

# Procedures HSE Manual

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**Purpose**

The purpose of this Procedures Manual is to give clear & precise Health, Safety & Environmental instructions to the contractors involved in the construction of the All over India Project Sites.

**Scope**

This Manual is designed to apply to our all personnel and equipment of R K Insulation Engineers & Contractors and also Subcontractor. The Manual shall apply to all suppliers entering the projects, and any subsequent subcontractors so engaged.

**References**

- R K Insulation HSE Plan.
- Republic of India Government Regulations
- The Dangerous Machines (regulations) Act, 1983
- American National Standards Institute. ANSI
- Occupational Safety & Health Administration. OSHA
- Australian Standard AS 1885.1-1990
- BOCWA Act, 1996
- BOCWR Building and Other Construction Workers Central Rules, 1998

In addition, the construction works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:

- Indian Electricity Act 2003 and Rules 1956
- National Building Code, 2005
- Factories Act, 1948,
- Motor Vehicles Act as amended in 1994 and The Central Motor Vehicles Rules, 1989.
- Indian Road Congress Code IRC: SP: 55-2001 'Guidelines on Safety In Road Construction Zones.
- The Petroleum Act, 1934 and Rules 1976
- Gas Cylinder Rules, 2003
- Indian Explosives Act. 1884, along with the Explosives substance Act 1908 and the Explosives Rules 1983
- The (Indian) Boilers Act, 1923
- The Public Liability Insurance Act 1991 and Rules 1991
- Minimum Wages Act, 1948 and Rules 1950
- Contract Labour Act, 1970 and Rules 1971
- Child Labour (Prohibitions & Regulations) Act, 1986 and Rules 1950
- Environment Protection Act, 1986 and Rules 1986
- Air (Prevention and control of Pollution) Act, 1981
- Water (Prevention and Control of Pollution) Act, 1974
- The Noise Pollution (Regulation & Control) Rules, 2000
- Notification on Control of Noise from Diesel Generator (DG) sets, 2002
- Recycled Plastic Usage Rules, 1998
- Notification, Central Ground Water Board, Act January 1997
- Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989
- The Hazardous Waste (Management & Handling) Rules, 1989
- Hazardous Waste Management Rules 1989 (as amended in 1999)
- Batteries (Management and Handling) Rules
- Fly ash utilization notification, Sept 1999 as amended in August 2003
- Workman Compensation Act, 1923

**Definitions**

PPE	Means Personal Protective Equipment
HSE	Means Health, Safety & Environment
Approved	Means acceptable to common industry standards
BOCWA	Means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996
BOCWR	Means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998
DG	Means Director General of Ministry of Labour, Govt. of India.

## **1. RESPONSIBILITIES**

- **Project Managers**

Project Managers are responsible for compliance of their respective discipline Managers towards the goal of providing a safe & hazard free working environment.

- **Construction Managers**

Construction Managers are responsible for the following of safe work principals and field guidelines as developed in this, and other project manuals on the R K Insulation Engineers & Contractors, for the provision of safe methods of work, and for the provision of sufficient stock of PPE to supply field requirements.

- **Superintendents & Supervisors**

Are responsible for the provision of a safe work environment in which their operatives are to work, and for ensuring sufficient PPE is available for them, commensurate with the tasks to be performed and that PPE is used correctly.

- **HSE**

Are responsible for ensuring information concerning the Project HSE Program is available to Sub contractors and are also responsible for compliance of Client Companies.

- **Site Personnel**

Workmen engaged in construction work are responsible for: Compliance with this procedure as instructed by supervision, their own personal Safety. And the Safety of fellow workmen who may be affected by their actions

## **2. PROCEDURE**

### ▪ **General Rule**

The primary purpose of this Procedure Manual is to prevent accidents which may injure personnel or damage property during the course of the work.

Follow not only the requirements of the HSE Plan & Manual but also any other safety rules and regulations specified in Indian law and the provisions of other laws, rules and regulations where applicable and agreed as reasonable.

### ▪ **Hse Meetings**

#### Project Health, Safety & Environmental Management Meeting

- \* Every Project shall have a Project HSE & S Management Meeting. The meeting shall be held at 10:00 hrs on every WEDNESDAY of every week unless otherwise advised by Client, the meeting shall include the Sub-contractors
- \* The meeting shall be chaired by rotation. The minutes shall be generated. The minutes shall be official whereby instructions and or decisions have been given and or agreed by all present. And such instructions and or agreements are recorded in the minutes.
- \* Attendance shall be by a Project representative, having the authority of the Site Manager, to reasonably make decisions on behalf of the company, on the matters of HSE & S that may from time to time be required.
- \* The purpose of the HSE & S Meeting is to set project guidelines on matters of HSE & S, to transmit information to and from members of the meeting. And to resolve issues of HSE & S on site.

### ▪ **Workforce Training**

#### Site Safety Induction

- \* In order to ensure field activities follow this procedure, Sub-contractors and or Mini contractors shall provide a lecture related to safe work practices for all key personnel engaged in the work prior to the execution of the field activities, and shall provide Project Specific HSE instruction prior to employee engagement on site.
- \* The INDUCTION training is to be linked to the issue of badges for access to projects, and records of attendance maintained.

### ▪ **Tool Box Meetings**

Specific toolbox meetings on site in order to address matters concerning particular issues relating to the workplace, these toolbox meetings shall be of short duration and shall relay instructions and provide specialised instruction regarding unusual or hazardous tasks. Records of attendance shall be maintained by the contractor

### ▪ **Vocational Training**

Contractors shall be required to provide vocational training, on the job, to enhance the skills and Safety awareness of employees and staff. This training shall be incorporated into toolbox meetings on particular subjects; training shall also be separately planned.

▪ **Workplace Inspections**

Internal Audits

- \* The Audit is to be performed on a REGULAR basis, the Audit is to be subcontractor specific, and is to relate directly to the works performed by the subcontractor. The audit is to inspect administrative records related to HSE requirements of the project such as Induction records, Tool Box meeting records, Training records, Accident, Near Miss & Incident reports, and a physical inspection of the works in progress, INCLUDING use and supply of PPE.

▪ **Heavy Equipment & Light Vehicle Inspection**

- \* All mobile equipment is to have a PRE-USE inspection carried out by a competent member of the contractor staff. The inspection is to use a check list format to determine the equipment's suitability for project use, and to identify the equipment's current condition.
- \* The mobile equipment is to have a REGULAR PERIODIC inspection by a similarly competent member of the organisation. The inspection is to be at not more than 6-Month intervals. A checklist format is to be employed to determine the equipment's condition.
- \* Records of PRE- USE & PERIODIC inspections are to be maintained.

### **3. MANDATORY PERSONAL PROTECTIVE EQUIPMENT**

▪ **General**

Provide required PPEs to workmen to protect against safety and / or health hazards. Primarily PPEs are required for the following protection

- Head Protection (Safety helmets)
- Foot Protection (Safety footwear, Gumboot, etc)
- Body Protection (High visibility clothing (waistcoat/jacket), Apron, etc)
- Personal fall protection (Full body harness, Rope-grap fall arrester, etc)
- Eye Protection (Goggles, Welders glasses, etc)
- Hand Protection (Gloves, Finger coats, etc)
- Respiratory Protection. (Nose mask, SCBAs, etc)
- Hearing Protection (Ear plugs, Ear muffs, etc)

- All workers shall wear suitable working clothing, of a minimum of Vest, long pants, safety footwear and a safety hat on the jobsite. Personal protective equipment for devices, machines, specialised and or hazardous work, shall be furnished as required. shall enforce their use, any safety equipment utilised shall be in accordance with recognised standards.

▪ **Sight and Face Protection**

Workers engaged in gas welding, cutting, and brazing shall be required to wear goggles or face masks to protect themselves from injuries. Workers engaged in electric welding, cutting, or other similar operations shall be required to wear helmets or shields with filters of an appropriate shade and gloves. Workers engaged in grinding or similar work shall be required to wear goggles with safety filters for sight protection or facemasks giving equal protection.

▪ **Safety Belt/Harness**

- \* Workers in hoppers, bins, or confined spaces or on steep slopes, swinging scaffolds, manages, structural steel, or unstable work areas at an elevation of 2 meters or more above the ground or water shall be secured by safety belts/harness & secure life lines.
- \* Safety nets shall be provided where the use of scaffolding, safety belts/harness or life jackets is impractical.

- The PPEs and safety appliances provided by the Company shall be of the standard as prescribed by Bureau of Indian Standards (BIS). If materials conforming to BIS standards are not available, the Site Management as approved by the Client Company shall procure PPE and safety appliances.

- In addition to the above any other PPE required for any specific jobs like, welding and cutting, working at height, etc shall also be provided to all workmen and also ensure that all workmen use the PPEs properly while on the job.



#### **4. ACCESS & EGRESS**

- \* Adequate, clear and safe access and egress shall be provided to all working locations
- \* Access shall be a minimum of one (1) meter wide, and handrailed at a height of over two (2) meters, with the rail at a height not more than one (1) meter and not less than point eight (80cm.) unless a life line is provided.
- \* Ladder access is to be provided to work platforms greater than two (2) meters in height, ladders are to be of sound construction, secured at the top, rungs are to be no more than thirty (30cm) apart. Ladders are to be set at a rake of two (2) to one (1) e.g. 2:1.
- \* Shall ensure sufficient PPE is maintained on site in preparation for immediate requirement, which shall include however be not limited to.
  - Approved Safety Hard Hat
  - Industry standard hearing protection relevant to task
  - Safety Glasses
  - Safety Goggles (splash/dust proof)
  - Full face shields
  - Welding shields or goggles
  - Dust Masks
  - Toxic Fume Respirators
  - Coveralls
  - Gloves (general & specific to task)
  - Safety Belts (with approved lanyards)
  - Full Safety Harnesses (with approved lanyards)
  - Safety Footwear (steel capped)
  - Rubber boots
  - Life jackets

## **5. ACCIDENT/INCIDENT & NEAR MISS INVESTIGATION & REPORTING**

### **▪ Lost-Time Injury/Disease**

- \* Those occurrences that resulted in a fatality, permanent disability or time lost from work of one day / shift or more.
- \* The report shall be verbal notification to the HSE & S Manager, as soon as practicable following the occurrence, (within one (1) hour). The completed R K Insulation Engineers & Contractors occurrence report form, with cover letter and chronological details as an attachment is required by Client no later than eighteen (18) Hrs after the occurrence.
- \* Shall inform Client immediately on notice;
- \* In the event of a fatality or dismemberment, the HSE & S Manager is to be notified immediately to Client, The Senior Management of R K Insulation Engineers & Contractors shall be notified immediately.

### **▪ No Lost-Time Injury/Disease**

- \* Those occurrences, which were not, lost time injuries, and for which First Aid and or medical treatment was administered.
- \* The report shall be a weekly listing of occurrences, reported on the MONDAY, immediately following the closure of the reporting period. The report shall be to the HSE & S Manager, report form for each occurrence, with a cover note listing the DATE, NAME & TREATMENT of the injured party.

### **▪ Near Miss**

Any unplanned incidents that occurred at the workplace which, although not resulting in any injury or disease, had the potential to do so.

### **▪ Property Damage**

Any damage to the operating facility, or to the plant or equipment at the workplace,

### **▪ Fire Incident**

Any incidence of fire within the construction laydown areas or housing colonies.

### **▪ Environmental Incident**

Any incidence of degradation to the environment at the workplace, either by failure to follow procedure, or toxic pollutant spillage that causes, or has the potential to cause environmental harm and or pollution.

### **▪ Statistical Recording**

- \* Require the recording of statistics as identified in the HSE Plan.
- \*  $INCIDENCE\ RATE = \frac{\text{Number of Occurrences in the report period}}{\text{Number of workers}} \times 200,000$
- \*  $FREQUENCY\ RATE = \frac{\text{Number of Occurrences in the report period}}{\text{Number of Hrs. worked in the report period}} \times 200,000$
- \*  $AVERAGE\ TIME\ LOST\ RATE = \frac{\text{Number of Working Days Lost}}{\text{By the number of Occurrences in the report period}}$

## **6. EMERGENCY PLAN**

**Shall be required to establish an Emergency Plan for every Projects.**

The Emergency Plan shall include Emergency Evacuation Assembly Area (EEAA) locations & alarms, by position and by signal; the plan is required to provide the protocol in which the information is to be conveyed to the general workforce, supervision.

- \* Audible, by siren including signal duration for alarms, evacuations and all clears, or radio, including channel, and call signs, Visual (if applicable)
- \* Evacuation Locations, identification, including the manner of transportation for a full site evacuation.
- \* Responsibility chart and action flow diagrams,
- \* Instructions regarding the leaving of plant & equipment.

### **▪ Supply of Information**

Shall prepare signboards identifying mandatory site requirements, as identified in the HSE Plan In addition, each sub contractor shall individually prepare a STATISTICAL INFORMATION signboard, in HINDI & ENGLISH.

- \* Company name.
- \* Listing of Subcontractors by name.
- \* Listing of hours worked since the last LTI in total.
- \* Listing of days worked to date.

The statistical notice board shall be provided at a strategic point near the project office, in order to enhance knowledge with regard to safety. and is to be updated on a weekly basis, Shall also supply HSE related posters and other information aids as may be required or may be agreed at the Project HSE & S Management meeting.

## **7. FIREPREVENTION, PROTECTION AND FIGHTING SYSTEM**

### **▪ Fire Control**

Prevent fire within the boundaries of their work areas & practicability by providing regulations, equipment, training, and prevention plans for all areas of activity, including accommodation and food preparation areas to include

- Provision of a Fire Control Plan. (including emergency communications)
- Adequate information of the hazards of fire.
- Information on the prevention of fire.
- Information and training on the control of fire.
- Provision of the equipment for the recognition of fire where practicable.
- Provision of the correct equipment for the control of particular types of fire.

A. Ensure that construction site is provided with fire extinguishing equipment sufficient to extinguish any probable fire at construction site. An adequate water supply is provided at ample pressure as per national standard.

B. Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards

C. All drivers of vehicles, foreman, supervisors and managers shall be trained on operating the fire extinguishers and fire fighting equipment.

D. As per the DBOCW Rules 2002, Rule 63(a)(vii), all lifting appliances' driver cabin should be provided with a suitable portable fire extinguisher.

E. Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.

F. Every fire, including those extinguished, shall be reported to the Client Company representatives.

G. Emergency plans and Fire Evacuation plans shall be prepared and issued . Mock drills should be held on a regular basis to ensure the effectiveness of the arrangements and as a part of the programme, the Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.

## **8. FIRST AID**

Provide a FIRST AID addressing a remote location, limited resource environment.

- \* Minor First Aid.
- \* Onsite Clinical Stabilisation
- \* Offsite Medical Attention
- \* Evacuation
- \* Site Management is required to prepare a FIRST AID PLAN; the plan is to address in detail the matters of project FIRST AID, with regard to the following:
- \* Provision of information to Expatriate employees.
- \* The location and or locations of the proposed Clinical First Aid facilities within individual project boundaries, for all areas.
- \* The level of staffing to be provided, including level of qualification and approximate mobilisation, for each facility?
- \* What arrangements are planned for executing the next level of intervention after site stabilisation?

Corporate Management shall require an implementation schedule, with target dates for the provision of facilities related to construction progress.

## **9. TRAFFIC RULES**

Traffic regulations shall be as refer to Project Clients requirement.

