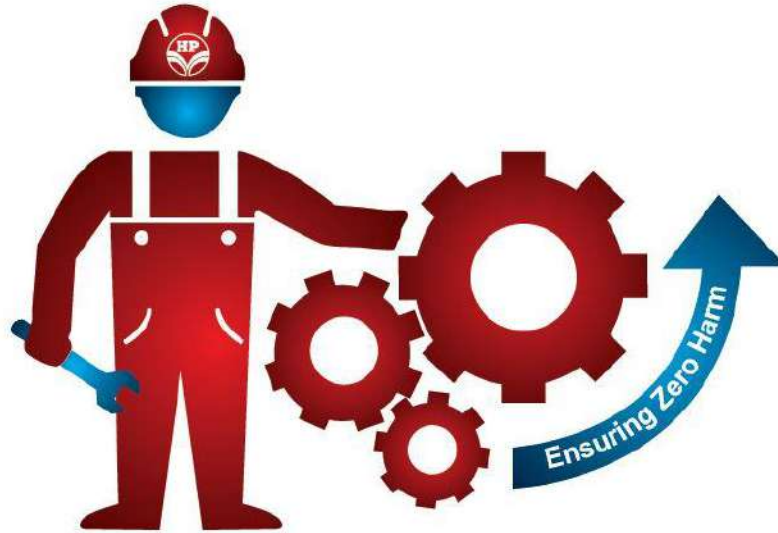


## Documents to be submitted

- a. Detailed GA drawings, Guaranteed technical particulars, complete bill of materials, etc to be submitted for HPCL Approval along with manufacturer's QAP for review.
- b. TPI to be carried out as per HPCL approved QAP thru any of the HPCL approved TPI Agencies. The cost of TPI is deemed inclusive in the quoted price.**
- c. After approval of GA Drawings, TPI Reports, particulars, etc. material is to be dispatched.
  1. All transportation of materials, tools and tackles including manpower required for loading and unloading of the materials at the site is in the scope of the bidder.
  2. It is the responsibility of the bidder to ensure all safety rules of HPCL to be followed at the work site during unloading.
  3. The bidder to provide warranty for the supplied Lights /Panels (including Panels, Batteries, Electronics accessories/Mechanical accessories for 5 years period.
  4. All the materials to be delivered at Secunderabad Terminal on door delivery basis.
  5. Bidder to quote the rates including P&F. No extra amount will be paid by HPCL.
  6. It is the responsibility of the bidder to ensure all safety rules of HPCL to be followed at the work site during unloading.



# HSE Policy for Construction

Initiated By:

Darshan Pandya  
(Const. Engineer- E&P)

Issued For Approval of Review Committee by Engineering Cell

No	Designation	Name	Date	Signature
1	Ch Manager-E & P (ASR)	A S REDDY		
2	Ch Manager- HSE (SSVP)	S S V PRASAD		
3	Ch. Manager-E & P (DG)	DEBASISH GOSWAMI		



# HINDUSTAN PETROLEUM CORPORATION LIMITED

E & P Department , Gresham House-2

## Contents

1.0	SCOPE .....	4
2.0	REFERENCE .....	4
3.0	DEFINITIONS AND ABBREVIATIONS.....	5
4.0	REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS.....	7
4.1	MANAGEMENT RESPONSIBILITY .....	7
4.2	HOUSE KEEPING.....	8
5.0	SAFETY REQUIREMENT AT CONSTRUCTION WORK .....	9
5.1	MEANS OF ACCESS AND EGRESS .....	11
5.2	PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES.....	11
5.3	PREVENTION OF UNAUTHORISED ENTRY .....	11
5.4	EXCAVATION .....	12
5.5	SCAFFOLDING, LADDERS & SHUTTERING.....	14
5.6	PERSONNEL PROTECTION .....	18
5.7	STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING.....	19
5.8	ROAD WORK.....	23
5.9	CUTTING/WELDING .....	24
5.10	WORKING IN CONFINED SPACES.....	26
5.11	PROOF/PRESSURE TESTING .....	27
5.12	WORKING AT HEIGHTS .....	28
5.13	HANDLING AND LIFTING EQUIPMENT: .....	30
5.14	VEHICLE MOVEMENT.....	36
5.15	ELECTRICAL.....	37
5.16	DEMOLITION .....	40
5.17	RADIOGRAPHY .....	42
5.18	GRIT SHOT/ SLAG BLASTING/ SPRAY PAINTING.....	43
5.19	FIRE PREVENTION AND FIRE FIGHTING .....	43
5.20	LIGHTING .....	44
5.21	PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS .....	45
5.22	MISCELLANEOUS.....	47



