construction, Operation and Maintenance of River Valley Projects.
45. (IS : 11057) Code of practice for Industrial safety nets
46. (IS : 13415) Code of Practice on safety for Protective barriers in and around building
47. (IS : 13416) Recommendations for preventive measures against hazards at working places