Need minimum Requirement -

- \* All vehicles & mobile equipment on site shall follow the traffic rules as sign posted on the project, specific to works and or conditions.
- \* All vehicles & mobile equipment shall be operated by a licensed / driver operator.
- \* All vehicles & mobile equipment shall carry Client security gate passes

## **10. “EMERGENCY CONTACT PROCEDURE”**

### **Purpose**

The purpose of this procedure is to give clear and precise Health, Safety & Environmental guidelines to the Employee

The Procedure is titled EMERGENCY CONTACT PROCEDURES and is designed to identify NOTIFICATION & CONTACT methods.

### **Scope**

This procedure is designed to encompass personnel and equipment of and all subinvolved in the Project activities. The procedure shall similarly apply to suppliers entering the project, and all second tier engaged for project activity.

### **Definitions**

- |      |  |
|------|--|
| HSE  | - Means Health, Safety and Environment.    |
| EEAA | - Means Emergency Evacuation Assembly Area |

### **HSE Responsibilities**

- **Project Managers**  
Project Managers are responsible for HSE compliance of the entire projects.
- **Construction Managers**  
Construction Managers of each project are responsible for ensuring Superintendents follow HSE regulations.
- **Superintendents**  
Superintendents are responsible for ensuring that requirements of HSE Plan & Manual, are adhered.
- **HSE Groups**  
Are responsible for ensuring compliance with the Procedure and are to provide training, instruction and guidance with regard to the provision of safe equipment, work methods and work areas,
- **Site Personnel**
  - \* Workmen engaged in construction work are responsible for
  - \* Compliance with this procedure as instructed by supervision.
  - \* Their own personal safety.
  - \* The safety of other workmen who may be affected by their actions

### **PROCEDURE**

Follow the every client projects Emergency plan.

## **11. “SCAFFOLDING PROCEDURE”**

### **Purpose**

The following procedure is designed to protect the Health Safety and welfare of all persons required to erect or to work on scaffold in any location on the project, where scaffold has been erected to provide access to a workstation on the site.

The procedure is also designed to ensure people involved in the design, erection and dismantling of scaffold follow correct and safe work methods.

### **Scope**

This procedure applies to all the personnel on site specifically directed engaged in the erection or dismantling of scaffold on site.

### **References**

- \* “Code of Practice for access and working scaffolds, and Special scaffold structures in steel, or equivalent.
- \* Guidelines for Scaffold
- \* A.N.S.I (American National Standards Institute) A 10.8-1977 and A 92.1-1977

### **Definition**

*Scaffolding means:* Any temporary structure, stage or platform that, for the purposes of work, has been specifically designed, erected in tube and fitting, component or timber and is for the support or protection of persons, equipment or other materials.

*Scaffolding work means:* Construction work involving erecting dismantling or altering scaffold as described above in

### **Responsibilities**

SMDCPL shall appoint a responsible person to hold the responsibility for the design, erection, modification, use and dismantling of scaffold, that person shall also be responsible for determining the suitability of the scaffold for purpose.

SMDCPL Supervision and workmen engaged in construction work are responsible for.

- \* Compliance with this procedure as instructed by supervision.
- \* Their own personal safety
- \* The safety of other workmen who may be affected by their actions.

## **PROCEDURE**

### **IDENTIFICATION OF HAZARDS**

Erection and use of scaffold is a hazardous undertaking, the design, erection, use, modification and dismantling of scaffold shall only be undertaken following the identification of hazards by use of a Risk Assessment.

When selecting scaffold for a particular job, consider,

- The proximity of open space or adjoining structures.
- The proximity and operating radius of vehicles, cranes and other moving machinery.
- The proximity of overhead power lines or other hazardous structures.
- The strength and condition of ground or other supporting structures.
- The profile of the workface and any adjacent structure.



- The height and levels at which the job will be carried out.
- The probability of significant forces being applied to the scaffold structure by point load or impact.
- The exposure of the scaffold to significant atmospheric conditions or winds loadings.
- Access/Egress and ease of material loading or removal.
- Associated rescue systems that may be required in an emergency.

The nature of the work

- The type of work to be undertaken.
- The material and equipment to be used, including weight & dimensions
- The number of people required to perform the job.
- The expected duration of the job.

The work that has immediately proceeded& will immediately follow the scaffold.

### **Engineering**

If doubt exists regarding the adequacy of the supporting structure, a qualified person should assess it. The assessment shall take into account:

- The most adverse combination of dead loads, environmental & live loads.
- Any other loads on the supporting structures.
- Any equipment or other plant likely to be used on or from supporting structures.
- Any alterations to be made to supporting structures.

### **Foundations & Structure**

- The foundations for a scaffold shall be adequate to carry and distribute the loads imposed on each standard, and the whole of the LOADED scaffold.
- All scaffolds constructed AT OR ABOVE, TO OR OVER, 15 METERS shall be designed and authorized by design engineers and shall require a WORK PERMIT which shall be raised by the Company erecting the scaffold. The permit shall be duly authorized by SMDCPL.
- A method statement giving general studies of load and erection and dismantling practices shall be required for this scaffold.

### **Special Note**

- IDENTIFICATION of SCAFFOLD
- Scaffold erected on the any Project AT, 2 or ABOVE (2) Meters shall require a regular inspection. The inspection shall be by the Responsible Person or designee. That inspection shall be performed within every two (2) week period on a regular basis for the life of the scaffold concerned.
- Scaffold in use and inspected, shall have a GREEN tag affixed. Scaffold under construction, repair, alteration or dismantling shall have a RED tag affixed.
- Information on the tag shall be as follows: DUAL LANGUAGE:
- SMDCPLname.
- Date
- Location of the Scaffold
- Serial Number of the scaffold
- Inspection

### **TYPES OF SCAFFOLD - SEVEN (7) DIFFERENT TYPES OF SCAFFOLD ARE IDENTIFIED ON THE PROJECT**

1. Independent Frame Scaffold (Including Tower Scaffold)
2. Bracket Scaffold

3. Cantilever Scaffold
4. Suspended Scaffold (Including Slung Staging)
5. System Scaffold (Including Design Formwork Support)
6. Mobile Tower Scaffold (Internal & External Applications)
7. Bird Cage Scaffold

**GENERAL PRINCIPALS**

Each scaffold of the seven (7) identified types on this project shall incorporate the following basic principals.

- Foundations or supporting structures
- Scaffold shall be stable.
- Scaffold shall be tied
- Each and every scaffold shall be rigid.
- Each scaffold shall be provided with the correctly designed working platforms conforming to the principals of good practice. Working platforms shall be wide enough to provide clear access, a work area, and the provision for materials. Working platforms shall be secured.
- Each scaffold shall be provided with safe, secure access free from obstruction, scaffold of twenty (20) meters or longer shall be provided with two (2) access/egress points.
- A Safety harness shall be worn for all scaffold erection and dismantling work at or over two (2) meters in height.

Scaffold of two (2) meters or more in height, shall have fitted a guardrail at NLT and NMT one (1) meter, and a mid rail at NLT and NMT point five (0.5) of a meter, from the working platform positioned immediately below.

**TABLE  
REQUIREMENTS FOR WORKING PLATFORMS**

Duty classification as specified in AS/NZS 1576.1	Approximate maximum total load for persons and materialsKg per platform per bay	Approximate maximum mass of any single concentrated load of materials or equipment(as part of total load)Kg	Minimum length and width of platformmm
Light Duty*	225	100	450
Medium Duty	450	150	900
Heavy Duty	675	200	1,000

\*Materials shall not be stored on Light Duty Scaffold that is constructed to the minimum allowable widths

**SCAFFOLD TYPES**

**INDEPENDENT FRAME SCAFFOLD (including tower scaffold)**

- \* This type of scaffold is generally built using tube and coupler fittings, this type of scaffold can be adapted to almost any configuration or loading application. As a general consideration, this type

of scaffold is built with steel tube of nominal outside diameter of approximately 48 mm and a nominal wall thickness of 4 mm.

- \* BAY: A bay is the vertical, horizontal and longitudinal area of a series of standards, ledgers and transoms making up an independent scaffold structure
- \* LIFT: Is the VERTICAL distance between one (1) set of horizontal ledgers, and transoms and the ones immediately above or below, one (1) lift shall be no greater than two (2) meters vertical dimension, regardless of the scaffold bearing capacity.
- \* An independent scaffold is to be tied at the third (3<sup>rd</sup>) lift and every second (2<sup>nd</sup>) lift thereafter to a maximum height of forty-five (45) meters. And finally tied at the top lift. Ties are to encompass both faces of the scaffold.

**BRACKET SCAFFOLD (ensure compatible material for welds)**

- \* Bracket scaffold maximum spacing of brackets is not to exceed 1.5 meters.
- \* Planks where overlapped are to extend each other NMT 250 mm and NLT 150 mm, and are to be tied securely.
- \* Brackets of angle steel are to be NLT 43mm x 43 mm x 4.5 mm steel angle or steel tube of equivalent strength. All joints are to be fully welded.
- \* Each bracket is to have a hook of 50 mm x 6 mm.
- \* A SADDLE of not less than 50 mm x 6 mm x 225 mm, shaped to receive shall be fully welded to the supporting structure by not less than 5 mm fillet weld.
- \* The working platform shall not exceed 650 mm WIDTH and shall be light duty only.
- \* Access shall be by independent access tower scaffold.

**CANTILEVER SCAFFOLD (including drop cantilever)**

- \* A structural engineer shall design cantilever scaffold and supporting structures.
- \* Needles shall be secured by THROUGH BOLTING, CAST INSERTS or PROPPING.
- \* Steel beams as needles shall be of NLT 75 mm thickness.
- \* Where practicable the inboard portion of the needle shall be 3 x the outboard length.
- \* Where props are used to secure needles, they shall be tied horizontally by pipe & clamp.
- \* Standards shall be placed only directly over the needles, planks shall be laid between the needles and the standards, and all shall be secured prior to commencement of erection.
- \* OTE This type of scaffold shall be tied at the first (1<sup>st</sup>) lift from the base, and every second (2<sup>nd</sup>) thereafter.

**SUSPENDED (including slung staging)**

- \* A structural engineer shall design slung and hung scaffold.
- \* An independent scaffold may be hung at a fixed height from beams, grid mat flooring, structural roofing members or other overhead structure, whether permanent or temporary.
- \* **NOTE** OPEN-ENDED HOOK RODS SHALL NOT BE USED; couplers with speed threads shall also not be used.
- \* Beam clamps, trolleys and shackles shall have a rated Safe Working Limit (SWL) of NLT 500kg.
- \* Hangers may include: Scaffold tube in single length to six (6) meters: 6 X 24 Flexible Steel Wire Rope (FSWR) of NLT 11mm. dia.: Grade T Chains of NLT 8mm dia.
- \* Securing of supports shall prevent dislodgment by swaying.

- \* Scaffold pipe shall have check clamps immediately above suspension points and immediately below platforms.
- \* Eyed slings are to have shackles moused (secured against unwind)
- \* Sharp edges of slung points are to be protected.
- \* Ledgers supported through sling eyes are to have checked clamps outside the eye.
- \* **NOTE** BULLDOG OR CLAMP GRIPS ARE NOT TO SECURE FSWR TAILS WHERE HEAVY LOAD OR PERSONS ARE SUSPENDED.

**MOBILE SCAFFOLD (including tower, internal & external steel aluminum)**

Typical mobile tower scaffolds are shown in appendix

**NOTE**

- \* A mobile scaffold shall only be used on a hard level surface from which it shall not be moved.
- \* A mobile scaffold shall not be positioned closer than one (1) meter from any slab edge, penetration or other step down, unless a physical barrier to prevent crossing is in place. Such as a fixed fence, rail or suitable upturn is in place.
- \* A mobile scaffold must be positioned no closer to power lines than a static scaffold (6m)
- \* Do not release wheel locks for repositioning until the scaffold is unoccupied and all material has been secured against movement and falling.
- \* A mobile scaffold shall not be relocated by any other method than manpower, unless it has been otherwise specifically designed.
- \* A mobile tower scaffold shall be constructed NMT two times (2x) the minimum base width for external work, and three times (3x) the minimum base width for internal work.
- \* In any event, a mobile scaffold shall not exceed nine (9) meters in height.
- \* Plan bracing shall be placed at the bottom of the scaffold immediately above the wheels, and at the top immediately below the platform.
- \* Access to a mobile tower scaffold shall be internal.

**SYSTEM SCAFFOLD (pre fabricated)**

- \* System scaffolds are most commonly grouped into one of three (3) categories
- \* Modular systems, consisting of individual standards, ledgers, transoms, braces and other members.
- \* Frame system, consisting of pre fabricated walk through frame units (usually incorporating a pair of standard units and a transom) that are connected longitudinally with other frames usually by use of a scissors brace.
- \* Tower-frame systems, incorporating fabricated single frame units for use in single bay tower scaffolds.
- \* **NOTE** Parts of different design of system scaffold shall not be incorporated into the design or structure of any other system of scaffold.
- \* System scaffold should be erected, used and dismantled according to the supplier's manufacturers' procedure.
- \* The tying of this type of scaffold to supporting structures shall comply with the guidelines for tying as described in item 6.8 of this procedure.

**BIRDCAGE SCAFFOLD**

- \* Birdcage is the term commonly applied to scaffold that has been erected to gain access to soffits, ceilings, roofs of tanks etc.

- \* The principals of each type of scaffold described in this procedure are applicable to birdcage, dependant on the method of scaffolding adopted to achieve the aim.

**GENERAL MATTERS**

- \* How to find the S.W.L Safe Working Load of fiber rope and flexible steel wire rope using mathematical calculation (rule of thumb).

**FIBRE**

Diameter squared (multiplied by itself) equals the S.W.L in kilograms (Kg)

Example 20 mm x 20 mm = 400 kg S.W.L

**FLEXIBLE STEEL WIRE ROPE (FSWR)**

Diameter squared (X by itself) then X by 8 = S.W.L in Kgs.

Example 20 mm x 20 mm = 400 x 8 = 3200 kg. S.W.L = 3.2 T

1000 Kg = one Tonne (1.0 T)

**Ladders**

- \* Ladders used on the project are to be of sound quality and professionally manufactured. Ladders manufactured on the project are to be of professional design; the design is to be approved by the HSE group.
- \* Ladders used as access to working platforms are to protrude past the platform one (1) meter. The preferred method of placement is described in figure.1
- \* Ladders are to be inclined at a ratio of 4: 1, where 4 is the height in meters.
- \* Ladders are to be secured at the access platform or top

**Barricading**

- \* Barricading is to be positioned for scaffold erection and dismantling for any structures over two (2) meters in height.
- \* Barricading is to begin at a ratio of 2:1, where 2 is the height in meters. The barricading is to be placed at a maximum of five (5) meters from the base of the scaffold unless otherwise directed by the HSE group of the Company.