# HINDUSTAN PETROLEUM CORPORATION LIMITED

E & P Department , Gresham House-2

<b>5.23</b>	<b>REPORTING OF ACCIDENT</b> .....	47
6.0	DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR .....	48
7.0	ADDITIONAL GUIDELINES TO BE FOLLOWED FOR PROJECTS IN OPERATIONAL TERMINAL/DEPOT PREMISES AND UNITS WITH HYDROCARBONS .....	50
8.0	WORK PERMIT SYSTEM .....	53
9.0	NON COMPLIANCE OF SAFETY AND HEALTH PROVISIONS.....	58
<b>9.1</b>	<b>DISCIPLINARY ACTION</b> .....	58
<b>9.2</b>	<b>PENALTIES</b> .....	59
10.0	CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES .....	62



### 1.0 SCOPE

- 1.1 This document specifies guidelines on safe practices to be adhered to during construction activities in Marketing Installations of oil industry. However before commencing any job, specific hazards and its effects should be assessed and necessary corrective / preventive actions should be taken by all concerned. This document is intended only to supplement and not to replace or supersede the prevailing statutory requirements which shall be adhered to as applicable.
- 1.2 The scope of this document does not include the design aspects and quality checks during construction.
- 1.3 The purpose of this Policy is to create awareness among Project engineers, describe procedures and guidelines for ensuring safety during construction activity undertaken at Project sites. The implementation of this system will help in reducing the risks at work sites, thereby reducing possibility of any accident, fire, explosion, property damage and adverse effects on environment.
- 1.4 This Manual covers the Safety guidelines to be adopted at Project Sites both at Greenfield and Brownfield locations.
- 1.5 This Manual does not cover the design safety standards to be considered for any project.

### 2.0 REFERENCE

- 2.1 This document shall be read in conjunction with following:
  - General Conditions of Contract (GCC)
  - Special Condition of Contract (SCC)
  - Job Specifications
  - Any other conditions/enclosures which form part of the contract
- 2.2 For personnel protective equipment (PPE), OISD-STD-155 (Part-I & II) shall be referred to.
- 2.3 Project Sites may be either Greenfield or Brownfield locations. Work at Brownfield locations (working / operating locations) shall be governed by the Work Permit System stipulated in OISD-STD-105.
- 2.4 This policy summarizes some of the HSE requirements which are abstracted from OISD-GDN-192 (Safety Practices during Construction) and OISD-GDN-207 (Contractor Safety). However, it may be noted that all the provisions mentioned in the OISD Standards / Guidelines referred to above shall be adhered to. OISD-GDN-192 and OISD-GDN-207 have been attached with this document.
- 2.5 In case of any contradiction in provisions mentioned herein, applicability of the provisions shall be determined on the basis of the following hierarchy:
  - 2.5.1 Statutory Requirements
  - 2.5.2 OISD Standards / Guidelines / Recommended Practices
  - 2.5.3 Special requirements specified in the SCC
  - 2.5.4 Health Safety and Environment (HSE) Policy (this document)



- 2.5.5 General Conditions of Contract (GCC)  
2.5.6 Good Engineering Practices

### 3.0 DEFINITIONS AND ABBREVIATIONS

- a) **Hot Work:** An activity that can produce a spark or flame or other source of ignition having sufficient energy to cause ignition, where the potential for flammable vapours, gases, or dust exists. This includes all works, which produces spark, running of IC engine, breaking of concrete, use of ordinary torches, use of battery operated devices, etc.
- b) **Cold Work:** Cold Work is an activity that does not produce sufficient heat to ignite a flammable air-hydrocarbon mixture or a flammable substance.
- c) **Radiation Work:** Any activity that is carried with a source of ionizing radiation, which does not produce sufficient heat to ignite a flammable air- hydrocarbon mixture or a flammable substance.
- d) **Working at Height:** Any activity that is carried out at 2.0 meters & above on temporary structure, scaffolds or on a structure meant to do particular job safely.
- e) **Excavation:** Any job, which requires excavation/ digging of earth.  
An **Excavation** is any man-made cut, cavity, trench, or depression in an earth surface that is formed by earth removal. A **Trench** is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth of a trench is greater than its width, and the width (measured at the bottom) is not greater than 15 ft (4.6 m).
- f) **Confined Space:** It is an enclosure with known potential hazards and restricted means of entrance and exit. It is not meant for normal occupancy of people and is usually not well ventilated such as Underground tanks, vessels, boilers, storage tanks, large diameter piping, etc. The following shall be classified as confined space:
- Any excavation more than 1.50 M deep
  - Entry into floating roof tanks with roof at short leg or long leg
  - Entry in to Underground Tanks
  - Space located below ground level such as pits, drain channels etc.
- g) **Lower Explosive Limit (LEL):** LEL is the minimum concentration of a vapour in air (or other oxidant) below which propagation of flame does not occur on contact with an ignition source. This is usually expressed as volume percentage of the vapour in air.
- h) **Upper Explosive Limit (UEL):** UEL is the maximum concentration of a vapour in air (or other oxidant) above which propagation of flame does not occur on contact with and ignition source. This is usually