**Handrails**

- \* Handrails are to be provided to all working platforms at a height of two (2) meters or more.
- \* The basic rulings for handrails are that there shall be a mid rail at NLT 0.5 from the platform with the top rail at NLT one (1) meter from the platform.
- \* If for reasons of engineering, practicality or requirement of the job to be undertaken, a handrail cannot be installed. Refer to section, 6.11 of this procedure titled FALL PROTECTION.
- \* Handrails may be constructed of metal tube, FSWR and chain. Wooden handrails shall be permitted on, but no higher than two (2) meter scaffold or working platform

**Hole Openings**

- \* Holes or gaps in scaffold or suspended decking are to be NGT 200mm x 200mm. Holes of the stated dimension and up to one (1) sq. meter are to be covered with a sturdy material and secured against removal.
- \* Holes greater than one (1) sq. meter are to be covered with a sturdy material that is secured against removal and in addition has written in ENGLISH & HINDI/MARATHI local language. the words "HOLE BENEATH, DO NOT REMOVE" or like translation.
- \* Holes that cannot be covered are to be securely barricaded.
- \* PROXIMITY TO ELECTRICAL HAZARDS

- \* Any event, scaffold is not to be erected within six (6) meters of an overhead electrical power cable. Electrical extension cables are permitted to be attached to scaffold provided cables are sheathed and secured on the mid rail.

**Scaffolding Planks**

Scaffold planks should comply with the basic guidelines as outlined herein. Timber scaffold planks shall not have or be:

- \* Warped or twisted
  - \* Broken
  - \* Split
  - \* Overly worn
  - \* Large splits
  - \* Saw Cut
  - \* Knotted
  - \* Metal scaffold planks shall not have or be
  - \* Bent
  - \* Crushed
  - \* Open ended, Broken welds
  - \* Planks in any , event are to be NGT four (4) meters in length
- MAXIMUM SPAN OF SOLID TIMBER SCAFFOLD PLANKS

Nominal thickness of plank (mm)	Maximum span between putlogs (m)
32 (hardwood only)	1.0
38	1.5
50	2
63	2.5

**SUPERVISION / WORK KIT / CREW SIZE**

- The size of an individual work crew shall not exceed seven (7) persons including supervision.
- The crew shall consist of six scaffolders and a foreman or supervisor.

The supervisor foreman shall be provided with the following work tools as a minimum.

- \* Safety Harness & Lanyard
- \* Magnetic Spirit Level
- \* Five (5) Meter Tape measure
- \* Adjustable wrench or Scaffold Key (with rope)
- \* Hammer (with rope)
- \* Tool Belt
- \* The work crew are to be provided with the following as a minimum
- \* Safety Harness & Lanyard
- \* Adjustable wrench or Scaffold Key (with rope)
- \* Hammer (with rope)
- \* Tool Belt
- \* The footwear of the crew is to be of a quality that allows surety of footing while working at elevated locations.

**INSPECTIONS**

- Scaffold erected by the Company shall be inspected by the responsible person NLT every two (2) week period.

Inspections shall be:

- Performed regularly by a competent responsible person.
- Performed using a checklist.
- The scaffold is tagged as inspected at each inspection.
- The name date & signature of the inspecting person is applied to the checklist.
- Swing tags of GREEN for active scaffold & RED for inactive/unsafe/in construction scaffold shall be applied. The design of the tags is shown in attachment and shall contain the information.

### **FALL PROTECTION**

- Safety Harness, secured to a firm anchorage above the waist, safety cable or inertia reel.
- Fully hand railed working platform conforming to 6.8 HANDRAILS
- Safety Net.
- Life vest or jacket over water
- SAFETY NETS

Industrial Safety nets do not apply considerable loads to structures, unless arresting a fall. Where safety nets are combined with overlay of nylon fishing net, they can also provide protection from falling debris.

Where possible, fabrication of supports for safety nets should be carried out at ground level & hoisted or lifted into place. Nets shall be installed as close as practicable to the location of the work.

The following basic concepts shall be applied to the use of Industrial Safety Nets on this project.

- The gap between the net and the structure is not to exceed 200mm.
- Nets shall protrude NLT two (2) meters past a structure if outside the structure.
- Nets shall be secured at NLT 750mm intervals, using tie cords, hooks or thimbles.
- On sharp edges, nets shall be protected.
- No material shall be stored on the net.
- Debris shall not be allowed to accumulate in the net.
- Nets shall be protected from hot work spark, acids and alkalines.
- Nets shall be stored under cover of elements when not in use.
- Net hole size

### **Attachments**

- \* Adequate Foundation
- \* Typical means of access
- \* Unsuitable means of access
- \* Typical mobile scaffold
- \* Inspection OK to use

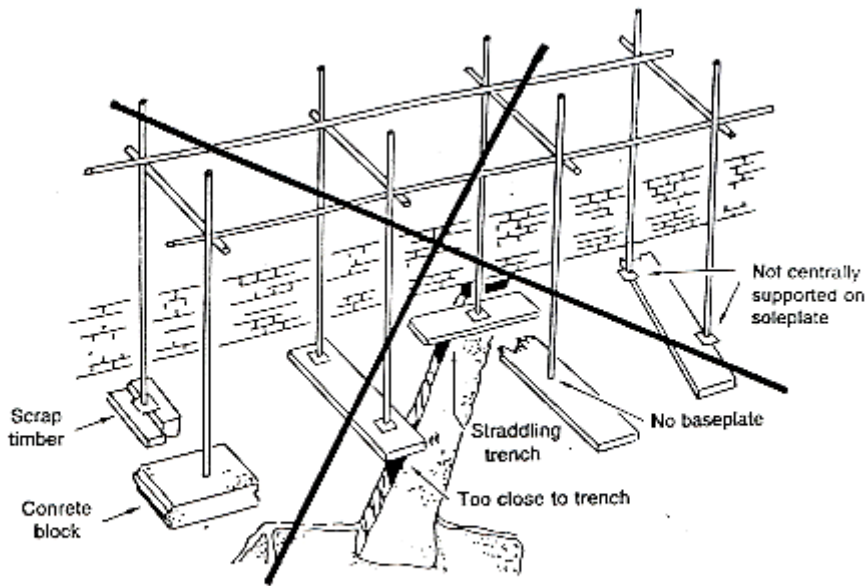


FIGURE UNSAFE FOUNDATION

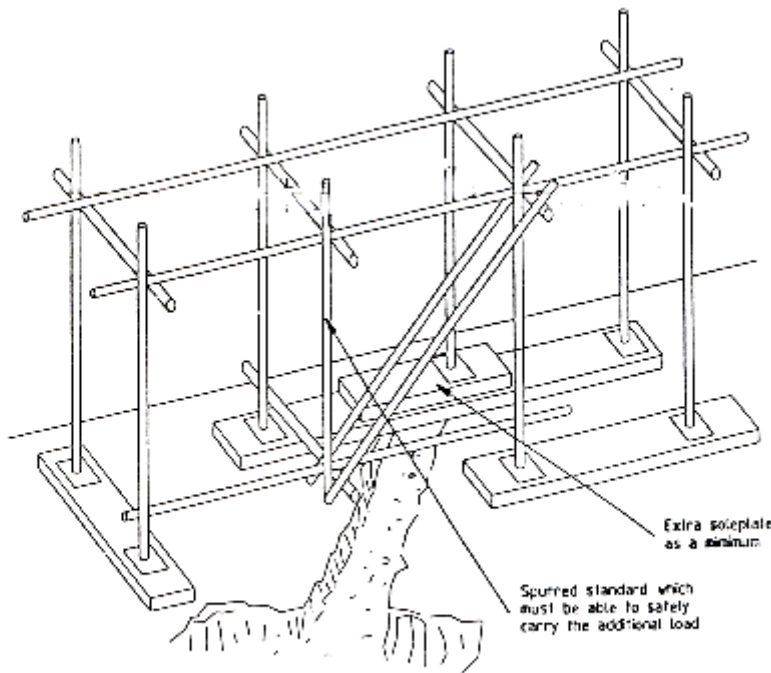


FIGURE 7.1 ADEQUATE FOUNDATION

\* DO NOT USE – under construction



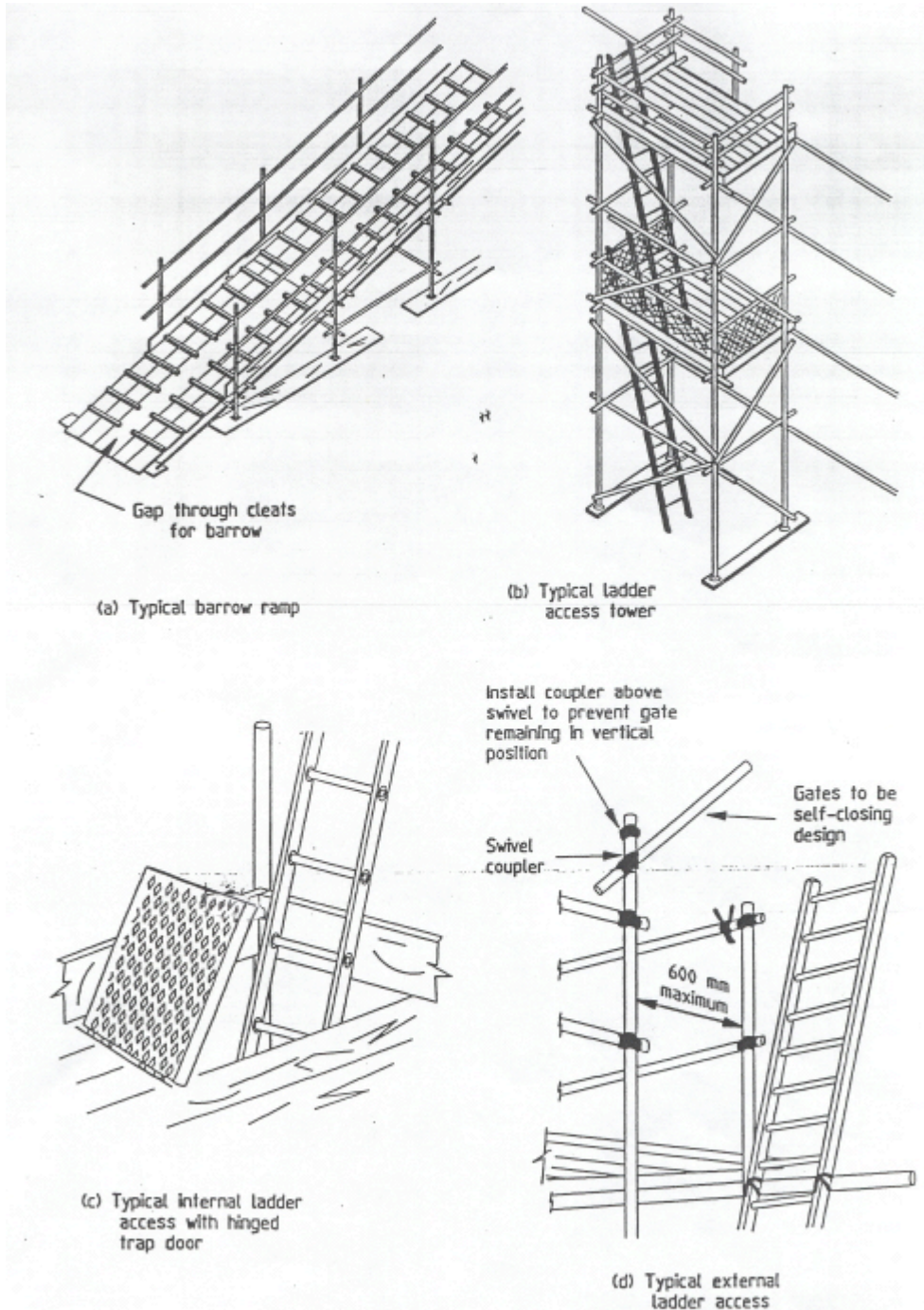
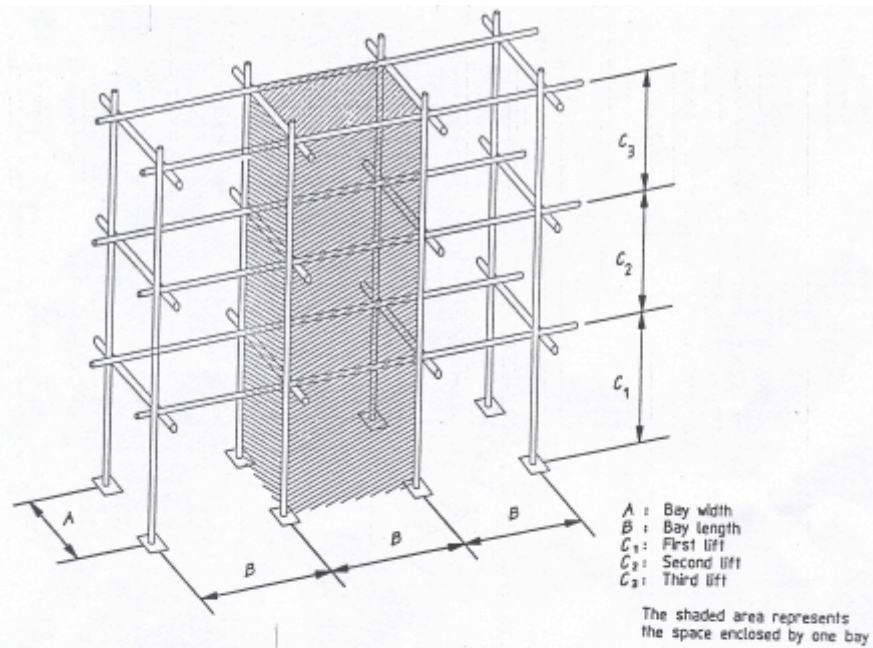
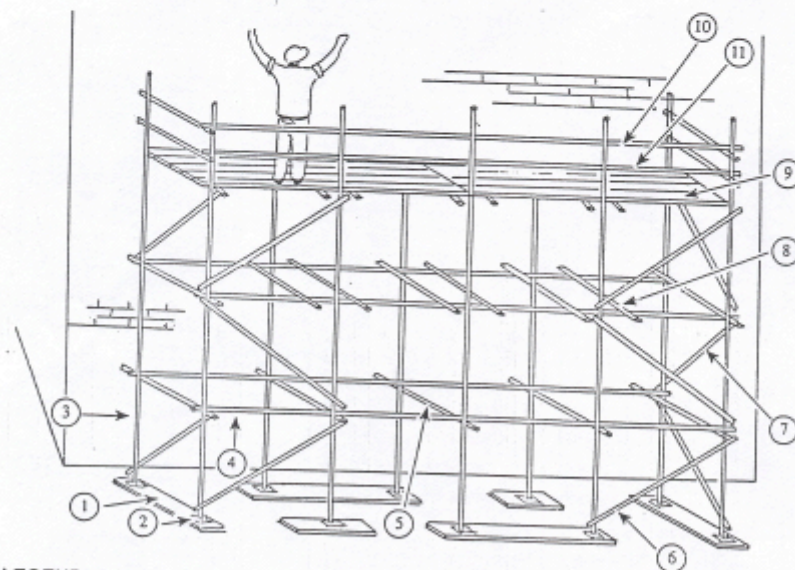


FIGURE 7.2. TYPICAL MEANS OF ACCESS



**FIGURE MAIN DIMENSIONS OF A SCAFFOLD**



**LEGEND**

- |             |                      |                    |
|-------------|----------------------|--------------------|
| 1 Soleplate | 5 Transom            | 9 Working platform |
| 2 Baseplate | 6 Longitudinal brace | 10 Guard rail      |
| 3 Standard  | 7 Traverse brace     | 11 Mid rail        |
| 4 Ledger    | 8 Putlog             |                    |

NOTE: Ties, toeboards and access omitted for clarity.