expressed as a volume percentage of vapours in air.

- i) **Pyrophoric Substance:** Substances that ignites spontaneously in air at ambient temperature. In hydrocarbon industry, iron sulphide is the most commonly observed pyrophoric substance and is called as pyrophoric iron.
- j) **Self-Contained Breathing Apparatus (SCBA):** It is a lifesaving personal protective apparatus consisting of a face mask: combined with a hose and source of fresh air generally in form of a cylinder of compressed air to be carried by bearer.
- k) **Work Permit issuer:** He is a designated officer authorized to issue work permit in case of following:
  - Confined space working
  - Electrical Connection & welding clearance Permit
  - Height permit.

He signs & issues the permit for the particular job after receiving the recommendation from the job engineer for issuing the permit. The particular job engineer shall address & check all the checklist points of permit and then recommend the permit by signing.

- l) **Permit Receiver:** He is the designated person authorized by the Contractor to receive work permit.
- m) **Adequate, appropriate or suitable** are used to describe qualitatively or quantitatively the means or method used to protect the worker.
- n) **Brace:** A structural member that holds one point in a fixed position with respect to another point; bracing is a system of structural members designed to prevent distortion of a structure.
- o) **By hand:** The work is done without the help of a mechanized tool.
- p) **Competent Authority:** A statutory agency having the power to issue regulations, orders or other instructions having the force of law.
- q) **Competent person:** A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.
- r) **Execution agency:** Any physical or legal person, having contractual obligation with the owner, and who employs one or more workers on a construction site
- s) **Owner:** Any physical or legal person for whom construction job is carried out. It shall also include owner's designated representative/consultant/nominee/agent, authorized from time to time to act for and on its behalf, for supervising/workplace or for escaping in case of danger.



- t) **Scaffold:** Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance as defined above.
- u) **Toe-board:** A barrier placed along the edge of a scaffold platform, runway, etc., and secured there to guard against the slipping of persons or the falling of material.
- v) **Worker:** Any person engaged in construction activity.
- w) **Workplace:** All places where workers need to be or to go by reason of their work.

## 4.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS

### 4.1 MANAGEMENT RESPONSIBILITY

- 4.1.1 The contractor should have a documented HSE policy covering commitment of their organization to ensure health, safety and environment aspects in their field of operation.
- 4.1.2 The HSE management system of the contractor shall cover the HSE requirements for ensuring safe execution, including but not limited to what is specified in the scope of this document.
- 4.1.3 The Contractor shall ensure that the Health, Safety & Environment (HSE) requirements are clearly understood & faithfully implemented at all levels at the site.
- 4.1.4 The Contractor shall promote and develop consciousness for Safety, Health and Environment among all personnel working for the Contractor. Regular awareness programs, site meetings, Tool Box Talks shall be arranged on HSE activities to cover hazards involved in various operations during construction.
- 4.1.5 Arrange necessary first aid measures such as First Aid Box, trained personnel to administer First Aid, Stand-by vehicle in case of an emergency and install fire protection measures such as adequate number of steel buckets with sand and deploy adequate fire extinguishers as per the site requirement.
- 4.1.6 The Contractor shall implement a comprehensively planned and documented system for monitoring of the HSE requirements. This shall be submitted to HPCL/Owner for approval. The monitoring for implementation shall be done through regular inspections and compliance of the observations thereof. The Contractor shall get similar HSE systems implemented at his sub-contractor(s) work site/office. However, compliance of HSE requirements shall be the sole responsibility of the Contractor. Any review /





# HINDUSTAN PETROLEUM CORPORATION LIMITED

## E & P Department , Gresham House-2

approval by HPCL/Owner shall not absolve contractor of his responsibility / liability in relation to all HSE requirements.

4.1.6.1 Non-Conformance on HSE by Contractor (including his Sub-contractors) as brought out during review/audit by HPCL representatives shall be resolved forthwith by Contractor. Compliance report shall be provided to HPCL.

4.1.6.2 The Contractor shall ensure participation of his Resident Engineer / Site-in-Charge in the Safety Committee / HSE Committee meetings arranged by HPCL. The compliance of any observations shall be ensured at the earliest.

4.1.6.3 The Contractor shall consistently adhere to all provisions of HSE requirements. In case of non-compliance or continuous failure in implementation of any of the HSE provisions; HPCL may impose stoppage of work. In case stoppage of work is imposed by HPCL, any Cost & Time implications arising out of the duration of the stoppage shall be entirely to the account of the contractor and no claim whatsoever in this regard shall be tenable. The decision of imposing stoppage work, its duration or imposing a monetary penalty (in line with the provisions mentioned elsewhere in this document) shall rest with HPCL & shall be binding on the Contractor.

4.1.6.4 All fatal accidents, incidents involving injuries or loss of property and near misses at the worksite shall be investigated by a team of Contractor's senior personnel for root causes, with recommendations regarding corrective and preventive measures. Findings shall be documented and actions taken to avoid recurrences shall be communicated to HPCL. HPCL shall have the liberty to independently investigate such incidents and Contractor shall extend all necessary help and co-operation in this regard.

## 4.2 HOUSE KEEPING

4.2.1 Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure inter alia the followings wherever applicable:

- a. All surplus earth and debris is removed/disposed of from the working areas to identified location(s).
- b. Unused/Surplus Cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).
- c. All wooden scrap, empty wooden cable drums and other combustible packing materials shall be removed from work place to identified location(s).
- d. Roads shall be kept clear and materials like pipes, steel, sand boulders, concrete, chips and bricks etc. shall not be allowed on the roads to obstruct free movement of men, machinery and vehicles.



# HINDUSTAN PETROLEUM CORPORATION LIMITED

E & P Department , Gresham House-2

- e. Fabricated steel structural, pipes & piping materials shall be stacked properly for erection.
- f. Water logging on roads shall not be allowed.
- g. No parking of trucks / trolleys, cranes and trailers etc. shall be allowed on roads which may obstruct the traffic movement.
- h. Utmost care shall be taken to ensure overall cleanliness and proper upkeep of the working areas.
- i. Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the premises.
- j. Only properly designed steel scaffolding materials to be used for working at heights more than 3.0 M. Double scaffolding using wooden ballis may be allowed for working at height less than 3.0 M, with prior permission of Engineer-in-charge.

## 5.0 SAFETY REQUIREMENT AT CONSTRUCTION WORK

A fulltime / dedicated Safety Officer should be assigned, where more than 100 workers are employed at site. For smaller jobs, the supervisor should assume the additional responsibility of safety officer.

Duties & responsibilities of the contractor's Supervisor / Safety Officer should include the following:

- i. To ensure strict compliance with work permit system by carrying out work only with appropriate work permits and after ensuring that all safety precautions / conditions in the permit are complied with and closing the same after job completion.
- ii. To ensure that required guards and standard personal protective equipment are provided, used, and properly maintained including contingency requirement.
- iii. To ensure inspection, tested, certification and maintenance of all tools and ensure removal of defective tools.
- iv. To plan the workload and assign workers to jobs in commensuration with their qualification, experience and state of health.
- v. To ensure that all the preventive measures for identified hazards (e.g. Job Safety Analysis, Job Hazard Analysis, HIRA, etc.) are in place and communicated to workers.
- vi. To take immediate corrective action against the violation of safety rules observed or reported.
- vii. To ensure that the workers likely to be exposed to hazardous chemicals/materials have access to appropriate Material Safety Data Sheets (MSDS), and provide necessary mitigation measures.
- viii. To ensure that appropriate warning signboards or tags are displayed.



- ix. To ensure that all workers have proper training for their job assignments, including use of appropriate PPE, first aid and firefighting equipment.
- x. To ensure that only medically fit person shall be engaged in work and also ensure that sick / or injured workers during course of work should receive timely and appropriate first aid and/or medical attention.
- xi. To report each incident and/or injury in accordance with established procedures and assist in investigation.
- xii. Maintain Daily HSE observation log book at site.
- xiii. Conduct Tool Box talks along with Site Engineers/ supervisors.
- xiv. Maintain the published HSE literature, HSE regulations, codes and other communications. Advise management of compliance and conditions requiring attention.