**FIGURE 7.6 EXAMPLE OF AN INDEPENDENT SCAFFOLD**

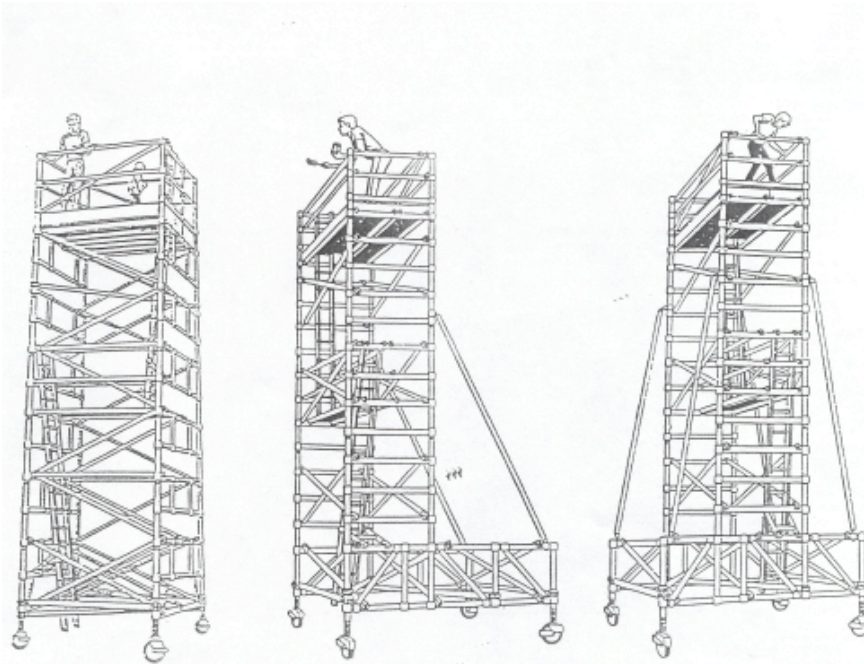


FIGURE 7.4 TYPICAL MOBILE SCAFFOLDING

**INSPECTION**

**OKAY FOR USE**

**INSPECTION**

**DANGER DO NOT USE**



\_\_\_\_\_  
\_\_\_\_\_

**BY CO. NAME:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**LOCATION:** \_\_\_\_\_

**Sr. No.:** \_\_\_\_\_

**COMPANY CO. NAME:** \_\_\_\_\_

## **12. “CRANE & RIGGING PROCEDURE”**

### **Purpose**

- \* The following procedure is designed to protect the Health Safety and welfare of all persons required to use or operate crane for the purpose of lifting or placing materials on site.
- \* The procedure is also designed to ensure people involved in the use and maintenance of cranes on site is fully conversant with the safe working requirements of the cranes.

### **Scope**

The procedure is specifically directed to using or maintaining cranes on site.

### **References**

- \* The Factories Act, 1948 with (Project State) Factories Rules, 1963
- \* The Dangerous Machines (Regulations) Act, 1963
- \* The Mines Act, 1952

### **Definition**

Crane Means: Any mobile or fixed lifting device that is designed to independently lift, raise, lower or place any material, machine or apparatus on a permanent or temporary structure.

### **Responsibilities**

- \* Appoint a responsible person to hold the responsibility for the positioning, erection, modification, use and dismantling of cranes,
- \* That person shall also be responsible for determining the suitability of the crane for purpose
- \* Crane crews are experienced and competent in the cranes and crane work.

### **Company Supervision and workmen engaged in construction work are responsible for.**

- \* Compliance with this procedure as instructed by supervision.
- \* Their own personal safety
- \* The safety of other workmen who may be affected by their actions.

## **CRANE AND RIGGING PROCEDURE**

### **Introduction**

- \* This procedure is not designed to provide instruction in the operations of cranes or lifting equipment. And is not designed to provide analysis or rigging studies for particular usage
- \* The procedure is designed to give guidelines and information in good inspection and maintenance procedures for lifting equipment.
- \* The procedure is designed to give a general view of the basic requirements for cranes in general, so therefore is not specific to any type or model.

### **Crane Details**

1. Shall keep an up-to-date Register of all cranes which he operates on the site. The Register should contain the following information for each crane.
2. Company

3. Owner
4. Make
5. Model
6. Description
7. Rated capacity
8. Plant Number
9. Serial Number
10. Date of manufacture

### **Crane Manuals**

The maker should provide the following manuals with the new crane.

- **Operating Manual**, which includes instructions for assembling and dismantling the crane, and details of rope receiving for all configurations.
- **Driver's Handbook**, which includes routine maintenance instructions. It should be in a language which the operator can read and understand.
- **Parts Manual**, for purposes of re-ordering spares.
- **Workshop Manual** when the crane is to be repaired and maintained on site.
- **Detailed** instructions for assembling and dismantling the crane, and details of rope review for all configurations
- **Driver's Handbook**, which includes routine maintenance instructions. It should be in a language which the operator can read and understand.
- **Parts Manual**, for purposes of re-ordering spares.
- Workshop Manual when the crane is to be repaired and maintained on site.
- Safe Working Load Charts
- **Load Charts** showing the safe working loads for the various specified working conditions of the crane, which will be used on the site, should be available.

### **Certification**

- Various tests and examinations are necessary to ensure that a crane is safe for use. When the crane is delivered from the factory, the maker will issue a **MakersCertificate** of Test and Thorough Examination having performed a series of overload tests which are designed to stress every component to its working limit. They will also have carried out function and performance tests to prove the crane meets their own specification.
- The crane must have a **CurrentCertificate** of Test and Thorough Examination, issued within the last year, or following any substantial alteration or repair to the crane, whichever period is the shorter. It should give full details of the testing which was undertaken and be signed by the competent person who witnessed the tests.
- This certification shall be by an authorised person, as per The Factories Act, 1948 Maharashtra India.
- All running ropes on the crane should have a **Rope Test** Certificate, issued by the rope maker at the time of manufacture.
- All hookblocks carried by the crane should have a **Hookblock Test** Certificate, issued by the hookblock maker at the time of manufacture.
- Any lifting tackle carried by the crane should have a **TackleTest** Certificate, issued by the maker at the time of manufacture. This includes chains, slings, shackles and any other items that may be used for purposes of suspending the load.
- These items shall be maintained in a crane file held for each crane.

### **Working Area**

- The ground should be of uniform construction, well consolidated and of sufficient bearing capacity to withstand the loads that will be applied. It should be level within the limits appropriate for the work to be carried out, the ground must be level enough to permit setting up of the crane on its outriggers, such that all wheels are clear of the ground.
- The area should not be in the vicinity of any overhead power lines or any other overhead obstruction

#### **Operator Competence**

- Establish the identity and basic competence of the Operator, first of all by noting the following
- Operators name
- ID number
- For how long has he operated cranes?
- For how long has he operated this particular crane?
- A **Certificate of Competence** from his Client Company to operate this crane shall be required.
- Slew, both directions
- Derrick, up and down.
- Hoist and lower.
- Extend and retract the boom

#### **Operator's Cab**

- All **control levers**, pedals and switches should be clearly labelled to show their function and direction of operation, in a language that the Operator can read and understand.
- **Controls** should not be restricted by any loose or hanging items.
- The Operator should have a clear, unrestricted view and all **windows** should be clean, free of obstructions and not cracked or broken.
- All **handrails**, running boards, steps and machinery guards should be securely fitted when the crane is operational.
- The Operator's **seat** should be secure and so positioned as to allow the Operator to easily reach all hand and foot controls.
- The **door** should be lockable in order to secure the controls from tampering when the Operator is not in attendance.
- **Load charts should** be clearly displayed in the cab, such that they may be referenced by the Operator while he is operating the crane. The charts should be those applicable to the currently rigged configuration of the crane.
- The crane should have a **Safe Load Indicator**.
- The crane should be fitted with an **audible warning** device or horn.

#### **Outriggers (if appropriate to the model)**

- The **outrigger mats** shall be of the type and size which have been approved for use on this site. They shall be of sound construction and positioned under each outrigger pad so that the load from the crane is transmitted centrally into the mat. The mat shall be uniformly supported by the ground over its entire area.
- The **outrigger pads**, or floats, should be attached to the outrigger jacks via a bearing which allows complete articulation and even distribution of the load from the outrigger into the outrigger mat. This requirement applies to both beam type and cantilever type outriggers. The pad should be of sound construction.
- The **outrigger jacks**, which are positioned at the ends of beam outriggers, and within the crane chassis for cantilever outriggers, should be seen to operate smoothly (during the setting up of the crane) and be clearly capable of maintaining the crane in a level condition while it is working.

- The **outriggers** shall be structurally sound and extend and retract smoothly.
- The outriggers retract into the **outrigger boxes** that form part of the crane chassis. There should be no obvious twisting or distortion and the outriggers should slide in and out of the boxes smoothly and without obstruction.
- There will be a **levelling glass** at each of the outrigger control positions and this should be in tact and correctly adjusted. To check the one in the operator's cab, slew the crane to the four compass points and confirm that the bubble is always central. If there is one on the crane chassis, this can only be checked by a spirit level.

#### Crawler Tracks (as appropriate)

- The Examiner should note the **track setting**. 'Extended' for the wide setting. 'Retracted' for the narrow setting. 'Standard' when the setting cannot be varied. The duty chart in use must be for the correct track setting.
- The crawler tracks have **side frames** (around which the shoes of the crawler pass) and which are attached to extensions of the carbody structure by pins, keys, or bolts. The side frames themselves, and their attachments to the carbody, should be examined for structural integrity. They may be of cast or fabricated steel construction. Distortion, cracking of the structure, weld cracking, and looseness of connections is unacceptable.
- The **track shoes** should be complete in number, individually sound and securely pinned to adjacent shoes. They should pass smoothly over the support rollers along the bottom of the track, the carrier rollers along the top of the track, and the drive and idler tumblers at each end of the track. The teeth on the inside of the track shoes should engage smoothly and neatly with the sprockets on the drive and idler tumblers. There should be no climbing or jumping action as individual track shoes pass over the sprockets. This is an indication of poor alignment of the tracks and can lead to failure. The misalignment should be corrected as soon as possible.
- The crawler **tractension** should be correct. Too slack leads to excessive wear and the possibility of drive teeth disengaging and jamming. Too tight leads to over-stressing causing the pins linking the track shoes to break. The track shoes should not be in tension in the 'rest' position, with no more than two shoes deflected due to slackness.
- Drive to the tracks may be either through chains or directly from hydraulic motors. **Drive chains** need to be properly tensioned, with problems arising from maladjustment being similar to the tracks themselves. A little bit of slack is good, rather like a bicycle chain. The chains should be well lubricated.
- **Hydraulic motors** should have no obvious damage or leaks. Connecting hoses should be in sound condition.
- There are often **greasing points** on the side frames and they should show evidence of recent use.
- It will be necessary to track the crane to and fro in order to expose all the track shoes, and also to check the smooth operation of the drive system.

#### Crane Chassis

- The **structural integrity** of the crane chassis should be sound and free of distortion, impact damage, and corrosion to structural components, integrity of welding, evidence of any repairs, and completeness and condition of bolted connections.
- The **running gear** should be in generally good condition.
- The **tyres** should be in reasonable condition and correctly inflated.
- If the crane is fitted with a **road cab**, it should be in generally sound condition.
- The **hydraulic systems** on the crane chassis should be in sound condition, including manifolds, unions and rigid and flexible pipework, with no impact damage, heavy corrosion or leaks of hydraulic fluid.

**Slew Ring**

- The **enclosed roller bearing** slew ring should not have any evidence of cracking. There should be a full complement of anchor bolts and they should be under tension. The operation of the slew ring should be smooth and silent. Any banging or cracking noises during slewing are unacceptable. The crane should be rotated fully through 360 degrees in both directions while this is checked.

**Crane Superstructure**

- The **structural integrity** of the crane superstructure should be free of distortion, impact damage, and corrosion to structural components, integrity of welding, evidence of any repairs, and completeness and condition of bolted connections.
- The make-up of the **counterweight** should correspond with the Operating Manual for the particular boom and fly jib configuration which is fitted. The correct numbers and weights of elements should be assembled in the correct order.
- The **hydraulic systems** on the crane superstructure should be in sound condition, including pumps, manifolds, unions and rigid and flexible pipework, with no impact damage, heavy corrosion or leaks of hydraulic fluid.
- The **operator's cab** should be in generally sound condition.

**Main Hook block**

- The **hook** should be of sound appearance and not modified in any way from the original. For example, it should not have anything additional welded to it. The entire surface should be smooth and rounded.
- The hook may be of the single 'C' type, or the double 'ramshorn' type. In each case there should be a **safety latch** that prevents the displacement of the sling or load from the hook. If the latch is hinged, it should return to the closed position automatically when released.
- The action of the **swivel** should be smooth and free over a complete revolution. There should be evidence of lubrication.
- The **hook block** itself should be of sound construction with no severely bent plates or components and no damaged welds or bolts.
- The **safe lifting capacity** of the hook block should be hard stamped on the side and also sign written in a prominent way for easy identification from the ground
- All **hook blocksheaves** should be undamaged, free to rotate and tight on their bearings. That not in use should be rotated by hand. Those in use should be observed to rotate freely when the hoist motion is operated.
- The **rope seating** in the sheaves should not be damaged or worn. Wear can be detected as a sharp change in the cross sectional profile of the sheave, possibly accompanied by heavy rope markings in the bottom of the seating.
- The hook block should be fitted with **rope guards**. The design of these varies, but their basic purpose is to prevent the hoist rope from jumping out of the sheaves where it enters and leaves the hook-block. The guards should be of sound construction and securely fixed to the side plates of the hook-block at the point where the rope leaves the sheaves. The gap between the sheave flanges and the rope guard should, ideally, be about half the diameter of the hoist rope. If it is less, there is risk of a damaged guard jamming against the sheaves. If it is more, there is risk of the rope jamming between the sheave and the guard in the event that it jumps out of the sheave.
- When the hook block is freely suspended with no load, it should be level. This will be dictated by the **hoist rope reeving**. The sheaves which are used, the direction in which the rope passes over them, and the sequence in which each sheave is used all need to be in accordance with the Operating Manual for the particular hookblock which is in use



- This is a good time to check the **hoist rope diameter**. This should be measured over the widest part of the rope. Again, check the Operating Manual for the correct diameter. Hoist rope condition is dealt with later.
- The crane should be fitted with an **over-hoisting limit**. This is a switch that is suspended on a chain or wire from the jib point. One fall of the hoist rope passes through a ring, which is attached to the switch, thus holding the switch in position. There is a cable along the boom, connecting the switch to the operator's cab. When the hookblock makes contact, the switch is activated and the hoist motion is stopped and an alarm and/or warning light alerts the operator. He may have to temporarily disarm the switch in order to recover the hook-block.
- The over-hoisting **limit adjustment** is important, as the switch needs to be suspended the correct distance below the boom point sheaves. This should be checked by reference to the Operating Manual. The purpose of this safety device is to prevent the hookblock sheaves from approaching too close to, or making contact with, the boom point sheaves. In this event, the hoist ropes may be drawn too far from the vertical thus reducing capacity, or may bear on the flanges of the sheaves and/or rope guards causing excessive wear, or may even jump out of the sheaves.