### **Contract workers**

The duties & responsibilities of the contractor worker should include the following:

- i. To perform work safely as per the job requirement and instructions.
  - ii. To inform all concerned regarding unsafe conditions / and unsafe acts.
  - iii. To wear PPEs as stipulated and necessary for the job.
  - iv. To inform promptly to their supervisor regarding all work related incidents resulting in personal injury, illness and/or property damage.
  - v. To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.
- This specification deals with the safety and protection to be observed in during Construction. These shall be adhered to along with all related statutory requirements/obligations including Governmental byelaws, codes, regulations of local or central authorities related to the construction work.
  - In case of complicated work like deep excavation, intricate shuttering and formwork, excavation in loose soil and below water table, stacking of excavated earth etc., work plan with necessary drawings and documents have to be prepared by the Contractor and approved by the Site Engineer (Owner).
  - All openings and other areas likely to pose danger to workers should be clearly indicated.
  - Workers & Supervisors should wear safety helmet, safety shoes and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.
  - Never use solvents, alkalis and other oils to clean the skin.
  - Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.
  - Ensure the usage of correct and tested tools & tackles. Don't allow make shift tools and tackles.



- No loose clothing should be allowed while working near rotating equipment or working at heights.

### **5.1 MEANS OF ACCESS AND EGRESS**

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

### **5.2 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES**

- 5.2.1 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.
- 5.2.2 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.
- 5.2.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.
- 5.2.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.

### **5.3 PREVENTION OF UNAUTHORISED ENTRY**

- 5.3.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of un-authorized persons.
- 5.3.2 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.



### 5.4 EXCAVATION

- 5.4.1 No excavation or earth work below the foundation level of an adjoining building shall be taken up unless adequate steps are taken to prevent damage to the existing structure or fall of any part.
- 5.4.2 Every accessible part of an excavation, pit or opening in the ground into which there is a danger of persons falling shall be suitably cordoned off up to a height of one metre suitably placed from the edge of the excavation as far as practicable. Red tape & warning boards shall be used.
- 5.4.3 No material or load shall be placed or stacked near the edge of the excavation or opening in the ground. The excavated material shall not be placed within 1.5 m of the trench or half of the depth of the trench, whichever is more.
- 5.4.4 Cutting shall be done from top to bottom. No undercutting of sides of excavation shall be allowed.
- 5.4.5 Materials shall not be dumped against existing walls or partition to a height that may endanger the stability of the walls.
- 5.4.6 While withdrawing piled materials like loose earth, crushed stone, sand, etc. from the stock piles, no overhanging shall be allowed to be formed in the existing dump.
- 5.4.7 No material on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or public or any other agency at work.
- 5.4.8 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;
- 5.4.9 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required decided.
- 5.4.10 All excavation work should be supervised.
- 5.4.11 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.

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

**5.4.13** 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.

**5.4.14** Don't allow vehicles to operate too close to excavated area. Maintain at-least 2 m distance from edge of excavation. 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.

**5.4.15** 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.

**5.4.16** 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.

**5.4.17** Barricade at 1 m height (with red & white band/self-glowing caution board) should be provided for excavations beyond 1.5 m depth. Provide two entries/exits for such excavation.

**5.4.18** 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.

**5.4.19** 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.

**5.4.20** During rains, the soil becomes loose. Take additional precaution against collapse of side wall.

**5.4.21** In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.

**5.4.22** 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 levelled 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.

**5.4.23** In case of blasting, IS: 4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation shall be strictly adhered to.

### 5.5 SCAFFOLDING, LADDERS & SHUTTERING

- 5.5.1 For all work that cannot be done from the ground level or from part of any permanent structure or from other available means of support, soundly constructed scaffoldings of adequate strength shall be used as a safe means of access to places of work.
- 5.5.2 All scaffolding shall be securely supported or suspended and wherever necessary be properly braced to ensure stability.
- 5.5.3 All working platforms and stages from which workers are liable to fall shall be of adequate width depending on the type of work done and closely boarded and planked.
- 5.5.4 Every ladder shall be securely fixed at top and bottom. A ladder more than 5 m long shall have a prop.
- 5.5.5 No portable single ladder shall be over 8 m in length.
- 5.5.6 Unfinished scaffolding which is under construction shall be prominently marked as unsafe and any access points shall be closed.
- 5.5.7 Shuttering  
The above remarks shall be applicable for shuttering also. Shuttering, particularly for slabs, should be treated as a scaffold. Unfinished shuttering should be marked as dangerous. Similarly the finished form work should be adequately supported & care being taken to avoid trap door effect.
- 5.5.8 Metal as material of construction
  - I. 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.
  - II. Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.