### Boom Point

- All **sheaves** should be undamaged, free to rotate and tight on their bearings. Those not in use should be rotated by hand. Those in use should be observed to rotate freely when the hoist motion is operated.
- The **rope seating** should not be damaged or worn. Wear can be detected as a sharp change in the cross sectional profile of the sheave, possibly accompanied by heavy rope markings in the bottom of the seating.
- The boom point should also be fitted with **rope guards**. The guards should be of sound construction and securely fixed to the side plates of the boom point at the point where the rope leaves the sheaves. The gap between the sheave flanges and the rope guard should, again, be about half the diameter of the hoist rope.
- The Examiner should also check the **hoist rope reeving** through the boom point sheaves. The sheaves which are used, and the sequence in which each sheave is used all need to be in accordance with the Operating Manual for the particular hookblock which is fitted.
- On some cranes, there may be an **anemometer** (wind speed indicator) attached to the boom point. This should be securely fixed and not causing any interference with the operation of the crane.
- The hoist rope will be terminated at the boom point by a **wedge and socket** rope anchorage. Check for rope damage, such as broken wires, or deformation of the live rope, where it emerges from the socket. Check the socket and its lugs for cracks and deformation, particularly if the wedge is seen to protrude excessively. Check the security and tightness of the wedge fitting. Check that the dead end of rope is properly secured by bulldog grips to the live rope. Remember - 'D to Dead'. The rope should be a tight fit if there is to be no risk of it pulling through.

### Boom (hydraulic)

- The operation of the **boom telescoping** action should be smooth, without jerking, steady and silent. There should be no suspicious noises from inside the boom i.e. banging and scraping. The telescoping ram is long, slender, and lightweight and, therefore, vulnerable to damage. It can easily become bent, by operation under load, and when this is severe it may stop operating completely.

- **Slide pads**, just inside the top of each section and at the bottom and side of the boom, should also be smooth in operation and there should be no obvious play. They should be well lubricated and this shows up on that part of the boom that is in contact with the pads.
- The entire boom should be **structurally sound**. There should be absolutely no distortion, or bending, at all. Only very minor impact damage, at infrequent intervals along the boom, is permissible. There should be absolutely no broken or cracked welding, or evidence of any repair being carried out. Gusset plates and brackets should generally be in good condition with no severe distortion or weld damage.
- The **boom foot pins** to the crane superstructure should be close fitting, smooth in operation and properly retained in position.
- Any **guide rollers**, fitted to the top of the boom for protection of the hoist rope, should be in sound condition and free to rotate.

#### Derricking Rams

- There may be one or two **derricking rams** that raise and lower the boom. These should be of sound appearance. The structural brackets and pin arrangements at top and bottom should be in sound condition with no cracked or broken welds.
- As far as can be observed, the derricking **hydraulic system** should be in sound condition, including unions and rigid and flexible pipework, with no impact damage, heavy corrosion or leaks of hydraulic fluid.

#### Boom (Pin jib or lattice)

- The Examiner should make a note of the type of **boom construction**. Examples as follows
- All tubular welded.
- Angle chord, tubular bracing welded.
  - All angle welded.
  - Tubular chord, angle bracing welded.
- The same descriptions, but bolted or riveted.
- The Examiner should ascertain the boom length from the crane operator. He should make a note of the type and length of all **boom sections** making up the boom and check the correctness of the assembly from the Operating Manual.
- The entire boom should be examined for its **structural integrity**. Chord members should be checked for straightness and localised damage. There should be absolutely no distortion, or bending, at all. Only very minor impact damage to chord members, at infrequent intervals along the boom, is permissible. Bracing and other ancillary members should be similarly checked. In this case, impact damage may be acceptable, provided that it is only in single members which are well separated from other damage, and that it is not accompanied by actual rupturing of the member or its welding. Any member which shows evidence of having been straightened, following impact damage, should be counted as a damaged member. There should be absolutely no broken or cracked welds. If there is evidence of any welding repair, then written records of the repair should be obtained. These records should contain evidence that certified materials and the manufacturer's approved welding procedures have been used for the repair. The Certificate of Test and Thorough Examination for the post repair test should also be obtained. Gusset plates and brackets should generally be in good condition with no severe distortion or weld damage.
- The **boom connections** should also be examined for their structural integrity. All connecting pins must be fitted with retaining clips. Ideally, pins should be entered from the inside, so that they can be removed without standing under the boom, but this is only advisory and not cause to reject the crane. Pins should be of good fit. Bolted connections are rare, but these should be sound and well made with a full complement of bolts. Bearing surfaces should be tight fitting across their complete area.

- The **boom foot pins** to the crane superstructure should be close fitting, smooth in operation and properly retained in position.
- Any **guide rollers**, fitted to the top of the boom for protection of the hoist rope, should be in sound condition and free to rotate.
- Any **open mesh walkway** on the boom should be sound and free from damage

#### Boom Suspension

- The fixed **pendant ropes** connecting from the boom point to the bridle should be carefully examined for rope deterioration, particularly in the area close to the swaged terminations. Any broken wires, distortion, or obvious corrosion in these areas is cause for immediate rejection of the pendant rope. Pin and eye connections between the ropes should be of sound appearance. It is particularly important that pendant ropes are always used in matched pairs of exactly the same length. In some cases, crane makers mark the ropes and this makes the job of managing them much easier. Others don't and so it is possible to separate matched ropes. The consequence of unequal length pendant ropes is to rotate the boom point and cause the loading in the boom to be non-symmetrical. The Examiner should check for rotation of the boom point.
- The pendant ropes connect to the **bridle**, a structural frame with an arrangement of sheaves through which the derricking rope is reeved. The structure itself should be free from damage, sheaves should be as previously described, and rope guards should be sound and properly positioned. In order to examine the bridle closely, it may be necessary to climb onto the top of the boom and lower the bridle by derricking down.
- The **boom stops** are two struts that connect from some point on the superstructure of the crane to the top chord of the main boom. They are telescopic and extend as the boom is lowered, and retract as it is raised. They prevent the boom from being raised above its maximum angle of inclination, usually of the order of 82-83 degrees. The boom stops are therefore of exactly the right length when they are in their fully closed position. They may have spring or hydraulic buffer arrangements at the outer ends. They should be absolutely straight and show no signs of having being subjected to impact load

#### Fly Jib

- **Fly jibs** where fitted are to correspond with the manufacturers specifications.
- In the case of a **lattice structure**, chord members should be checked for straightness and localised damage. There should be absolutely no distortion, or bending, at all. Only very minor impact damage to chord members, at infrequent intervals along the jib, is permissible. Bracing and other ancillary members should be similarly checked. In this case, impact damage may be acceptable, provided that it is only in single members which are well separated from other damage, and that it is not accompanied by actual rupturing of the member or its welding. Any member that shows evidence of having been straightened, following impact damage, should be counted as a damaged member. There should be absolutely no broken or cracked welds. If there is any welding repair, then written records of the repair should be retained. These records should contain evidence that certified materials and the manufacturer's approved welding procedures have been used for the repair. The Certificate of Test and Thorough Examination for the post repair test should also be obtained. Gusset plates and brackets should generally be in good condition with no severe distortion or weld damage.
- The **fly jib connections** should also be examined for their structural integrity. All connecting pins must be fitted with retaining clips. Pins should be of good fit.
- The **fly jib pins** to the boom point should be close fitting and properly retained in position.

#### Fly Jib Point

- All **sheaves** should be undamaged, free to rotate and tight on their bearings. Those not in use should be rotated by hand. Those in use should be observed to rotate freely when the auxiliary hoist motion is operated.
- The **rope seating** should not be damaged or worn. Wear can be detected as a sharp change in the cross sectional profile of the sheave, possibly accompanied by heavy rope markings in the bottom of the seating.
- The jib point should also be fitted with **rope guards**. The guards should be of sound construction and securely fixed to the side plates of the jib point at the point where the rope leaves the sheaves. The gap between the sheave flanges and the rope guard should, again, be about half the diameter of the hoist rope.
- The Examiner should also check the auxiliary hoist **rope reeving** through the jib point sheaves. The sheaves which are used, and the sequence in which each sheave is used all need to be in accordance with the Operating Manual for the particular hookblock which is fitted.
- The auxiliary hoist rope will be terminated at the jib point by a **wedge and socket** rope anchorage only if there is more than one fall of rope. Check for rope damage, such as broken wires, or deformation of the live rope, where it emerges from the socket. Check the socket and its lugs for cracks and deformation, particularly if the wedge is seen to protrude excessively. Check the security and tightness of the wedge fitting. Check that the dead end of rope is properly secured by bulldog grips to the live rope. Remember - 'D to Dead'. The rope should be a tight fit if there is to be no risk of it pulling through

#### Auxiliary Hook-block

- The **auxiliary hook** should be of sound appearance and not modified in any way from the original. For example, it should not have anything additional welded to it. The entire surface should be smooth and rounded.
- The auxiliary hook will be of the single 'C' type. There should be a **safety latch** that prevents the displacement of the sling or load from the hook. If the latch is hinged, it should return to the closed position automatically when released.
- The action of the **swivel** should be smooth and free over a complete revolution. There should be evidence of lubrication.
- **heauxiliaryhookblock** itself should be of sound construction with no severely bent plates or components and no damaged welds or bolts.
- The **safe lifting capacity** of the auxiliary hookblock should be hard stamped on the side and also sign written in a prominent way for easy identification from the ground.
- If the hookblock is capable of accommodating more than one fall of rope, the **sheaves** should be undamaged, free to rotate and tight on their bearings. Those not in use should be rotated by hand. Those in use should be observed to rotate freely when the auxiliary hoist motion is operated.
- The **rope seating** should not be damaged or worn. Wear can be detected as a sharp change in the cross sectional profile of the sheave, possibly accompanied by heavy rope markings in the bottom of the seating.
- The sheaves should be fitted with **rope guards**. The guards should be of sound construction and securely fixed to the side plates of the hookblock at the point where the rope leaves the sheaves. The gap between the sheave flanges and the rope guard should, again, be about half the diameter of the hoist rope.
- When the auxiliary hookblock is freely suspended with no load, it should be level. This will be dictated by the auxiliary **hoist rope reeving**. The sheaves which are used, the direction in which the rope passes over them, and the sequence in which each sheave is used all need to be in accordance with the Operating Manual for the particular hookblock which is in use.

- Also check the auxiliary **hoist rope diameter**. This should be measured over the widest part of the rope. Again, check the Operating Manual for the correct diameter.
- Check the auxiliary **over-hoisting limit** operation.
- For the auxiliary over-hoisting **limit adjustment** the distance of the switch below the jib point should be checked by reference to the Operating Manual.
- **Safe Load Indicator**
- If the crane is fitted with a safe load indicator, its calibration should be verified by use of the following **load test**.
- By reference to the duty charts, for the crane configuration that is in use, select a suitable known weight to be lifted. This should be less than the maximum allowed and greater than the minimum allowed.
- Lift the weight at less than the maximum radius allowable.
- Boom the crane out until the safe load indicator warns that the maximum allowable radius has been reached. The warning should be audible and visual and may include a reading of load, radius and maximum allowable load. Make a note and compare these with the duty chart.
- Measure the radius at which the load is suspended. Measure from the centre of the load to the centre of rotation of the crane. Compare this with the duty chart and the results given by the safe load indicator.

## **ERECTION WORK**

### **General**

- The erection work plan and procedure shall be checked thoroughly by the authorised Construction Supervisors. shall provide warning signs of NO ENTRY and safety ropes. The strength of the road and any obstacles on the route of the crane shall be checked. The road shall be reinforced and obstacles removed when required and reinstalled after work completion.
- The strength of the ground where the crane is to be placed shall be examined. If necessary, reinforcements, such as installation of steel plate or wooden mats shall be made.
- Only authorised persons licenses shall be permitted to operate a crane. Experienced personnel shall undertake slinging for lifting equipment only.
- A foreman and signalman shall be assigned for each erection project under an operating system established for the work. They shall stand where they can observe the erection operation and be clearly visible to the crane operator during the crane work. A uniform signal system shall be used with flags, transceivers, and whistles for signaling.
- The capacity of the crane to be used for erection shall be determined after careful consideration and calculations. Total lifting weights and the centre of gravity of the equipment to be erected shall be carefully rechecked before commencing erection work. Before starting the work, the condition and functioning of the brakes, limit switches, over-load preventing devices, wire ropes, and lifting devices shall be checked and inspected, and other lifting devices shall first be operated on a trial basis without a load.
- As a preliminary check, the equipment to be erected shall be lifted and held 10 centimeters from the ground. In this state, all elements shall be checked and inspected to see if they are functioning properly. If risky conditions are detected, the lifting work shall stop immediately
- Lifting work shall not be carried out during bad weather, such as strong winds or rain.
- All cranes and winches shall be tested and inspected regularly. Cranes or winches shall be locked or braked when not in operation.

### **Erection by Crane**

- Lifting work shall begin only after confirming by preliminary check that the crane is set up satisfactorily.

- The crane shall be secured horizontally and steel plate or square timbers shall be placed under the outriggers firmly, then secured with knock pins after being set in position.
- The operator shall not leave the crane or winch during lifting work.
- The inclined angle of the boom during operation shall not exceed the range of 30 to 80 degrees. When using the jib, its length must be minimised. An angle indicator shall be provided for the crane operator to visually check the boom angle. Cranes booms shall be secured to the specified position when the crane is not in use.
- Crane shall never be loaded in excess of the manufacturer's stipulated rating. Lifting loads for each crane shall be controlled within 90 percent of the maximum lifting load.
- During the lifting work, the operation shall be carefully supervised to prevent hasty lifting. Prolonged suspension, and lifting beyond the limit. Abrupt lifting and stopping shall be prohibited.
- Simultaneous rotation and lifting or rotation and boom movement shall be prohibited.
- The boom shall be slowly rotated as so not to produce centrifugal forces on equipment or materials being lifted.
- Workers shall be forbidden to ride on lifted equipment or materials being lifted or moved.
- The crane's wire rope shall be rolled up entirely after the work is finished.

#### **Rigging Work**

- Rigging work shall be performed under the direction of a rigging Supervisor who has qualified certification OR Company determined experience.
- The lifting weight shall be the total weight of the equipment or materials, crate, and lifting tackle.
- Ropes shall be of good quality, free from rust, corrosion, and deformation. All wire shall be carefully checked for suitability prior the use. Wire rope shall be replaced when either of the following critical conditions is observed:
  - Quantity of broken wires exceeds 10 percent of the total in one strand.
  - Reduction in diameter exceeds 7 percent of the original.
  - Materials shall be secured by at least two (2) slings, and the sling angle shall not exceed 60 degrees
- The coefficient of safety for the main wire and other rigging shall be 6 or more when in use.
- Padding shall be provided at sharp edges of materials to be lifted to prevent the ropes and slings from being damaged or cut.
- A guy rope shall be provided for extra long or unstable special materials to be lifted.
- The hook shall be placed above the centre of gravity of the material to be lifted. When the centre of gravity is above the centre of the list or not in the middle of the material, special precautions shall be taken to prevent swinging, slipping, or falling.
- Working under materials or equipment being lifted or riding on materials or equipment while being lifted shall be prohibited.
- Lifting ropes and slings shall not be removed until confirming that the lifted material is stable.
- **REGULARLY INSPECT ALL LIFTING TACKLE FOR DAMAGE. A COLOR CODE SHALL BE ASSIGNED TO READILY IDENTIFY INSPECTION PERIODS.**

**13.****12 HOUSEKEEPING**

- Housekeeping is the act of keeping the working environment cleared of all unnecessary waste, thereby providing a first-line of defence against accidents and injuries.
- Understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of house keeping is always maintained. Indeed “Cleanliness is indeed next to Godliness”
- Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.
- General House keeping shall be carried out and ensured at all times at Work Site, Construction Depot, Batching Plant, Labour Camp, Stores, Offices and toilets/urinals.
- Adequate time shall be assigned to ensure that good housekeeping is maintained. Team of housekeeping squad shall carry out this.
- All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, fire fighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.
- Roads shall be kept clear and materials like: pipes, steel, sand boulders, concrete, chips and brick etc. shall not be allowed on the roads to obstruct free movement of road traffic.
- Water logging or bentonite spillage on roads shall not be allowed. If bentonite spillage is observed on road endangering the safety of road users,
- Flammable chemicals / compressed gas cylinders shall be safely stored.
- Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to identify location(s).
- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).
- Empty cement bags and other packaging material shall be properly stacked and removed.

**13 WORKING AT HEIGHT**

**Definitions:-**

"access" and "egress"	Include ascent and descent.
"fragile surface"	Means a surface, which would be able to fail if any reasonably foreseeable loading were to be applied to it.
"line"	includes rope, chain or webbing
personal fall protection"	a fall prevention, work restraint, work positioning, fall arrest or rescue system, other than a system in which the only safeguards are collective safeguards; or rope access and positioning techniques;
"work at height"	work in any place, including a place at or below ground level; obtaining access to or egress from such place while at work, except by a staircase in a permanent workplace, where, if protective measures were not taken, a person could fall a distance liable to cause personal injury;
"work equipment"	means any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not) and includes <ul style="list-style-type: none"> <li>• a guard-rail, toe-board, barrier or similar collective means of protection</li> <li>• a working platform</li> <li>• a net, airbag or other collective safe guard for arresting falls.</li> <li>• personal fall protection system</li> <li>• ladders</li> </ul>
"working platform"	means any platform used as a place of work or as a means of access to or egress from a place of work; includes any scaffold, suspended scaffold, cradle, mobile platforms, trestle, gangway, gantry and stairway which is so used.

**Organisation and planning**

Ensure that work at height is properly planned for any emergencies and rescue appropriately supervised; and carried out in a manner, which is reasonably practicable safe.

Ensure that work at height is carried out only when the weather conditions do not jeopardise the health or safety of persons involved in the work.

**Competence**

Ensure that no person engages in any activity, including organization, planning and supervision, in relation to work at height or work equipment for use in such work unless he is competent to do so or, if being trained, is being supervised by a competent person.

**Avoidance of risks from work at height**

Ensure that work is not carried out at height where it is reasonably practicable to carry out the work safely otherwise than at height.

Where work is carried out at height, shall take suitable and sufficient measures as given below to prevent, so far as is reasonably practicable, any person falling a distance liable to cause personal injury.

**Selection of 'work equipment' for work at height**

Selecting work equipment for use in work at height, shall give collective protection measures priority over personal protection measures; and take account of the working conditions and the risks to the safety of persons at the place where the work equipment is to be used; in the case of work equipment for access and egress, the distance to be negotiated; the distance and consequences of a potential fall; the duration



and frequency of use; the need for easy and timely evacuation and rescue in an emergency; and any additional risk posed by the use, installation or removal of that work equipment or by evacuation and rescue from it;

Select work equipment for work at height which: have characteristics including dimensions which: are appropriate to the nature of the work to be performed and the foreseeable loadings; and allow passage without risk; and is in other respects the most suitable work equipment.

**Fragile surfaces**

Ensure that no person at work passes across or near, or working on, from or near, a fragile surface where it is reasonably practicable to carry out work safely and under appropriate ergonomic conditions without his doing so.

Where it is not reasonably practicable to carry out work safely and under appropriate ergonomic conditions without passing across or near, or working on, from or near, a fragile surface, ensure, so far as is reasonably practicable, that suitable and sufficient platforms, coverings, guard rails or similar means of support or protection are provided and used so that any foreseeable loading is supported by such supports or borne by such protection; where a risk of a person at work falling remains despite the measures taken under the preceding provisions of this regulation, take suitable and sufficient measures to minimise the distances and consequences of his fall.

Where any person at work may pass across or near, or work on, from or near, a fragile surface, ensure that prominent warning notices are so far as is reasonably practicable affixed at the approach to the place where the fragile surface is situated; or where that is not reasonably practicable, such persons are made aware of it by other means.

**Falling objects**

- Where necessary to prevent injury to any person, take suitable and sufficient steps to prevent, so far as is reasonably practicable, the fall of any material or object.
- Ensure that no material or object is thrown or tipped from height in circumstances where it is liable to cause injury to any person.
- Ensure that materials and objects are stored in such a way as to prevent risk to any person arising from the collapse, overturning or unintended movement of such materials or objects.

**Inspection of work equipment**

- Ensure that, where the safety of work equipment depends on how it is installed or assembled, it is not used after installation or assembly in any position unless it has been inspected in that position.
- Ensure that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected at suitable intervals;
- Ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time.
- Ensure that the reports of all inspections are properly maintained

**In this clause "inspection"**, means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes; includes any testing appropriate for those purposes, Inspection of places of work at height

**Duties of persons at work**

Workmen shall report to the supervisor about any defect relating to work at height which he knows is likely to endanger the safety of himself or another person.

Workmen shall use any work equipment or safety device provided to him for work at height, in accordance with

- a) any training in the use of the work equipment or device concerned which have been received by him; and
- b) the instructions respecting that use which have been provided to him by the Company as per the requirements of the Client Company

Requirements for existing places of work and means of access or egress at height Every existing place of work or means of access or egress at height shall be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used; where applicable, rest on a stable, sufficiently strong surface;

- a) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work to be carried out there;
- b) possess suitable and sufficient means for preventing a fall;
- c) possess a surface which has no gap
  - i) through which a person could fall;
  - ii) through which any material or object could fall and injure a person; or
  - iii) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk;
- d) be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable -
  - i) the risk of slipping or tripping; or
  - ii) any person being caught between it and any adjacent structure;
- e) Where it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

#### **Requirements for guardrails, toe-boards, barriers and similar collective means of protection**

Unless the context otherwise requires, any reference in this section to means of protection is to a guardrail, toe-board, barrier or similar collective means of protection.

#### **Means of protection shall**

- a) be of sufficient dimensions, of sufficient strength and rigidity for the purposes for which they are being used, and otherwise suitable;
- b) be so placed, secured and used as to ensure, so far as is reasonably practicable, that they do not become accidentally displaced; and
- c) be so placed as to prevent, so far as is practicable, the fall of any person, or of any material or object, from any place of work.

#### **In relation to work at height involved in construction work**

- a) the top guard-rail or other similar means of protection shall be at least 950 millimeters above the edge from which any person is liable to fall;
- b) toe-boards shall be suitable and sufficient to prevent the fall of any person, or any material or object, from any place of work; and
- c) Any intermediate guardrail or similar means of protection shall be positioned so that any gap between it and other means of protection does not exceed 470 millimeters.
- iv) Any structure or part of a structure which supports means of protection or to which means of protection are attached shall be of sufficient strength and suitable for the purpose of such support or attachment.

**Requirements for all Working Platforms**

- i) Every working platforms requires a supporting structure for holding it
- ii) Any surface upon which any supporting structure rests shall be stable, of sufficient strength and of suitable composition safely to support the supporting structure, the working platform and any loading intended to be placed on the working platform.
- iii) Stability of supporting structure An supporting structure shall
  - a) be suitable and of sufficient strength and rigidity for the purpose for which it is being used;
  - b) in the case of a wheeled structure, be prevented by appropriate devices from moving inadvertently during work at height;
  - c) in other cases, be prevented from slipping by secure attachment to the bearing surface or to another structure, provision of an effective anti-slip device or by other means of equivalent effectiveness;
  - d) be stable while being erected, used and dismantled; and
  - e) When altered or modified, be so altered or modified as to ensure that it remains stable.
  - f) Have suitable base plates and properly footed thereby.

**Stability of working platforms a working platform shall**

- a) Suitable and of sufficient strength and rigidity for the purpose or purposes for which it is intended to be used or is being used;
- b) be so erected and used as to ensure that its components do not become accidentally displaced so as to endanger any person;
- c) When altered or modified, be so altered or modified as to ensure that it remains stable; and be dismantled in such a way as to prevent accidental displacement.

**Safety on working platforms a working platform shall**

- a) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work being carried out there;
- b) possess a suitable surface and, in particular, be so constructed that the surface of the working platform has no gap
  - i) through which a person could fall;
  - ii) through which any material or object could fall and injure a person; or
  - iii) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk; and
- c) be so erected and used, and maintained in such condition, as to prevent, so far as is reasonably practicable
  - i) the risk of slipping or tripping; or
  - ii) Any person being caught between the working platform and any adjacent structure.

**Loading**

A working platform and any supporting structure shall not be loaded so as to give rise to a risk of collapse or to any deformation, which could affect its safe use.

**Additional requirements for scaffolding**

Strength and stability calculations for scaffolding shall be carried out unless

- a) a note of the calculations, covering the structural arrangements contemplated, is available; or it is assembled in conformity with a generally recognised standard configuration.
- Depending on the complexity of the scaffolding selected, a competent person shall draw up an assembly, use and dismantling plan. This may be in the form of a standard plan, supplemented by items relating to specific details of the scaffolding in question.
  - A copy of the plan, including any instructions it may contain, shall be kept available for the use of persons concerned in the assembly, use, dismantling or alteration of scaffolding until it has been dismantled.
  - The dimensions form and layout of scaffolding decks shall be appropriate to the nature of the work to be performed and suitable for the loads to be carried and permit work and passage in safety.
  - While a scaffold is not available for use, including during its assembly, dismantling or alteration, it shall be marked with general warning signs in accordance with and be suitably delineated by physical means preventing access to the danger zone.

Scaffolding may be assembled, dismantled or significantly altered only under the supervision of a competent person and by persons who have received appropriate and specific training in the operations envisaged which addresses specific risks which the operations may entail and precautions to be taken, and more particularly in

- understanding of the plan for the assembly, dismantling or alteration of the scaffolding concerned;
- safety during the assembly, dismantling or alteration of the scaffolding concerned;
- measures to prevent the risk of persons, materials or objects falling;
- safety measures in the event of changing weather conditions which could adversely affect the safety of the scaffolding concerned;
- permissible loadings;
- any other risks which the assembly, dismantling or alteration of the scaffolding may entail.

#### **Requirements for collective safeguards for arresting falls**

- i) Collective safeguard are a safety net, airbag or other collective safeguard for arresting falls
- ii) A safeguard shall be used only if
  - risk assessment has demonstrated that the work activity can so far as is reasonably practicable be performed safely while using it and without affecting its effectiveness;
  - the use of other, safer work equipment is not reasonably practicable; and
  - a sufficient number of available persons have received adequate training specific to the safeguard, including rescue procedures.
- iii) A safeguard shall be suitable and of sufficient strength to arrest safely the fall of any person who is liable to fall.

#### **A safeguard shall**

- a) in the case of a safeguard which is designed to be attached, be securely attached to all the required anchors, and the anchors and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of safely

supporting the foreseeable loading in arresting any fall and during any subsequent rescue;

- b) in the case of an airbag, landing mat or similar safeguard, be stable; and
- c) in the case of a safeguard, which distorts in arresting a fall, afford sufficient clearance.

Suitable and sufficient steps shall be taken to ensure, so far as practicable, that in the event of a fall by any person the safeguard does not itself cause injury to that person.

#### **Requirements for personal fall protection systems**

- i) A personal fall protection system shall be used only if
    - a) a risk assessment has demonstrated that
      - i) the work can so far as is reasonably practicable be performed safely while using that system; and
      - ii) the use of other safer work equipment is not reasonably practicable; and
    - b) The user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.
  - ii) A personal fall protection system shall
    - a) be suitable and of sufficient strength for the purposes for which it is being used having regard to the work being carried out and any foreseeable loading;
    - b) where necessary, fit the user;
    - c) be correctly fitted;
    - d) be designed to minimise injury to the user and, where necessary, be adjusted to prevent the user falling or slipping from it, should a fall occur; and
    - e) be so designed, installed and used as to prevent unplanned or uncontrolled movement of the user.
- A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of supporting any foreseeable loading.
  - Suitable and sufficient steps shall be taken to prevent any person falling or slipping from a personal fall protection system.

#### **Requirements for Ladders**

Ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk and

- The short duration of use; or
  - Existing features on site, which he cannot alter.
- Only metal ladders shall be allowed. Bamboo ladders are prohibited.
  - Any surface upon which a ladder rests shall be stable, firm, of sufficient strength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.
  - A ladder shall be so positioned as to ensure its stability during use
  - A suspended ladder shall be attached in a secure manner and so that, with the exception of a flexible ladder, it cannot be displaced and swinging is prevented.
  - A portable ladder shall be prevented from slipping during use by -
    - securing the stiles at or near their upper or lower ends;
    - an effective anti-slip or other effective stability device; or

- any other arrangement of equivalent effectiveness.
- A ladder used for access shall be long enough to protrude sufficiently above the place of landing to which it provides access, unless other measures have been taken to ensure a firm handhold.
- No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.
- A mobile ladder shall be prevented from moving before it is stepped on.
- Where a ladder or run of ladders raises a vertical distance of 9 metres or more above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.
- Every ladder shall be used in such a way that
  - a secure handhold and secure support are always available to the user; and
  - the user can maintain a safe handhold when carrying a load unless, in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of
    - i) the low risk; and
    - ii) the short duration of use.

## **14** **OVERHEAD PROTECTION**

Provide overhead protections as per Rule 41 of BOCWR

- Overhead protection should be erected along the periphery of every building which is under construction and the building height shall be 15m or above after construction.
  
- Overhead protection shall be minimum 2m wide and the outer edge shall be 150mm higher than the inner edge and an angle not more than 20° to its horizontal sloping into the building.
  
- Overhead protection shall not be erected more than a height of 5m from the base of the building.
  
- Areas of inadvertent hazard of falling of material shall be guarded or barricaded or roped-off.

## **15 SLIPPING, TRIPPING, CUTTING, DROWNING AND FALLING HAZARDS**

As per Rule 42 of BOCWR,

- All places should be free from dust, debris or similar materials.
- Sharp projections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.
- Not allow workmen to work or use platforms, scaffolds/passageways or any walkways, which have water, or oil or similar substances spilt and have a slipping hazard, unless it is cleaned off or covered or sanded or saw dusted or make it safe with any suitable material.
- Open side or opening where worker, equipment, vehicle or lifting appliance may fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.
- Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.



## **16 LIFTING APPLIANCES AND GEAR**

Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, luffing machinery sheaves, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyesnuts and other accessories of a lifting appliance.

No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:

- the weights, dimensions and lift radii of the heaviest and largest loads
- the maximum lift height, the maximum lift radius and the weight of the loads that must be handled at each
- the number and frequency of lifts to be made
- how long the crane will be required on site
- The type of lifting to be done (for example, is precision placement of loads important?)

The type of carrier required (this depends on ground conditions and machine capacity in its operating quadrants) capacity is normally greatest over the rear, less over the side, and non-existent over the front

- whether loads will have to be walked or carried
  - whether loads will have to be suspended for lengthy periods
  - the site conditions, including the ground where the machine will be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation
- 
- Ensure that a valid certificate of fitness issued & is available for all lifting appliances including synchronised mobile jacks, pre-stressing hydraulic jacks, jacks fitted with launching girders etc. and Client approval before inducting to the site. Only after obtaining the approval from the Client Company any lifting appliances and gear shall be used.
  - The laminated photocopies of fitness certificate issued by competent person, the Client Company approval letter, the operators' photo, manufacturer's load chart and competency certificate shall always be either kept in the operator cabin or pasted on the visible surface of the lifting appliances.
  - All lifting appliances and loose gears shall be clearly marked for its safe working load and identification by stamping or other suitable means.
  - Maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.
  - Test and periodical examination of lifting appliances and gears
  - All lifting appliances including all parts and gears thereof, whether fixed or movable shall be thoroughly tested and examined by a competent person once at least in every six months or after it has undergone any alterations or repairs liable to affect its strength or stability. Within the validity, if the lifting appliances are shifted to a new site, re-examination by the same competent person for ensuring its safety shall also be done.
  - Utilise the services of any competent person as defined in Factories Act, 1948 and approved by Chief Inspector of Factories with the permission of the Client Company.
  - All alarms and signals like automatic safe load indicators (SLI), boom angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius

indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition

#### **Automatic safe load indicators**

As stipulated in Rule 57 of DBOCW Rules, every lifting appliances and gears like cranes, hydras etc, if so constructed that the safe working load may be varied by raising or lowering of the jib or otherwise shall be attached with an automatic indicator of safe working loads approved by Bureau of Indian standards/ International certifying bodies which gives a warning to the operator and arrests further movements of the lifting parts.

#### **Qualification of operator of lifting appliances and of signalleretc**

Shall not employ any person to drive or operate a lifting machine like crane, hydra etc whether driven by mechanical power or otherwise or to give signals to work as a operator of a rigger or derricks unless he

- is above twenty-one years of age and possesses a valid heavy transport vehicle driving licence as per Motor Vehicle Act and Rules.
- is absolutely competent and reliable
- possesses the knowledge of the inherent risks involved in the operation of lifting appliances by undergoing a formal training at any institution of national importance acceptable to Client Company
- is medically examined periodically as specified in schedule VII of BOCW Rules.

#### **General requirements of appliances**

##### **Out-of level**

One of the most severe effects of being out-of fit level is that side loads develop in the boom. Because of side loads all mobile cranes lose capacity rapidly as the degree of out-of-level increases and therefore

##### **Boom**

- The boom is one of the more critical elements of the crane and must be in perfect condition at all time. No boom section with a bent lattice member shall be allowed
- All welds shall be crack and corrosion free
- No member of the boom shall be bent
- All telescopic boom shall be free from cracks, rust, flaking or cracked paint, bulges, greases or varnishes
- The sweep area (work area) of the construction machinery shall be always free from obstructions.
- All hydraulic piping and fittings shall be maintained leak proof.

The operator cab shall posses good and safe:

- structure, windows and windshield wipers
- Drivers chair and foot rest
- Control handles
- Cab instrumentation
- Telecommunication
- Cab out fitting
- wind indicator with an adjustable set point shall be in a position representative for the wind on the crane. The indicator shall give continuous information regarding constant speeds and gusts.

## **17 CONSTRUCTION MACHINERY**

Construction machineries may include dumpers and dump trucks, lift trucks and telescopic handlers piling rigs, vibro hammers, welding equipments, mobile elevating work platforms, cranes, tipper lorries, lorry loaders, skip wagons, 360° excavators, 180° backhoe loaders, crawler tractors, scrapers, graders, loading shovels, trenchers, side booms, pavers, planers, chippers, road rollers, locomotives, tankers and bowsers, trailers, hydraulic and mechanical breakers etc.

### **Safe worthiness certificate**

- Every construction equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or manufacturers' warranty in case of brand new equipments or authorized persons / firms approved by Client Company before induction to any site.
- Every such certificate shall have the date of purchase, main overhauling undertaken in the past, any accident to the equipment, visual examination details, critical components safety check, list of safety devises and its working condition, manufacturer's maintenance checklist, past projects wherein the equipments were used etc as its minimum content.

### **Reverse Horns**

All Vehicles shall be fitted with audible reverse alarms and maintained in good working condition. Reversing shall be done only when there is adequate rear view visibility or under the directions of a banksman

### **General operating procedures**

Drivers entering site shall be instructed to follow the safe system of work adopted on every work site. These shall be verbal instructions or, preferably, written instructions showing the relevant site rules, the site layout, delivery areas, speed limits, etc.

- No passengers shall be carried, unless specific seating has been provided in accordance with the manufacturer's recommendations.
- Working on gradients beyond any equipments capability shall not be allowed.
- Prevention of dumper and dump truck accidents should be managed by providing wheel stops at a sufficient distance from the edges of excavations, spoil heaps, pits, etc.
- The manufacturer's recommended bucket size must not be exceeded in excavators.
- If excavators operating on a gradient which cannot be avoided, it must be ensured that the working cycle is slowed down, that the bucket is not extended too far in the downhill direction, and that travel is undertaken with extreme caution. A large excavator must never be permitted to travel in a confined area, or around people, without a banksman to guide the driver, who should have the excavator attachment close in to the machine, with the bucket just clear of the ground. On wheeled excavators, it is essential that the tyres are in good condition and correctly inflated. If stabilizing devices are fitted, they should be employed when the machine is excavating.
- When the front shovel of the 180° backhoe loaders is being employed, the backhoe attachment shall be in its "travel" position, with the safety locking device in place.
- When operating the backhoe in poor ground conditions, the stabilisers tend to sink into the surface of the ground, reducing stability. Therefore frequent checks shall be made for the

stability of the machine. The loading shovel should always be lowered to the ground to stabilise the machine when the backhoe is employed.

- The netting operation of the skip wagons should be carried out prior to lifting the skip to reduce the risks of working on the rear platform
- If a tractor dozer is employed on clearing scrub or felling trees, it shall be provided with adequate driver protection.
- When two or more scrapers are working on the same job, a minimum distance of at least 25m shall be kept between them.
- In case of hydraulic breakers, hydraulic rams and hoses shall be in good working condition
- All wood working machines shall be fitted with suitable guards and devices such as top guard, riving knife, push stick, guards for drive belts and chains, and emergency stop switch easily accessible by the operator.

## **18** **MACHINE AND GENERAL AREA GUARDING**

Ensure at the construction site all motors, cogwheels, chains and friction gearing, flywheels, shafting, dangerous and moving parts of machinery are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

**19 MANUAL LIFTING AND CARRYING OF EXCESSIVE WEIGHT**

Ensure at his construction site of a building or other construction work that no building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight as said below as per Rule 38 of BOCWR, Unless aided by another building worker or device.

<b>Person</b>	<b>Maximum weight in kg.</b>
Adult man	55
Adult woman	30

No building worker aided by other building worker shall lift or carry weight higher than or exceeding the sum of total of maximum limits set out for each building worker separately as mentioned in the table above.

## **20** **ELECTRICITY**

### **Distribution system:**

Shall provide distribution system for control and distribution of electricity from a main AC supply of 50Hz for typical appliances,

- Fixed plant – 400V 3 phase
- Movable plant fed via trailing cable over 3.75 kW – 400 3 phase
- Installation in site buildings – 230V single phase
- Fixed flood lighting – 230V single phase
- Portable and hand tools – 115V single phase
- Site lighting - 115V single phase
- Portable hand lamps – 115V single phase

### **Electrical protection circuits**

- Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged. A conductor shall be regarded as earthed when conductors of sufficient strength and current-carrying capability to discharge electrical energy to earth connect it to the general mass of earth.
- If a circuit conductor is connected to earth or to any other reference point, nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.
- Appropriate electrical protection shall be provided for all circuits, against over load, short circuit and earth fault current.
- Provide sufficient ELCBs (maintain sensitivity 30 MA) / RCCBs for all the equipments (including Potable equipments), electrical switchboards, distribution panels etc. to prevent electrical shocks to the workers.
- All protection devices shall be capable of interrupting the circuit without damage to any equipment and circuits in case of any fault may occur.
- Rating of fuses and circuit breakers used for the protection of circuits should be coordinate with equipment power ratings.
- Protection against lightning shall be ensured to all equipment kept in open at sites.

### **Cables:**

- Cables shall be selected after full consideration of the condition to which they shall be exposed and the duties for which they are required. Supply cable up to 3.3 kV shall be in accordance with BS 6346.
- For supplies to mobile or transportable equipment where operating of the equipment subjects the cable to flexing, the cable shall conform to any of these codes BS 6007 / BS 6500 / BS 7375.
- Flexible cords with a conductor cross sectional area smaller than 1.5 mm<sup>2</sup> shall not be used and insulated flexible cable shall conform to BS 6500 and BS 7375.
- Where low voltage cables are to be used, reference shall be made to BS 7375. The following standards shall also be referred to particularly for under ground cables BS 6346 and BS 6708
- Cables buried directly in the ground shall be of a type incorporating armour or metal

sheath or both. Such cables shall be marked by cable covers or a suitable marking tape and be buried at a sufficient depth to avoid their being damaged by any disturbance of the ground. Cable routes shall be marked on the plans kept in the site electrical register.

- Cabling passing under the walk way and across way for transport and mobile equipment shall be laid in ducts at a minimum depth of 0.6 meters.
- Cables that need to cross open areas, or where span of 3m or more are involved, a catenary wire on poles or other supports shall be provided for convenient means of suspension. Minimum height shall be 6 m above ground.
- Cables carrying a voltage to earth in excess of 65V other than supply for welding process shall have metal armour or sheath, which has been effectively earthed and monitored. In case of flexible and trailing cables such earthed metal sheath and/or armour should be in addition to the earth core in the cable and shall not be used as the protective conductor.
- Armoured cables having an over-sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring

**Plugs, socket-outlets and couplers:**

- Ensure plugs, socket-outlets, and couplers available in the construction site as “splash proof” type. The minimum degree of Ingress Protection should be of IP44 in accordance with BS EN 60529.
- Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the internationally recognised standards for example as detailed as follows:
  - (a) 110 volts : Yellow.
  - (b) 240 volts : Blue.
  - (c) 415 volts : Red.

**Connections**

- Every joint and connection in a system shall be mechanically and electrically suitable for use to prevent danger. Proper cable connectors as per national/international standards shall only be used to connect cables.
- No loose connections or tapped joints shall be allowed any where in the work site, office area, stores and other areas. Penalty as per relevant clause shall be put in case of observation of any tapped joints.

**Portable and hand-held equipments:**

Ensure the use of double insulated or all-insulated portable electrical hand equipment may be used without earthing (i.e. two core cables), but they shall still be used only on 110V because of the risk of damage to trailing leads.

**Other equipments:**

- All equipment shall have the provision for major switch/cut-off switch in the equipment itself.
- All non-current carrying metal parts of electrical equipment shall be earthed through insulated cable
- Isolate exposed high-voltage (over 415 Volts) equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts and prevent unauthorised access.
- Approved perimeter markings shall be used to isolate restricted areas from designated



work areas and entryways and shall be erected before work begins and maintained for entire duration of work. Approved perimeter marking shall be installed with either red barrier tape printed with the words "DANGER—HIGH VOLTAGE" or a barrier of yellow or orange synthetic rope, approximately 1 to 1.5 meter above the floor or work surface.

**Work on or near live conductors**

No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless-

- a) it is unreasonable in all the circumstances for it to be dead; and
- b) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and
- c) Suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

**Inspection and Maintenance**

- All electrical equipment should be permanently numbered and a record kept of the date of issue, date of last inspection and recommended inspection period.
- Fixed installations shall be inspected at least at three monthly intervals; routine maintenance being carried out in accordance with equipment manufactures recommendations.

**21**    **LIGHTING:**

- Provide sufficient site lighting, of the right type and at the right place for it to be properly effective. Lighting ought not to introduce the risk of electric shock. Therefore, 230V supplies should be used for those fittings, which are robustly installed, and well out of reach e.g. flood lighting or high-pressure discharge lamps.
- Ensure that luminaries should always be placed so that no person is required to work in their own shadow and so that the local light for one person is not a source of glare for the others. Strongly made clamps should be available for attaching luminaries to poles and other convenient supports.
- Luminaries should be robust, resistant to corrosion and rain proof especially at the point of the cable entry.
- The correct type of lamp for each luminaries should always be used and when lamps need to be replaced if shall be in accordance with the supply voltage.
- Lamp holders not fitted with a lamp should be capped off.

## **22 HAND TOOLS AND POWER TOOLS**

### **General**

- Use of short / damaged hand tools shall be avoided
- Ensure all hand tools used at worksite are safe to work with or stored and shall also train employees for proper use thereby.
- All hand tools and power tools shall be duly inspected before use for safe operation.
- All hand tools and power tools shall have sufficient grip and the design specification on par with national/international standards on anthropometrics.

### **Hand tools**

- Hand tools shall include saws, chisels, axes and hatches, hammers, hand planes, screw drivers, crow bars, nail pullers.

#### **Ensure that,**

- For crosscutting of hardwood, saws with larger teeth points (no. of points per inch) shall be preferred to avoid the saw jumping out of the job.
- Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.
- Unless hatchet has a striking face, it shall be used as a hammer.
- Only knives of retractable blades shall be used in the worksite.
- No screwdrivers shall be used for scraping, chiselling or punching holes.
- A pilot hole shall always be driven before driving a screw.
- Wherever necessary, usage of proper PPEs shall be used by his employees.

### **Power tools**

- Power tools include drills, planes, routers, saws, jackhammers, grinders, sprayers, chipping hammers, air nozzles and drills.

#### **Ensure that**

- Electric tools are properly grounded or / and double insulated.
- GFCIs/ RCCBs shall be used with all portable electric tool operated especially outdoors or in wet condition.
- Before making any adjustments or changing attachments, his workers shall disconnect the tool from the power source.
- When operating in confined spaces or for prolonged periods, hearing protection shall be required. The same shall also apply to working with equipments, which gives out more noise.
- Tool is held firmly and the material is properly secured before turning on the tool.
- All drills shall have suitable attachments respective of the operations and powerful for ease of operation.
- When any work / operation need to be performed repeatedly or continuously, tools specifically designed for that work shall be used. The same is applicable to detachable tool bit also.
- Size of the drill shall be determined by the maximum opening of the chuck in case of drill bit.
- Attachments such as speed reducing screwdrivers and buffers shall be provided to

prevent fatigue and undue muscle strain to his workers.