- III. Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.
- IV. 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.
- V. Boards and planks used for scaffolds should be protected against splitting.
- VI. Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.
- VII. Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.
- VIII. 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.
- IX. Scaffolds should be designed for their maximum load as per relevant code.
- X. Scaffolds should be adequately braced.
- XI. Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.
- XII. A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.
- XIII. Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.
- XIV. Scaffolds should be inspected and certified:
  - 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.
- XV. Inspection should more particularly ascertain that:
- the scaffold is of suitable type and adequate for the job;
  - 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.
- XVI. A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.
- XVII. 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.
- XVIII. If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

### 5.5.9 Lifting appliances on scaffolds

I. 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;
- i. 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.

### 5.5.10 Prefabricated scaffolds

- I. In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.



- II. Frames of different types should not be intermingled in a single scaffold.
- III. Scaffolding shall be erected on firm and level ground.
- IV. All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.
- V. Entry to scaffolding should be restricted.
- VI. Erection, alteration and removal shall be done under supervision of experienced personnel.
- VII. Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.
- VIII. Each supporting member of platform shall be securely fastened and braced
- IX. Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.
- X. 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.
- XI. The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.
- XII. Erect ladders in the “four up-one out position”
- XIII. Lash ladder securely with the structure.
- XIV. Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.
- XV. 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.”
- XVI. Portable ladders shall be used for heights not more than 4 m. Above 4 m flights, fixed ladders shall be provided with at least 600 mm landings at every 6 m or less.
- XVII. The width of ladder shall not be less than 300 mm and rungs shall be spaced not more than 300 mm.
- XVIII. Every platform and means of access shall be kept free from obstruction.
- XIX. If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.



- XX. 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.
- XXI. Don't overload the scaffolding. Remove excess material and scrap immediately.
- XXII. Dismantling of scaffolds shall be done in a pre-planned sequential manner.

### 5.5.11 Suspended scaffolds/boatswain's chair

- I. In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.
- platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;
  - the number or anchorage should be compatible with the dimensions of the platform;
  - the safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;
  - the anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;
  - the ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;
  - Before use, the whole structure should be checked by a competent person.

## 5.6 PERSONNEL PROTECTION

- 5.6.1 Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes, shall be provided with protective goggles.
- 5.6.2 Suitable personnel protective equipment (PPE) such as safety helmets, safety boots, safety belts, gloves for welders, clear glass safety goggles etc., as considered adequate by the Site Engineer have to be made available for the use of persons employed at the site of work and maintained in condition suitable for immediate use and Contractor shall take steps to ensure proper use of PPE by the workers.



- 5.6.3 Sign boards (1 m x 1.5 m in size) shall be displayed prominently with the following wording at the access points to the construction areas - "CONSTRUCTION AREA, PPE REQUIRED TO BE WORN BEYOND THIS POINT".
- 5.6.4 Arrangement for rendering prompt and adequate first aid to the injured persons shall be maintained at every work site. Depending upon the magnitude of the work, the availability of an ambulance at a very short notice (a telephone call) shall be ensured.
- 5.6.5 First-aid arrangements commensurate with the degree of hazard and with the number of workers employed shall be maintained in a readily accessible place. Arrangements shall be made for calling the medical officer, when such a need may arise. It is recommended that foreman / assistant foreman / supervisor/ permanent workmen who are normally present at each working phase in each shift are given adequate training on first-aid methods.

### 5.7 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

#### 5.7.1 General provisions

- I. The erection or dismantling of buildings, structures, civil engineering works, formwork, false work and shoring should be carried out by trained workers only under the supervision of a competent person.
- II. Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.
- III. Formwork, false work and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.
- IV. 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.

#### 5.7.2 Erection and dismantling of steel and prefabricated structures

- I. 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.



# HINDUSTAN PETROLEUM CORPORATION LIMITED

## E & P Department , Gresham House-2

- II. Steel and prefabricated structures should be so designed and made that they can be safely transported and erected.
- III. 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.
- IV. 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.
- V. 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.
- VI. 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.
- VII. Every lifting appliance should:
  - Be suitable for the operations and not be capable of accidental disconnection;
  - Be approved or tested as per statutory requirement.
- VIII. Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.
- IX. Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:
  - (a) be of such shape and dimensions as to ensure a secure grip without damaging the part;
  - (b) Be marked with the maximum permissible load in the most unfavorable lifting conditions.