- Stock should be clamped or otherwise secured firmly to prevent it from moving.
- Workers shall never stand on the top of the ladder to drill holes in walls / ceilings, which can be hazardous, instead standing on the fourth or fifth rung shall be recommended.
- Electric plane shall not be operated with loose clothing or long scarf or open jacket.
- Safety guards used on right angle head or vertical portable grinders must cover a minimum of 1800 of the wheel and the spindle / wheel specifications shall be checked.
- All power tools / hand tools shall have guards at their nip points.
- Low profile safety chain shall be used in case of wood working machines and the saw shall run at high rpm when cutting and also correct chain tension shall be ensured to avoid "kickback".
- Leather aprons and gloves shall be used as an additional personal protection auxiliary to withstand kickback.
- Push sticks shall be provided and properly used to hold the job down on the table while the heels moves the stock forward and thus preventing kickbacks.
- Air pressure is set at a suitable level for air actuated tool or equipment being used. Before changing or adjusting pneumatic tools, air pressure shall be turned off.
- Only trained employees shall use explosive actuated tools and the tool shall also be unloaded when not in use.
- Usage of such explosive actuated tools shall be avoided in case of places where explosive/flammable vapours or gases may be present.
- Explosive actuated tools and their explosives shall be stored separately and be taken out and loaded only before the time of immediate use.
- Misfired cartridges of explosive actuated tools must be placed in a container of water and be removed safely from the project.
- No worker shall point any power operated / hand tool to any other person especially during loading / unloading.

## **23 DANGEROUS AND HARMFUL ENVIRONMENT**

As per BOCWR Rule 40,

- When internal combustion engines are to be used into a confined space or excavation or any other workplace where neither natural or artificial ventilation system is inadequate to keep carbon monoxide below 50ppm, exposure of building workers shall be avoided unless suitable measures are taken and provided by the site management.
  
- No worker shall be allowed into any confined space or tank or trench or excavation wherein there is given off any dust, fumes / vapours or other impurities which is likely to be injurious or offensive, explosive or poisonous or noxious or gaseous material or other harmful articles unless steps are carried & certified by the responsible person to be safe.

## **24** **CORROSIVE SUBSTANCES**

As per BOCWR Rule 44,

Corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / construction site in a manner that it does not endanger the building worker and suitable PPE shall be provided to the worker during such handling and work.

In case of spillage of such substances on building worker, the Site Management shall take immediate remedial measures.

## **25** DEMOLITION

Ensure that

- All demolition works be carried out in a controlled manner under the management of experienced and competent supervision.
- The concerned department of the Government or local authority be informed and permission obtained wherever required. Media shall also be informed regarding this concern.
- all glass or similar materials or articles in exterior openings are removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines are put-off and such lines so located or capped with substantial coverings so as to protect it from damage and to afford safety to the building workers and public..
- examine the walls of all structures adjacent to the structure to be demolished to determine thickness, method of support to such adjacent structures
- No demolishing work be performed if the adjacent structure seems to be unsafe unless and until remedial measures like sheet piling, shoring, bracing or similar means be ensured for safety and stability for adjacent structure from collapsing.
- No person other than building workers or other persons essential to the operation of demolition work shall be permitted to enter a zone of demolition and the area be provided with substantial barricades.

## **26** WORK PERMIT SYSTEM

Develop a Work Permit system, which is a formal written system used to control certain types of work that are potentially hazardous.

A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work Permits form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high-risk activities include but are not limited to:

- \* Entry into confined spaces
- \* Work in close proximity to overhead power lines and telecommunication cables.
- \* Hot work.
- \* To dig—where underground services may be located.
- \* Work with heavy moving machinery.
- \* Working on electrical equipment
- \* Work with radioactive isotopes.
- \* Heavy lifting operations and lifting operations closer to live power line

The permit-to-work system should be fully documented, laying down:

- \* How the system works;
- \* The jobs it is to be used for;
- \* The responsibilities and training of those involved; and
- \* How to check its operation;

A Work Permit authorisation form shall be completed with the maximum duration period not exceeding 12 hours.

A copy of each Permit to Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.



## **27 OCCUPATIONAL HEALTH AND WELFARE**

### **Physical fitness of workmen**

- Ensure that his employees/workmen subject themselves to such medical examination as required under the law or under the contract provision and keep a record of the same.
- Shall not permit any employee/workmen to enter the work area under the influence of alcohol or any drugs.

### **Medical Facilities**

#### **Medical Examination**

Arrange a medical examination of all employees as drivers, operators of lifting appliances and transport equipment before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every two years up to the age of 40 and once in a year, thereafter.

- Maintain the confidential records of medical examination or the physician authorized by the Client Company.
- The medical examination shall include: -
  - a) Full medical and occupational history.
  - b) Clinical examination with particular reference to
    - \* General Physique;
    - \* Vision: - Total visual performance using standard orthorator like Titmus Vision Tester should be estimated and suitability for placement ascertained in accordance with the prescribed job standards.
    - \* Hearing: - Persons with normal must be able to hear a forced whisper at twenty-four feet. Persons using hearing aids must be able to hear a warning shout under noisy working conditions.
    - \* Breathing: - Peak flow rate using standard peak flow meter and the average peak flow rate determined out of these readings of the test performed. The results recorded at pre-placement medical examination could be used as a standard for the same individual at the same altitude for reference during subsequent examination.
    - \* Upper Limbs: - Adequate arm function and grip
    - \* Spine: - Adequately flexible for the job concerned.
    - \* Lower Limbs: - Adequate leg and foot concerned.
    - \* General: - Mental alertness and stability with good eye, hand and foot coordination.
    - \* Any other tests which the examining doctor considers necessary

### **First-aid boxes**

ensure at a construction site one First-aid box for 100 workers, provided and maintained for providing First-aid to the building workers. Every First-aid box is distinctly marked "First-aid" and is equipped with the articles specified in Schedule III of BOCWR.

### **Prevention of mosquito breeding**

Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

- Empty cans, oil drums, packing and other receptacles, which may retain water shall be deposited at a central collection point and shall be removed from the site regularly.

- Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding.
- Equipment and other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained.
- Water storage tanks shall be provided.
- Posters in both Hindi and English, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the site.
- At periodic interval shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides. Most effective insecticides shall include SOLFAC WP 10 or Baytex, The Ideal Larvicide etc.

**Alcohol and drugs**

- Ensure at all times that no employee is working under the influence of alcohol / drugs which are punishable under Govt. regulations.
- Smoking at public worksites by any employee is also prohibited as per Govt. regulations.

**Noise**

Consider noise as an environmental constraint in his design, planning and execution of the Works and provide demonstrable evidence of the same on Client Company's request.

Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

- Ensure that all powered mechanical equipment used in the Works shall be effectively sound reduced using the most modern techniques available including but not limited to silencers and mufflers.
- Construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

**VENTILATION AND ILLUMINATION****Ventilation**

- The oxygen level shall not be less than 19.5% in the working environment.

**Illumination**

- Conduct a monthly illumination monitoring by lux meter for all the locations and the report shall be sent to the Client Company within 7th of the next month and the same shall be reviewed during the monthly SHE committee meeting.

**RADIATION**

- The use of radioactive substances and radiating apparatus shall comply with the Govt. regulatory requirements and all subsidiary legislation
- Each area containing irradiated apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.
- Radioactive substances will be stored, used or disposed shall be strictly in accordance with the Govt. Enactments.
- Ensure that all site personnel and members of the public are not exposed to radiation.

**WELFARE MEASURES FOR WORKERS****Latrine and Urinal Accommodation**

- Provide one latrine seat for every 20 workers up to 100 workers and thereafter one for every

additional 50 workers. In addition one urinal accommodation shall be provided for every 100 workers.

- When women are employed, separate latrine and urinal accommodation shall be provided on the same scale as mentioned above.
- Latrine and urinals shall be provided as per Section 33 of BOCWA and maintained as per Rule 243 of BOCWR and shall also comply with the requirements of public health authorities

**Canteen:**

- In every workplace where in not less than 250 workers are ordinarily employed Site Management shall provide an adequate canteen conforming to Section 37 of BOCWA, Rule 244 of BOCWR and as stipulated in Rule 247 of BOCWR the changes for food stuff shall be based on 'no profit no loss' basis. The price list of all items shall be conspicuously displayed in such canteen.

**Serving of tea and snacks at the workplace:**

- As per Rule 246 of BOCWR, at a building or other construction work where a workplace is situated at a distance of more than 200 m from the canteen provided under Rule 244(1) of BOCWR, employing building works shall make suitable arrangement for serving tea and light refreshment to such building works at such place.

**Drinking water**

- As per Section 32 of BOCWA the shall make in every worksite, effective arrangements to provide sufficient supply of wholesome drinking water with minimum quantity of 5 litres per workman per day. Quality of the drinking water shall conform to the requirements of national standards on Public Health.
- While locating this drinking water facility due care shall be taken so that these are easily accessible within a distance of 200m from the place of work for all workers at all location of work sites.
- All such points shall be legible marked "Drinking Water" in a language understood by a majority of the workmen employed in such place and such point shall be situated within six metres of any washing places, urinals or latrines.

**Labour Accommodation**

Provide free of charges as near as possible, temporary living accommodation to all workers conforming to provisions of Section 34 of BOCWA. These accommodations shall have cooking place, bathing, washing and lavatory facilities

## **28 ENVIRONMENTAL MANAGEMENT**

Ensure all necessary permits and authorisations are obtained for works in environmentally sensitive areas of the project shall be required to furnish or provide for the following

- \* Containment, transportation, treatment and correct disposal of Human waste.
- \* Containment, transportation and correct disposal of construction waste.
- \* Containment, transportation, treatment and correct disposal of vehicle and equipment waste.

### **▪ Sewage Treatment Plant Effluent & Sludge Disposal**

Treated effluent and wastewater may only be discharged to the holding tanks at the location known as the High Point Basin. Treated effluent may be used for dust control on the project roads.

### **AIRQUALITY**

- Take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Client Company.
- Use construction equipment designed and equipped to minimise or control air pollution. Maintain evidence of such design and equipment and make these available for inspection by Client Company.
- Transport vehicles and other equipment shall conform to emission standards fixed by Statutory Agencies of Government of India or the State Government from time to time.
- Carry out periodical checks and undertake remedial measures including replacement, if required, so as to operate within permissible norms.
- Establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used on this project.
- Place material in a manner that will minimize dust production. Material shall be minimized each day and wetted, to minimize dust production. During dry weather, dust control methods must be used daily especially on windy, dry days to prevent any dust from blowing across the site perimeter.
- provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from work sites such as construction depots and batching plants. At such facility, high-pressure water jets will be directed at the wheels of vehicles to remove all spoil and dirt.
- design and implement his blasting techniques so as to minimise dust, noise, vibration generation and prevention fly rock.
- give preference to explosives with better environmental characteristics.
- protect structures, utilities, pavements roads and other facilities from disfiguration and damage as a result of his activities. Where this is not possible, shall restore the structures, utilities, pavements, roads and other facilities to their original or better, failing which the rectification/restoration work shall be carried out at the risk and cost.
- Every site Project Manager submit to the Client Company an Air Monitoring and Control Plan (AMCP) under contract specific Site Environmental Plan to guide construction activity insofar as it relates to monitoring, controlling and mitigating air pollution.

### **WATERQUALITY**

- Comply with the Indian Government legislation and other State regulations in existence in Project Site Location insofar as they relate to water pollution control and monitoring. A drainage system should be constructed at the commencement of the Works, to drain off all surface water from the work site into suitable drain outlet.
- provide adequate precautions to ensure that no spoil or debris of any kind is pushed, washed, falls or deposited on land adjacent to the site perimeter including public roads or existing stream courses and drains within or adjacent to the site. In the event of any spoil or debris from construction works being deposited or any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state to the satisfaction of the Client Company.
- ensure that earth, bentonite, chemicals and concrete agitator washings etc. are not deposited in the watercourses but are suitably collected and residue disposed off in a manner approved by local authorities.
- All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that will cause neither pollution nor nuisance.
- Any mud slurry from drilling, diaphragm wall construction or grouting etc. shall not be discharged into the drainage system unless treatment is carried out that will remove silt, mud particles, bentonite etc. shall provide treatment facilities as necessary to prevent the discharge of contaminated ground water.
- Take measures to prevent discharge of oil and grease during spillage from reaching drainage system or any water body. Oil removal / interceptors shall be provided to treat oil waste from workshop areas etc.
- If Required Apply to the appropriate authority for installing bore wells for water supply at site.

#### **ARCHAEOLOGICAL AND HISTORICAL PRESERVATION**

- seek to accommodate archaeological and historical preservation concerns that may arise due to the construction of the project especially in close vicinity of such areas where such monuments may be located.
- consult the Archaeological Survey of India (ASI) and other parties, on the advise of the Client Company, to identify and assess construction effects and seek ways to avoid, minimize or mitigate adverse effects on such monuments.
- Adverse effects may include reasonably foreseeable effects caused by the construction that may occur later in time, be farther removed in distance or those that alter, howsoever temporarily, the significance of the structure.

#### **LANDSCAPE AND GREENERY**

- As far as is reasonably practicable, shall maintain ecological balance by preventing deforestation and defacing of natural landscape. In respect of ecological balance, observe the following instructions.
- Conduct this construction operations, as to prevent any avoidable destruction, scarring or defacing of natural surroundings in the vicinity of work.
- As suggested list of trees/shrub suitable for planting and landscaping is found in

#### **WASTE**

- Maintain a Waste Management Programme (WMP) during the construction of the project for his works, which may include:-
  - \* Identification of disposal sites.

- \* Identification of quantities to be excavated and disposed off.
  - \* identification of split between waste and inert material
  - \* Identification of amounts intended to be stored temporarily on site location of such storage.
  - \* Identification of intended transport means and route.
  - \* Obtaining permission, where required, for disposal.
- Such a mechanism is intended to ensure that the designation of areas for the segregation and temporary storage of reusable and recyclable materials are incorporate into the WMP. The WMP should be prepared and submitted to the Engineer for approval.
  - handle waste in a manner that ensures they are held securely without loss or leakage thus minimizing potential for pollution. Maintain and clean waste storage areas regularly.
  - make arrangement to dispose of metals scrap and other saleable waste to authorized dealer and make available to the Client Company on request, records of such sales.

### **HAZARDOUS WASTE MANAGEMENT**

- If encountered or generated as a result of Company's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989, amendments 2000, 2003" shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.
- Chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 of Environment (Protection) Act, 1986 shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.
- identify the nature and quantity of hazardous waste generated as a result of his activities and shall file a 'Request for Authorisation' with Project location state Pollution Control Committee along with a map showing the location of storage area.
- Outside the storage area, display board', which will display quantity and nature of hazardous waste, on date. Hazardous Waste needs to be stored in a secure place
- Ensure that hazardous wastes are stored, based on the composition, in a manner suitable for handling, storage and transport. The labelling and packaging is required to be easily visible and be able to withstand physical conditions and climatic factors.
- Maintain of all environment related documents and records pertaining to monitoring and trend analysis on key parameters such as but not limited to consumption/efficient use of resources such as energy, water, materials such as cement, flyash, iron and steel, recycle/reuse of waste etc that shall have demonstrated continual improvement in the implementation of Environmental management System.

### **ENERGY MANAGEMENT**

- Use and maintain equipment so as to conserve energy and shall be able to produce demonstrable evidence of the same upon Client Company's request.
- Measures to conserve energy include but not limited to the following
  - \* Use of energy efficient motors and pumps
  - \* Use of energy efficient lighting, which uses energy efficient luminaries
  - \* Adequate and uniform illumination level at construction sites suitable for the task
  - \* Proper size and length of cables and wires to match the rating of equipment
  - \* Use of energy efficient air conditioners
- Design site offices maximum daylight and minimum heat gain. The rooms shall be well insulated to enhance the efficiency of air conditioners and the use of solar films on windows may be used where feasible