# HINDUSTAN PETROLEUM CORPORATION LIMITED

## E & P Department , Gresham House-2

- X. Structural steel or prefabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.
- XI. When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.
- XII. 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.
- XIII. 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.
- XIV. 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.
- XV. 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.
- XVI. 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.
- XVII. 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.
- XVIII. 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.
- XIX. 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.
- XX. 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.



- XXI. 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.
- XXII. Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.
- XXIII. When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded.
- XXIV. Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.
- XXV. Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.
- XXVI. 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.
- XXVII. Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

### **5.7.3 Reinforcement**

- I. Ensure that workers use Personnel Protective Equipment like safety helmet, safety shoes, gloves etc.
- II. Don't place the hand below the rods for checking clear distance. Use measuring devices.
- III. Don't wear loose clothes while checking the rods.
- IV. Don't stand unnecessarily on cantilever rods.
- V. To carry out welding/cutting of rods, safety procedures/precautions as required are followed.
- VI. For supplying of rods at heights, proper staging and/or bundling to be provided.
- VII. Ensure barricading and staging for supplying and fixing of rods at height.
- VIII. For short distance carrying of materials on shoulders, suitable pads to be provided.
- IX. 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 1.5 M whichever is less and tied with red flags/lights.

### 5.7.4 Concreting

- I. Ensure stability of shuttering work before allowing concreting.
- II. Barricade the concreting area while pouring at height/depths.
- III. Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.
- IV. Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may affect their integrity.
- V. Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.
- VI. Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.
- VII. Earthing of electrical mixers, vibrators, etc. should be done and verified.
- VIII. Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.
- IX. 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.
- X. Don't allow unauthorized person to stand under the concreting area.
- XI. Ensure adequate lighting arrangements for carrying out concrete work during night.
- XII. Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.
- XIII. During pouring, shuttering and its supports should be continuously watched for defects.

### 5.8 ROAD WORK

- 5.8.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.
- 5.8.2 Filled and empty bitumen drums shall be stacked separately at designated places.





- 5.8.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.
- 5.8.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.
- 5.8.5 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.
- 5.8.6 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,
- 5.8.7 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.
- 5.8.8 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.

### 5.9 CUTTING/WELDING

- 5.9.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken:
  - I. Dry chemical type fire extinguishers shall be made available in the work area.
  - II. 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.
  - III. Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.
  - IV. All covers and panels shall be kept in place, when operating an electric Arc welding machine.
  - V. The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipment etc.
  - VI. 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.
  - VII. 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.
  - VIII. Cable coiling shall be maintained at minimum level, if not avoidable.
  - IX. An energized electrode shall not be left unattended.



- X. The power source shall be turned off at the end of job.
- XI. All gas cylinders shall be properly secured in upright position.
- XII. Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.
- XIII. 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.
- XIV. When not in use, valves of all cylinders shall be kept closed.
- XV. All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.
- XVI. Forced opening of any cylinder valve should not be attempted.
- XVII. Lighted gas torch shall never be left unattended.
- XVIII. Store acetylene and oxygen cylinders separately.
- XIX. Store full and empty cylinders separately.
- XX. Avoid cylinders coming into contact with heat.
- XXI. Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.
- XXII. If cylinders have to be moved, be sure that the cylinder valves are shut off.
- XXIII. Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.
- XXIV. Do not use matches to light torches, use a friction lighter.
- XXV. Move out any leaking cylinder immediately.
- XXVI. Use trolleys for oxygen & acetylene cylinder and chain them.
- XXVII. Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.
- XXVIII. Ensure that hoses are free from burns, cuts and cracks and properly clamped.
- XXIX. Avoid dragging hoses over sharp edges and objects
- XXX. Do not wrap hoses around cylinders when in use or stored.
- XXXI. Protect hoses from flying sparks, hot slag, and other hot objects.
- XXXII. Lubricants shall not be used on Ox-fuel gas equipment.
- XXXIII. During cutting/welding, use proper type goggles/face shields.



### 5.10 WORKING IN CONFINED SPACES

- 5.10.1 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.
- I. Shut down, isolate, de-pressurize and purge the vessel as per laid down procedures.
  - II. Entry inside the vessel and to carry out any job should be done after issuance of valid permit only in line with the requirements of OISD-STD-105.
  - III. Ensure proper and accessible means of exit before entry inside a confined space.
  - IV. The number of persons allowed inside the vessel should be limited to avoid overcrowding.
  - V. When the work is going on in the confined space, there should always be one man standby at the nearby man way.
  - VI. Before entering inside the vessels underground or located at lower elevation, probability of dense vapors accumulating nearby should also be considered in addition to inside the vessel.
  - VII. Ensure requisite O<sub>2</sub> level before entry in the confined space and monitor level periodically or other wise use respiratory devices.
  - VIII. Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.
  - IX. Ensure adequate ventilation or use respiratory devices.
  - X. 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.
  - XI. Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.
  - XII. Use 24V flameproof lamp fittings only for illumination.
  - XIII. Use tools with air motors or electric tools with maximum voltage of 24V.
  - XIV. Housekeeping shall be well maintained.
  - XV. Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.
  - XVI. Don't wear loose clothing while working in a confined space.



- XVII. In case of the vessels which are likely to contain pyrophoric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyrophoric substances. Otherwise, these should be always kept wet by suitable means.
- XVIII. The cutting torches should also be kept outside the vessel immediately after the cutting.
- XIX. The gas cylinders used for cutting/welding shall be kept outside.
- XX. 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.
- XXI. To the extent possible sludge shall be cleared and removed from outside before entering.
- XXII. 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.
- XXIII. Communication should be always maintained between the worker and the attendant.

### 5.11 PROOF/PRESSURE TESTING

- 5.11.1 Review test procedure before allowing testing with water or air or any other fluid.
- 5.11.2 Provide relief valves of adequate size while testing with air or other gases.
- 5.11.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.
- 5.11.4 Inform all concerned in advance of the testing.
- 5.11.5 Keep the vents open before opening any valve for filling/draining of liquid used for hydro testing. The filling/draining should not exceed the designed rate for pressure testing.
- 5.11.6 Provide separate gauges of suitable range for pressurizing pump and the equipment to be tested.
- 5.11.7 Provide gauges at designated locations for monitoring of pressures.
- 5.11.8 Check the calibration of all pressurizing equipment and accessories and maintain records.
- 5.11.9 Take readings at pre-defined intervals.



### 5.12 WORKING AT HEIGHTS

#### 5.12.1 General Provision

- I. While working at a height of more than 3 meters, ISI approved safety belt shall be used.
- II. While working at a height of more than 3 meters, permit should be issued by competent person before commencement of the job.
- III. Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.
- IV. All tools should be carried in tool kits to avoid their falling.
- V. If the job is on fragile/sloping roof, roof walk ladders shall be used.
- VI. Provide lifeline wherever required.
- VII. Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.
- VIII. Keep working area neat and clean. Remove scrap material immediately.
- IX. Don't throw or drop material/equipment from height.
- X. Avoid jumping from one member to another. Use proper passageway.
- XI. Keep both hands free while climbing. Don't try to bypass the steps of the ladder.
- XII. Try to maintain calm at height. Avoid over exertion.
- XIII. Avoid movements on beam.
- XIV. Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

#### 5.12.2 Roof Work

- I. All roof-work operations should be pre-planned and properly supervised.
- II. Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- III. Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.
- IV. Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.
- V. Roofing brackets should fit the slope of the roof and be securely supported.
- VI. Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.
- VII. 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.



- VIII. All covers for openings in roofs should be of substantial construction and be secured in position.
- IX. Roofs with a pitch of more than 10 should be treated as sloping.
- X. 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.
- XI. 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.
- XII. 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.
- XIII. 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.

### 5.12.3 Work on tall chimneys

- I. For the erection and repair of tall chimneys, scaffolding should be provided. A safety net should be maintained at a suitable distance below the scaffold.
- II. The scaffold floor should always be at least 65 cm below the top of the chimney.
- III. Under the working floor of the scaffolding the next lower floor should be left in position as a catch platform.
- IV. The distance between the inside edge of the scaffold and the wall of the chimney should not exceed 20 cm at any point.
- V. Catch platforms should be erected over:
  - The entrance to the chimney;
  - Passageways and working places where workers could be endangered by falling objects.
- VI. For climbing tall chimneys, access should be provided by:
  - Stairs or ladders;
  - A column of iron rungs securely embedded in the chimney wall;
  - Other appropriate means.
- VII. When workers use the outside rungs to climb the chimney, a securely fastened steel core rope looped at the free end and hanging down at least 3 m should be provided at the top to help the workers to climb on to the chimney.
- VIII. While work is being done on independent chimneys the area surrounding the chimney should be enclosed by fencing at a safe distance.
- IX. Workers employed on the construction, alteration, maintenance or repair of tall chimneys should not: