# Annexure-B to GCC

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# NTPC SAFETY RULES

## FOR CONSTRUCTION AND ERECTION OF POWER PLANTS

### INTRODUCTION:

NTPC Limited is a Maharatna organization taking lead in realizing the power dreams of the Nation with a vision "To be one of the World's largest and best power utilities, Powering India's growth". Safety is one of the prime concerns of NTPC and it always strives towards accident free construction, erection, commissioning, operation and maintenance of its power projects. In this process, NTPC has already formulated Safety policy and guidelines for smooth execution of all its project activities.

In order to strengthen the existing Safety Rules for Construction and Erection and thereby curbing the chances of accidents in Construction & Erection works at various projects of NTPC, the existing safety rules have been revised for strict implementation. These Safety Rules lay down the safety requirements for safe execution of project activities, responsibilities of the contracting agencies, and all concerned involved in Construction and Erection.

### A. RESPONSIBILITIES OF CONTRACTORS FOR IMPLEMENTATION OF SAFETY RULES:

The Safety Rules for Construction & Erection as outlined hereunder, while setting out a broad parameter of safety norms, are not exhaustive. The contractor and his agencies are advised to refer to the following statutory provisions as amended from time to time for details and strict compliance therewith.

#### *FOR GREENFIELD PROJECTS:*

(a) Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996 (briefly referred to as BOCW Act),
(b) Building and other construction workers (regulation of employment and conditions of service) Central Rules, 1998 (briefly referred to as BOCW Rules) as adopted by the various State Governments,

#### *FOR EXPANSION, MODIFICATION, ALTERATION AND, OR CONSTRUCTION ACTIVITY WITHIN AN EXISTING PLANT OPERATING AS PER APPROVED SITE PLAN UNDER THE FACTORIES ACT;*

(a) Factories Act, 1948,
(b) Factories Rules, as adopted by the various State Governments
(c) BOCW Act
(d) BOCW Rules

The contractor is also required to ensure compliance with all the relevant Acts/Rules in addition to above.

It shall be incumbent on the contractor to ensure that the requirements of safety, statutory or otherwise specified, are fully met. Thus the onus of implementation of the norms so prescribed shall squarely rest with the contractor concerned or, on his behalf, his sub-contractor or any other agency deployed by him, indemnifying NTPC from all the liabilities that may arise out of any failure to comply with the above mentioned Acts/Rules or any contravention thereof by the contractor or any other sub-agency on his behalf.

Safety cannot be ensured solely through Rules and Regulations or Codes. It is the responsibility of the Contracting Agency to ensure that basic safety principles are incorporated in the planning stage of their mobilization, execution, installation of machines, equipment, storage, etc., and initiate and maintain *safety programs*. It is desirable to have a planned programme and secure adequate cooperation of senior management, EICs, sub-contracting agencies, supervisory personnel and workers involved to ensure the implementation of the provisions of these Rules in true spirit so as to achieve the ultimate goal of *accident prevention*.

It shall also be the responsibility of the contracting agency to provide amenities and safety requirements on each construction job in order to reduce or to eliminate hazards of construction activities and also to provided necessary *first aid* facilities as well as Ambulance van (in case of major agencies) for prompt transportation of injured persons to a physician or hospital.

It is also mandated that the authorized representative of NTPC, namely, the Engineer-in-charge, may, at his convenience, exercise such superintendence, supervision and, or control as may be deemed necessary, but this shall not absolve the contractor of his basic responsibility for strict compliance with the norms, standards and, or legal provisions as applicable under the Factories Act/Rules and the Building and other construction (regulation of employment and conditions of service) Act/Rules.

**Section wise checklist of provisions of BOCW Act/Rules is given hereunder for ready reference of the contractor.** (This list has been prepared in chronological order with primary importance to **S**ection of Act and secondary importance to **R**ules)
**S -** Refers relevant **S**ections in BOCWA
**R -** Refers relevant **R**ules in BOCWR

| Sl. No. | ITEMS | RELEVANT SECTIONS / RULES IN BOCWA AND BOCWR AND RBOCWR |
|---|---|---|
| 1 | Registration of establishment | S – 7, R – 23 to 27 |
| 2. | Display of registration certification at workplace | R – 26 (5) |
| 3. | Hours of work | S – 28 R – 234 to 237 |
| 4. | Register of overtime | S – 28; S – 29 R – 241(1) Form XXII |
| 5. | Weekly rest and payment at rest | R – 235 |
| 6. | Night shift | R – 236 |
| 7. | Maintenance of workers registers and records | S – 30 R – 238 |
| 8. | Notice of commencement and completion | S – 46 R – 239 |
| 9. | Register of persons employed as building workers | R – 240 |
| 10. | Muster roll and wages register | R – 241(1) (a); Form XVI and XVII |
| 11. | Payment of wages | R – 248 |
| 12. | Display of notice of wages regarding | R – 249 |
| 13. | Register of damage or loss | R – 241(1)(a); Form XIX, XX, XXI |
| 14. | Issue of wages book | R – 241(2)(a); Form XXIII |
| 15. | Service certificate for each workers | R – 241(2)(b); Form XXIV |
| 16. | Display an abstract of BOCWA and BOCWR | R – 241(5) |
| 17. | Annual return | R – 242; Form XXV |
| 18. | Drinking water | S – 32 |
| 19. | Latrines and Urinals | S – 33 R - 243 |
| 20. | Accommodation | S – 34 |
| 21. | Creches | S – 35 |
| 22. | First-aid boxes | S – 36 R – 231 and Schedule III |
| 23. | Canteens | S – 37 R – 244 |
| 24. | Food stuff and other items served in the canteens | R – 245 |
| 25. | Supply of tea and snacks in work place | R – 246 |
| 26. | Food charges on no loss no profit basis | R - 247 |
| 27. | Delhi BOCW welfare Board Rules | R – 250 to 296 |
| 28. | Safety committee | S – 38 R – 208 |

| | | |
|---|---|---|
| 29. | Safety officer | S – 38 R – 209 and Schedule VII |
| 30. | Reporting of accidents and dangerous occurrences | S – 39,R – 210 |
| 31. | Procedure for inquiry in to the causes of accidents | R – 211 |
| 32. | Responsibility of employer | S - 44 R – 5 |
| 33. | Responsibility of Architects, Project engineer and Designers | R – 6 |
| 34. | Responsibility of workmen | R – 8 |
| 35. | Responsibility for payment of wages and compensation | S – 45 |
| 36. | Penalties and Procedures | S – 47; S – 55 |
| 37. | Excessive noise, vibration etc. | R – 34 |
| 38. | Fire Protection | R – 35 |
| 39. | Emergency action plan | R – 36 |
| 40. | Fencing of motors | R – 37 |
| 41. | Lifting of carrying of excessive weight | R – 38 |
| 42. | Health, Safety and Environmental Policy | R – 39 |
| 43. | Dangerous and Harmful Environment | R – 40 |
| 44. | Overhead protection | R – 41 |
| 45. | Slipping, Tripping, Cutting, Drowning and Falling Hazards | R – 42 |
| 46. | Dust, Gases, Fumes, etc. | R – 43 |
| 47. | Corrosive substance | R – 49 |
| 48. | Eye Protection | R – 45 |
| 49. | Head Protection and other protection apparel | R – 46; R – 54 |
| 50. | Electrical Hazards | R – 47 |
| 51. | Vehicular traffic | R – 48 |
| 52. | Stability of structure | R – 49 |
| 53. | Illumination | R – 50; R – 124 |
| 54. | Stacking of materials | R – 51 |
| 55. | Disposal of debris | R – 52 |
| 56. | Numbering and marking of floors | R – 53 |
| 57. | Lifting appliances and gears | R – 55 to 81 |
| 58. | Runways and Ramps | R – 82 to 85 |
| 59. | Working on or adjacent to water | R – 86 & 87 |

| | | |
|---|---|---|
| 60. | Transport and earthmoving equipment's | R – 88 to 95 |
| 61. | Concrete work | R – 96 to 107 |
| 62. | Demolition | R – 108 to 118 |
| 63. | Excavation and Tunneling works | R – 119 to 168 |
| 64. | Ventilation | R – 153 |
| 65. | Construction, repair and maintenance of step roof | R – 169 to 171 |
| 66. | Ladders and Step ladders | R – 172 to 174 |
| 67. | Catch platform and hoardings, chutes, safety belts and nets | R – 175 to 180 |
| 68. | Structural frame and formworks | R – 181 to 185 |
| 69. | Stacking and unstacking | R – 186 & 187 |
| 70. | Scaffold | R – 188 to 205 |
| 71. | Cofferdams and Caissons | R – 206 to 211 |
| 72. | Explosives | R – 212 & 213 |
| 73. | Piling | R – 214 to 222 |
| 74. | Medical Examination for building and other construction worker, Crane operator an Transport vehicle drivers | R – 81; R – 223(a)(iii) and Schedule |
| 75. | Medical examination for occupational health hazards | R – 233(a)(iv) |
| 76. | Charging of workers for Medical Examination | R – 223(b) |
| 77. | Occupational health centres and Medical officers | R – 225 and Schedule X & XI |
| 78. | Ambulance van & room | R – 226 & 227 and Schedule IV & V |
| 79. | Stretchers | R – 228 |
| 80. | Occupational health service for building workers | R – 229 |
| 81. | Medical examination for occupational health hazards | R – 223(a)(iv) |
| 82. | Emergency care services and emergency treatment | R – 232 |
| 83. | Panel of experts and agencies | Central Rule 250 |
| 84. | Power of inspectors | Central rule 251 |

## B. RESPONSIBILITIES AND DUTIES OF WORKERS

(a) It shall be the responsibility of the worker to comply with the requirements of safety as laid down for him and the group of workers to which he belongs and fully cooperate in the discharge of the responsibility that has been assigned to the contractor.
(b) If he discovers any defects in the lifting appliance, lifting gear, lifting device or those concerning any transport equipment or other construction equipment or tools as well as the physical work conditions, he will report such defects promptly to his employer or NTPC Engineer or other person in authority;
(c) No building worker shall, unless duly authorized or in case of absolute necessity, remove or interfere with any fencing, guards, gangways, gear, ladder, hatch covering, life saving appliances, lighting or other things whatsoever required and provided for safety and health. If any of the aforesaid things is removed, the persons engaged in the work shall restore such thing at the end of the period during which its removal was necessary;
(d) Every worker shall use only means of access provided in accordance with the approved norms and no person shall authorize or order another to use such means of access or method other than those approved;
(e) Workers shall use such means of access and egress for going to and exiting from the workplace as provided.

## SECTION - I
## SAFETY MANAGEMENT

## *1.0* SAFETY MANUAL AND SAFETY POLICY:

***1.1*** The Safety policy of the contracting agency should reflect the commitment of the concerned agency towards safety and health of the workers specified for the particular site.

***1.2*** The Contractor shall have Safety Plan detailing the safety norms evolved through Safety Policy and Job Safety Analysis (JSA) or Hazard Identification & Risk Assessment (HIRA) of all package activities and constitute a Safety management program. Contracts shall also ensure POWRA (point of work risk assessment) before start of any activity.

***1.3*** The safety management programme in the form of Safety Manual shall give details of provisions proposed by the agency w.r.t. Job Safety Analysis (JSA ) or Hazard Identification and Risk Assessment (HIRA) to ensure safety of the employees and elimination of health hazards. The Safety Manual including safety policy duly signed by the head/senior executive of the agency shall be submitted to the concerned Engineer-Incharge(EIC), NTPC before start of their project activities at site.

***1.4*** Each contracting agency shall have facilities for conducting the above safety management programme, commensurate with magnitude of the work under contract.

## *2.0* APPOINTMENT OF SAFETY OFFICER/SAFETY SUPERVISOR:

***2.1*** Each contracting Agency shall provide a sufficient number of qualified, suitable and experienced persons to manage all safety related matter on Site relating to the works. Irrespective of manpower employed by the agency whether temporary, casual, probationer, regular or permanent or on contract, Agency shall deploy a qualified Safety Officer/executive, responsible for carrying out the safety management programme before start of the work.

***2.2*** The safety officer shall create an organization, commensurate with the project activities, consisting of other staff as required for suitable deployment.

***2.3*** The schedule of requirement of safety personnel is given below.

| **No. of Workers** | **No. of Safety Supervisors** | **No. of Safety Officers** |
|---|---|---|
| Up to 100 | 1 | 1 |
| 101 to 250 | 2 | 1 |
| 251 to 500 | 4 | 1 |
| 501 to 1000 | 6 | 2 |
| 1000 to 2000 | 6+ One additional supervisor up to every additional 250 workers | 3 |
| 2000-3000 | 10+ One additional supervisor up to every additional 250 workers | 4 |
| 3000-4000 | 14+ One additional supervisor up to every additional 250 workers | 5 |
| Above 4000 | 18 + One additional supervisor up to every additional 250 workers | 5 + one safety officer up to addition 1000 workers |

***2.4*** The qualification and experience of the safety personnel should meet the following criteria.

a) Safety Supervisor: (i) Possesses recognized degree in any branch of Engineering. OR
(ii) Diploma in any branch of Engineering with at least one year construction experience.

b) Safety Officer/Safety Executive: Qualification as given under BOCW Act/rules and minimum experience of three years.

***2.5*** In case contractor fails to employ the required safety professionals, the department may at the cost and risk of the contractor deploy additional/required safety professionals. The cost incurred towards this shall be deducted from contractor's bill at following the rates or actual whichever is higher.

| | |
|---|---|
| I. Safety Engineer | Rs. 1500/day. |
| 2. Safety Supervisor | Rs. 1000/day. |

## *3.0* MEETING FOR SAFETY AFTER AWARD OF THE CONTRACT:

Representatives of contracting agency along with safety Officer/executive shall meet the concerned EIC of the particular activity prior to start of construction activities for the purpose of discussing safety standards and requirements applicable to the work under contract. The person representing the agency should be a responsible person for all their site activities.

## *4.0* PERSONAL PROTECTIVE *EQUIPMENT:*

***4.1*** The contracting agency should ensure sufficient inventory of personal protective equipment (PPEs) prior to initial mobilization as specified in the Bidding Documents. After identifying the need of the required PPEs for various activities performed at the site, an additional inventory of approx. 20% of required PPEs should be maintain during the execution of the work. A PPE plan shall be prepared which gives fair idea regarding issue of PPEs to various personnel as per the following 'PPE Selection Matrix'.

***4.2*** **Mandatory PPEs:** Wearing of Safety Helmet, Safety Shoes and reflective jacket is mandatory for all work at site and it should be ensured that all employees and project visiting personnel shall invariably wear safety helmet, safety shoes & reflective jacket.

**PPE Matrix (apart from mandatory PPEs, i.e., Safety Helmet & Safety Shoes)**

| Activity | Type of Protection | | | | | | Remarks, if any |
|---|---|---|---|---|---|---|---|
| | Hand | Eye | Ear | Body | Respiratory | Others | |
| Gas Welding & Cutting | LG | WG | - | LA | *SCBA/ OLBA | - | * for confined space |
| Electric Arc Welding | LG | HMWS | - | LA | *SCBA/ OLBA | - | * for confined space |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rigging | CG | SG | - | | | | -- |
| Working at Height | - | SG | - | DLFBH | - | *FAS | * for vertical columns |
| Grinding & Chipping | CG | FS / SG | - | LA | - | - | -- |
| Working in High Noise | - | - | EP / EM | - | - | - | -- |
| Handling of Cement Concrete | RG | SG | - | - | DM | - | |
| Blasting | CG | SG | EP* | - | - | - | * at noise area |
| Excavation | CG | SG | - | - | DM | - | *Gum boot in place of Safety shoe for foot |
| Chemical Handling | PVCG | CSG | - | PVCA | - | - | *Full body rubber suit with hood |
| Electrical and C&I | ERG* | SG | - | - | - | - | *For high voltages |
| Sand/shot blasting | CG | - | EP/ EM | CA | SAMH | - | |

***ABBREVIATIONS:*** *FS: Face Shield, CSG: Chemical splash goggles, HMWS: Helmet mounted welder's shield, GB: gum boot, DLFBH: Double lanyard full body harness, SG: Safety goggles, DM: Dust mask, SAMH L Supplied air mask/hood, EP/EM: Ear plug/Ear Muff, CG: Cotton hand gloves, LG: Leather hand gloves, LA: Leather apron, RG: Rubber gloves, PVCG: PVC Gloves, PVCA: PVC Apron, SCBA: Self-contained breathing apparatus, WG: Welding goggles, ERG: Electrical Rubber Gloves. OLBA : Online breathing apparatus*

***4.3*** The above-mentioned PPEs should be made available with contractor at site and issued to the concerned workers on the day of employment. All PPEs shall comply with ISI standards with valid test certificates.

***4.4*** At least two breathing apparatus sets (complying requirement as per IS: 10245) shall be provided at each site where excavation/tunneling works and Welding/ Cutting operations in confined areas are being carried out, to rescue the victims under exposure to harmful gases/vapors, if any.

## *5.0* SAFETY COMMITTEE:

**5.1** *Safety committee* shall be formed within each contracting agency comprising of worker representatives with equal no. of management representatives as per the provisions of BOCW Act/rules. This committee in each agency shall meet at least once in every month. The safety officer of the concerned agency shall coordinate these meetings. NTPC Safety officer shall be special invitee for Safety Committee meetings. The safety committee functioning shall be in line with the provisions of BOCW Act/Rules.

**5.2** Apart from the above, each agency shall organize safety meetings every day before start of day's work to educate & motivate the workers about the necessity of safety. Case study of accident/ incident can be shared in these meetings.

**5.3** The contractor shall also regularly organize safety meetings for all job supervisors/foremen.

**5.4** Weekly meeting with agencies' Safety Officers to be organized by safety department of NTPC and minutes to be recorded, circulated and compliance status to be checked on regular basis.

## *6.0* SAFETY MESSAGE PROPAGATION:

**6.1** Contracting agencies shall arrange for display of safety hoardings depicting suitable safety cartoons/messages/ cautionary notices at appropriate places of project site to remind the workers to perform their duties safely. Minimum one safety message board/hoarding of appropriate size for every 10 workers to be provided and maintained by the concerned agency.

**6.2** Apart from safety hoardings, each agency should maintain a safety bulletin board at all their work locations. Such safety bulletin boards should depict the activities being planned for the day, good practices, permit details etc.

**6.3** Safety suggestion boxes shall be kept at each contractor's office at site for obtaining safety suggestions from the workers. Best suggestions should be implemented and may be rewarded suitably to encourage the workers for safety.

## *7.* COMPETENCY OF EMPLOYEES:

**7.1** Throughout the course of the contract, persons employed by agency shall be physically fit, qualified/experienced to perform their assigned duties/ jobs.

**7.2** Employees shall not, knowingly be permitted to work in a manner that their ability or alertness is so impaired because of fatigue, illness or any other reason, that it may expose them and or others to injury.

**7.3** No worker, vehicle operator shall be less than 18 years of age. And the vehicle operator shall have a valid license as per requirements of Motor Vehicle Act.

**7.4** Contractor shall comply with all applicable state/central laws and codes related to employment of operators for Hoist, Shovel, Crane, Tractor, Bull-dozer, any other howling heavy equipment/vehicle.

## *8.0* SAFETY INDUCTION AND TRAINING :

***8.1*** Each worker deployed by the agency shall be given 2-days induction training which shall include the medical examination and instructions related to particular job, fire fighting, first-aid and reporting of accidents. All employees shall be given safety training as per BOCW Act/Rules.

***8.2*** The contracting agency shall also impart job specific skill based safety training to all its employees (Minimum one day) on various related safety topics using internal/external safety professionals/consultants as per the matrix given below. Record of such trainings and attendance particulars shall be maintained in a register for ready reference to statutory authorities/engineer-in charge.

**TRAINING MATRIX:**

| **Name of topic** | **Executives** | **Super visors** | **Skilled Workmen** | **Other Workers** |
|---|---|---|---|---|
| Safety Induction | Y | Y | Y | Y |
| Accident_ Causes, factors, cost | Y | Y | Y | - |
| Industrial hazards & Accident Prevention | Y | Y | Y | - |
| Investigating, reporting, records | Y | Y | - | - |
| Personal Protective Equipment | - | Y | Y | Y |
| Construction Safety & Role of Supervisory personnel | - | Y | - | - |
| Permit to Work (PTW) | - | Y | Y | y |
| Statutory Provisions (BOCW Act/Rules, Factories Act 1948 etc.) | Y | Y | y | y |
| Material handling | - | y | Y | Y |
| Emergency Management | Y | Y | Y | - |
| Electrical Safety | - | Y | Y | - |
| Fire safety | Y | Y | Y | Y |
| First Aid & CPR (cardio pulmonary resuscitation) | - | Y | Y | Y (Selected) |
| Safety in Welding & Cutting | - | - | Y | - |
| Safety Audit | Y | Y | - | - |
| Safety in Lifting Tools & Tackles | - | Y | Y | y |
| Safety in Working at height | - | Y | Y | Y |
| Safety in Confined space work | - | Y | Y | Y |
| Defensive Driving | - | Y* | Y* | Y* |

*for construction vehicle operators, helpers & crane operators Y=Yes

**9.0 ID PASS**

**9.1** CLIMS (Contract Labor Information Management System) will be the criterion for entering or gate pass system if implemented at site.

**9.2** The contractor shall ensure that all personnel working at site having a photo Identity card before they are engaged for any work and properly mentioned details like validity, Category/designation and work area etc. This ID card should be issued only after ensuring their screening test, medical fitness and safety induction training. Id card gate pass shall be indicated with 3 nos. of offence marks. With each offence the gate pass of concerned workmen/ supervisor will be punched giving on the spot indication of persons indulging in unsafe actions.

**9.3** Drinking of Alcoholic beverages is strictly prohibited. Employees under the influence of any intoxicants, even to the slightest degree, shall not be permitted to remain at work. Each contractor should maintain 'breath analyzer' to determine the intoxicated workers at site.

## 10 SAFETY AUDIT

**10.1** Internal Safety Audit once in every six months by the contracting agency and external safety audit as once in a year by third party shall be conducted, with prior intimation to EIC and NTPC Safety Deptt. The external auditing agency should be reputed safety institution or a certified Safety Auditor under any statutory legislation. The audit report along with time bound action plan should be submitted to Engineer-in-charge and NTPC Safety Dept.

**10.2** Apart from above, Electrical Safety Audit shall be conducted quarterly by a team comprising of Electrical engineer, Safety representative of contractor and NTPC Electrical Erection representative covering the following and submit the report to EIC.

i) Electrical incidents investigation findings and remedial measures implemented.

ii) Adequacy of power supply requirements

iii) Power distribution system in place

iv) Updated electrical single line diagram including the IP44 DBs arrangement.

v) Electrical protection devices – ELCBs, O/L protections etc.

vi) Earth or ground connection and earth pit maintenance details

vii) Education and training of electrical personnel undertaken

viii) Any other point appropriate to the site conditions.

## 11. SAFETY BUDGET

Every contracting agency should clearly estimate and allocate a separate budget head for safety requirements every year and make the safety activity plan for the year and submit to NTPC EIC & Head of Safety. Budget allocations should be practically adequate to the site safety requirements and the details shall be intimated to the concerned EIC and safety deptt. before start of the work under the contract and subsequently, every year by 15th of April. Engineer-in Charge in consultation with Head of Safety shall review and monitor the effective utilization of allocated budget for safety related activities by the Contractor.

## 12. REPORTING AND INVESTIGATION OF ACCIDENTS AND DANGEROUS OCCURRENCES:

**12.1** **Reporting of accidents:** Notice of any accident (the prescribed format is annexed to the manual) to a worker at the building or construction site that

(a) Causes loss of life; or

(b) Disables a worker from working for a period of **48 hours** or more immediately following the accident;

Shall forthwith be sent by Telegram, Telephone, Fax, Email or similar other means including special Messenger within **four hours** in case of **fatal accidents** and **72 hours** in case of **other accidents**, besides the Engineer-in-charge, to:

I. The Regional Labour Commissioner (Central);

II. The Board with which the worker involved was registered as a beneficiary;

III. Director General of Building and other construction (regulation of employment and conditions of service) Act/Rules; and

IV. The next of kin or other relative of the worker involved in the accident;

**12.2** Further, notice of accident shall be sent in respect of an accident which

(a) Causes loss of life; or

(b) Disables the injured worker from work for more that 10 days to

(1) The Officer-in-charge of the nearest Police Station;

(2) The District Magistrate or, if the District Magistrate by order so desires, to

(3) The Sub-Divisional Magistrate;

**12.3** Where any accident causing **disablement that subsequently results in death**, notice thereof in writing of such death, shall be sent the Authorities mentioned above within **72 hours** of such death.

**12.4** In case of an accident causing minor injury, first-aid shall be administered and that resulting in disability of **48 hours or more**, the injured worker shall be given first-aid and immediately transferred to a Hospital or other place for medical treatment.

**12.5** All near-miss accidents shall be reported to NTPC Engineer In-charge and Safety Officer as per prescribed format.

**12.6** **Reporting of dangerous occurrences:** The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

(a) Collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of building or construction material or breakage or failure of rope, chain or loose gears; or overturning of cranes used in construction work;

(b) Falling of objects from height;

(c) Collapse or subsidence of soil, any wall, floor, gallery, roof or any other part of any structure, platform, staging, scaffolding or means of access including formwork;

(d) Contract work, excavation, collapse of transmission;

(e) Explosion of receiver or vessel used for storage at pa pressure than atmospheric pressure, of any gases or any liquid or solid used as building material;

(f) Fire and explosion causing damage to any place on construction site where building workers are employed;
(g) Spillage or leakage of any hazardous substance and damage to their container;
(h) Collapse, capsizing, toppling or collision of transport equipment;
(i) Leakage or release of harmful toxic gases at the construction site;
(j) In case of failure of a lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances, gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Authorities;

**12.7** Every notice given for fatal accidents shall be followed by a written report to the concerned Statutory Authorities and the Engineer In-charge in the specified Form annexed as Schedule, under acknowledgement.

**12.8** Incident / injury statistics shall be maintained by all agencies cause wise.

**12.9 Investigation of accidents and dangerous occurrences**

Besides reporting, it shall be the responsibility of the contractor to constitute a team (members as per the gravity of the incident) of responsible person to thoroughly investigate all incidents involving near-miss accidents, lost-time and reportable accidents and dangerous occurrences with a view to finding out the causative factor, taking remedial measures and fixing responsibility, and make a copy of the investigation report along with action-plan, specifying a definite time-frame for implementation of the findings, available to the Engineer in-charge forthwith.

## 13. MEDICAL AND FIRST AID AMENITIES:

**13.1** It is the responsibility of each contracting agency to ensure the availability of suitable arrangements at their work site for rendering prompt and efficient First aid to injured persons.

**13.2** Arrange one trained and certified first aid for every twenty workers in each shift.

**13.3** Ambulance with proper equipment for prompt transportation of the injured persons to a physician or a hospital shall be provided before start of the work in cases where 500 or more than 500 workers are employed. For smaller contracts, where less than 500 workers are employed, Contractor shall have a tie-up with suitable Agency for providing Ambulance with proper equipment for prompt transportation of the injured persons to a physician or a hospital in case of an Accident / Emergency. Further, Contractor shall submit a proof of the same to EIC/Safety Officer of NTPC.

**13.4** Deploy one full time construction medical officer (qualification as per Schedule XI of BOCW Central Rules -1998) for cases where 500 or more workers are employed (upto one thousand workers) and one additional construction medical officer for additional one thousand workers or part thereof. For smaller contracts, where less than 500 workers are employed, Contractor shall have a tie-up with suitable Hospital / Nursing home in the vicinity of the

Project/Site where work is being executed, for providing adequate medical treatment by qualified medical officers and nursing staff, as and when required. Further, Contractor shall submit a proof of the same to EIC/Safety Officer of NTPC.

Notwithstanding anything stated above, Contractor/Agency shall strictly comply with the requirements of relevant BOCW Act/ BOCW Rules/ Factory Act/Factory Rules/ any other statutory Act/Rules/Law with regards to providing suitable medical facilities to the workers.

In case contractor fails to employ the required construction medical officer alongwith Additional staff, corresponding payment for the same shall not be made and/or necessary action as per provisions of the Bidding documents shall be taken by NTPC.

**13.5** Additional staff including one nurse, one dresser-cum compounder, one sweeper-cum-ward boy with each construction medical officer for full working hours

**13.6** The Telephone nos. of Medical officer, Hospital(s) or ambulance shall also be conspicuously displayed at each work site.

**13.7** First-aid kits as approved by medical officer shall be provided at accessible points in the ratio of at least one kit for every 50 employees.

**13.8** **Health Management:** The site manager shall implement health examinations for the working personnel on a regular basis.

| Types of health examination | Target | Frequency |
|---|---|---|
| General health examination | All workers | Annual |
| Occupational health examination (Audiometric, PFT, Vision etc.) | Worker engaging in noise, dust, vibration, harmful light generating work | Annual |
| Occupational health examination (Vision) | Personnel involved in operation of Cranes, heavy vehicles | Annual |
| Occupational health examination (Vertigo/Height pass) | Workers engaged at Height Works | At the time of induction training and every year |

## 14. TESTING & EXAMINATION OF LIFTING, TOOLS, TACKLES, PRESSURE VESSELS AND OTHER EQUIPMENT:

**14.1** All the lifting equipment, tools, tackles, pressure vessels etc. shall be tested & examined as per BOCW or Factories Act and rules made there under.

**14.2** The records & certificates of such testing & examination shall be maintained and readily available for reference to statutory authorities/engineer-in-charge.

**14.3** Proper color coding system should be maintained and marking should be done accordingly on all lifting tackles.

**14.4** Regular testing of ELCBs and RCCBs by competent electrician must be ensured by agencies and record should be maintained.

## 15. EMERGENCY MANAGEMENT PLAN

**15.1** The contractor shall ensure that an Emergency Management Plan is prepared to deal with emergencies arising out of:

a. Fire and explosion;
b. Collapse of lifting appliances and transport equipment;
c. Collapse of building, sheds or structure etc.;
d. Gas leakage or spillage of dangerous goods or chemicals;
e. Drowning of workers, sinking vessels, and
f. Landslides getting workers buried; floods, storms and other natural calamities.

**15.2** While arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

**15.3** It is also required that there is a tie-up with the hospitals and fire stations located in the neighborhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.

**15.4** It shall be the responsibility of the contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to NTPC, telephonically initially and followed by a written report, shall be made by the contractor.

## 16. ENFORCEMENT OF SAFETY CODE, SAFETY RULES & REGULATIONS:

The Engineer-In charge shall ensure that the contractor is exercising at all times, reasonable and proper precautions for the safety of people at works and complying with the provisions of current safety rules and laws according to safety code and relevant statutes of state/central governments. In case of negligence or default, the agency shall be penalized suitably as per penal provisions of NTPC Safety Rules.

## 17. WORK PERMIT SYSTEM

**17.1** The Contractor shall implement 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 start the work

only after safe procedures have been defined and clearance taken from respective NTPC EICs. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

**17.2** Examples of high-risk activities include but are not limited to:

i) Entry into confined spaces
ii) Cutting & welding
iii) Working at Height along with checklist iv) Working on electrical equipment
v) Heavy lifting operations
vi) Removal of grating/ Handrail / floor opening
vii) Material Shifting

The copies of recommended formats for reference is given in annexure-IV.

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

i) How the system works
ii)The jobs it is to be used for;
iii) The responsibilities and training of those involved; and
iv) How to check its operation;

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

**17.5** A copy of each Permit to Work (PTW) shall be displayed near to work are (on PTW Display board) in close proximity to the actual works location to which it applies.

## 18. ACCESS TO AND FROM THE WORKPLACE

**18.1** Safe, clean, well lit, unencumbered access and egress to and from work areas shall be maintained at all times in normal operating conditions.

**18.2** The number and location of accesses and egresses from and to the workplace shall be adapted to the number of people likely to be present at any time, and therefore to evacuate from the workplace in case of emergency.

**18.3** If access and egress to work areas are restricted due to operational conditions (e.g. access restricted due to pressure testing, etc.), alternative access and egress ways must be implemented, so far as is reasonably practicable. If this is not reasonably practicable, all concerned organizations and persons must be informed of the access restrictions, and work scheduling must be adapted in consequence.

**18.4** Temporary access to height or into ground openings shall be of purpose made material such as scaffolds, stair cases/towers and ramps, which incorporate guardrails .

## 19. INTERFERENCE WITH MOVING VEHICLES AND PEDESTRIANS

**19.1** The circulation of vehicles and pedestrians must be segregated by establishing restricted areas, one way routes where possible, pedestrian crossing zones and designated parking areas.

**19.2** The appropriate measures must be implemented in order to prevent collision between pedestrians and vehicles at pedestrian crossings. This may include, but shall not be limited to:
- Mirrors;
- Lighting;
- Speed bumps before the crossing point.

**19.3** Vehicle and pedestrian ways shall be physically separated with Hard-barriers, so far as is reasonably practicable, and be indicated with signs.

**19.4** When it is not reasonably practical to implement a physical segregation, pedestrians must maintain safety distance of at least 2 meters from moving/operating vehicles at all times.

**19.5** Traffic rules must be made visible through signage and traffic stops, consistent with those used on public

**19.6** Roads as per road safety requirement.

**19.7** All pedestrians on Project sites must wear high-visibility garments.

**19.8** Pedestrians (including banksmen) must wear high-visibility garments in all areas where trucks and other vehicles (forklifts, cranes, etc.) maneuver. These areas must be clearly signaled / marked (floor painting, Hard-barriers, signs, etc.).Additional points:

**19.9** Competent banksmen must be used for operations involving reversing or maneuvering where space or view is restricted.

**19.10** Drivers must only operate vehicles they are competent to drive and must follow the established traffic routes and comply with all site rules.

**19.11** The maximum driving speed on site is 15 km per hour.

**19.12** Drivers and passengers must not get on or off moving vehicles.

**19.13** When driving a forklift, forks must be lowered, the mast tilted back.

**19.14** Smoking, eating, drinking, using a mobile phone or using earbuds or headphones when driving a vehicle is strictly prohibited.

**19.15** When the vehicle is not in use, it must be ensured that:

- The engine is stopped and prevented from unauthorized use (e.g.: starter key removed), brake applied (and with wheels chocked for heavy vehicles);
- All raised parts are lowered to the ground or put in a safe position (cranes);
- It does not obstruct emergency exits, other routes, fire equipment or electricity panels.

## 20. HOUSEKEEPING

The contractor shall ensure that their work area is kept clean, tidy and free from debris generated by their activities. All debris/scrap should be stored in separate bins. The work areas must be cleaned on a daily basis and a full cleaning session of each area shall be conducted on a weekly basis. All equipment, materials and vehicles shall be stored in an orderly manner. Access to emergency equipment, exits, telephones, safety showers, eye wash stations, fire extinguishers, pull boxes, fire hoses, etc. shall not be blocked or otherwise disturbed, restricted or delayed.

## 21. STACKING AND STORAGE PRACTICE

Contractor Agency shall ensure stacked material is bonded on a stable and level footing capable of carrying the mass of the stack. Adequate clearances shall be provided between the sides of the stack and top to facilitate unimpeded access to service equipment like overhead wiring, cranes, forklifts and firefighting equipment, and hoses. Circular items shall be sufficiently choked with wedges not with odd bits of materials. Free-standing stacks of gunny bags and sacks such as Cement bags shall be stacked to prescribe safe stacking heights with layers formed for stable bonding, preventing slippage causing accidents. Stacking against walls shall not be permissible.

Contractor shall maintain the premises and surrounding areas in clean and clear manner with safe access and egress. There shall be sufficient and adequate storage racks, shelving, bins and pallets and material handling equipment to stack his construction materials such as Pipes, Structural and his construction enabling materials. Unwanted materials shall be promptly moved away for efficient material movement.

Any temporary store shed will be built in conformity with fire safety requirements. The stores must be provided with adequate lighting arrangement (Flame proof / intrinsically safe depending upon the Zone category) and must be equipped with sufficient fire extinguishing arrangement. “No Smoking” and other relevant signage must be displayed conspicuously at strategic locations and safety precautions must be strictly enforced.

All material should be kept at least 150mm above from the ground by providing wooden packing below. Maximum height of material stacking should not be greater than 3 meter. All loose material must be kept in wooden box or in sharp edge protected drum and material identification details to be displayed. Materials inside store room should be kept on scaffold rack.

Gas cylinder storage area must be 30m away from the hot work zone and separate storage facility must be available for empty and full cylinder with proper shed. Storage area must be design in a way that 6 meter distance between LPG/DA and oxygen maintained

## 22. CONFINED SPACES

All Confined Spaces belonging to Subcontractor shall be identified and clearly signed posted as a confined space forbidden to unauthorized Personnel at every entrance. A method for preventing entry must be established and maintained for all Confined Spaces. Physical prevention system (such as locks) is preferred.

Before commencing work in a Confined Space, the Subcontractor must obtain a Permit to Work from the relevant authority.

The following requirements shall be met at any time:

- Only competent and trained workers can participate to work in confined spaces (as a minimum as per local Law). A Confined Space Entry Log (or equivalent) must be used to identify the person inside the Confined Space at any time;
- Air Analysis tests must be carried out to determine if the Confined Space is oxygen deficient and/or contains flammable substances, toxic agents, carbon monoxide and/or harmful physical agents. The air shall be analyzed before starting work, during work and after work. Adequate ventilation must be provided;
- Working in the confined space without a watcher is strictly forbidden. An adequate means of communication is required and shall enable easy and clear communication:
- Between those inside the space,
- Between those inside the space and those outside,
- To summon help in case of emergency;
- Adequate emergency provisions must be in place. In particular, necessary rescue equipment must be ready, pre inspected and available. The arrangements need to be suitable and sufficient for the rescue of persons in the event of an emergency.

## 23. FIRE PROTECTION AND PREVENTION

Routine hot works should be described in the contractor Risk Control Plan .Non-routine hot works are submitted to daily hot works permits given by the relevant authority.

Full and unrestricted access to emergency exits, fire-fighting equipment, fire control and emergency vehicles shall be maintained at all times. The Subcontractor shall provide, install and maintain their own temporary fire protection against hazards they introduce to the Site (work areas, storage areas, and temporary facilities under their responsibilities).

Fire extinguishers shall be inspected at least annually by a certified person and visually inspected monthly and documented by the Contractor.

## 24. ELECTRICAL SAFETY

Personal authorization must be issued by Contractor Management (or formally designed delegates) likely to perform or supervise electrical works.

Without such an authorization validated by EIC, no Contractor's employee shall undertake electrical works.

No live work on high voltage or medium voltage is allowed. All high voltage and medium voltage electrical works must be performed on isolated equipment and only after verification of absence of voltage with suitable equipment. Low voltage and very low voltage live work is only allowed for measurement tests and checks of equipment. The below measures will be taken:

- Work practices must protect against direct or indirect body contact by means of tools or materials and be suitable for work conditions and the exposed voltage level
- A Lockout and Tagout procedure must be applied prior to commencing any electrical work. Prior to commencing works on isolated equipment, a verification of absence of voltage with suitable safety test equipment must be performed.
- Energized panels will remain locked with a specific key or tool whenever they are unattended and tagged with the signs and warnings indicating the presence of danger. If not reasonably practicable, a restricted area delimited with physical barriers and supported by warning signs must be implemented around the opened equipment.
- Only qualified electrical Contractor Personnel may enter substations and/or transformer vaults and only after being specifically authorized by NTPC EIC.
- All joints (Both terminal and intermediate) in cable should be made using lugs and joint area should be crimped using crimping tools.
- All temporary connection should be provided through 30mA ELCB/RCCB using 3 core double insulated cable and only 3 pin industrial plug top will be used for connection.
- Zero energy verification needs to be ensured before any electrical operation using only VAV before working on a live circuit which has been isolated
- Only industrial type DB to be used for connection and weather protection shed needs to be provided for every DB and shed height should not be less than man height.
- Double earthing protection must be provided for every electrical equipment and earthing value should be less than 1 Ohm
- Deployment of trained, experienced & licensed electrician as well as licensed electrical supervisor must be ensured at site as per Rule-45 of the Indian Electricity Rules, 1956 ;
- EIC May perform screening/ competency test for all contractor electrical professions i.e. electrical engineers and helpers. Selection/ rejection of the personnel who appear for the screening is sole discretion of EIC
- Electrical helper who will be engaged in helping the electrician/ engineer must have minimum ITI certificate to be eligible for working with him
- All PPE' s used while being involved in electrical work must be as per IS Standards available for electrical work

## 25. COMPRESSED GAS CYLINDERS

Gas cylinders shall be securely stored and transported, and identified and used in line with the safety Requirements as per Gas Cylinder Rules -2106.

Hose lines shall be adequately protected, inspected and tested for leaks in line with the safety Requirements. Flash back arrestor /NRV must be used at both ends of the hoses and all hose should be free from damage and fixed properly preferably using crimping clamps. Leakage test must be done before every use by soap solution and physical inspection of hose must be carried out regularly. Only trolley attached with wheel will be used for cylinder transportation in which cylinders must be kept secured with chain. Only Industrial type regulator fitted with two stage double dial pressure gauze is allowed to be used.

## 26. LIFTING OPERATIONS

The Contractor shall prepare a lifting plan, checked and submit for authorization by contractor's competent authorized persons prior to any lifting operation and formally communicated to all persons undertaking the work.

All persons preparing, issuing lifting plans and all persons involved in lifting operations must be subject to formal competence checks by the contractor to ensure necessary training, experience and qualification prior to commencing work. The Subcontractor must ensure that their nominated Lifting Leader has appropriate qualifications.

Contractor lifting plans include:

The lifting methodology, step by step

The risk analysis of the operation including consideration for weather conditions and work environments (e.g.: proximity of hazards and obstructions to the load, consideration for overturning, load integrity) where appropriate and consideration for simultaneous operations and the measures taken to avoid conflicting tasks in the lifting area

The identification of the designated lifting area, the fall zone and the control measures to prevent access such as barriers, signs, etc.

The description of the type, weight, size, shape and center of gravity of the load and the method used for slinging, attaching and detaching the load with the availability of approved lifting points on load when necessary

The list of the certified and inspected equipment and lifting accessories to be used

The composition of the team required to perform the task (crane driver, rigger, etc.) with the needed qualifications and description of their roles and responsibilities including the intended communication method

Any Heavy equipment (crane, winch machine, etc.) manufactured less than 15 years from the current year shall be only allowed to be used at our project Site's. Pre-safety Inspection of the equipment by safety deptt. shall be done before mobilizing the equipment at our project site.

The contractor must ensure that a competent operational leader is formally appointed to supervise each lifting operation. All lifting plans must clearly define the specific roles and responsibilities for each person involved (e.g.: crane drivers, lifting coordinators and riggers) and must be checked and issued prior to lifting operation. Clear communication channels must be formally established and maintained between everyone involved in a lift with only authorized person giving instruction to the operator.

Special permission needs to be taken from NTPC EIC for tandem lifting and for any non-routine lifting operations must strictly adhere to the guidelines described in corresponding Standard / Procedures / Directive.

No employee of the contractor shall be positioned under a suspended load or between a suspended load and fixed objects.

All lifting equipment and accessories must have valid manufacturers certificates or thorough examination records and be uniquely identified, marked with the safe working load, listed in a register and subject to formal regular inspection as per EHS requirements and shall have valid certificates from a competent authority. Inspection before use by the operator is mandatory. All lifting hooks must have latch. All cranes shall be fitted with Automatic Safe Load Indicator (ASLI) and Anemo Meter.

The contractor shall operate and maintain cranes and hoisting equipment in accordance with manufacturers' specifications and limitations and the safety Requirements. All defective, non-inspected or unidentified (safe working load / identification number) lifting equipment or accessories must be either removed from site or physically prevented from use.

## 27. LOCKOUT TAGOUT ("LOTO")

Prior to performing work on Machines or Equipment, the Subcontractor shall ensure that all energy sources are isolated and verify the absence of residual energy (e.g.: by using specific voltage detecting device for electricity).

At any time, the contractor shall follow the Site-specific LOTO and Permit to Work rules. The contractor must ensure that all of their affected Subcontractor Personnel receive the necessary training. Lockout/ Tagout must be implemented before servicing and maintenance is performed on Machines and Equipment, which could unexpectedly start-up, become energized, or release stored energy exposing persons to a risk of injury, unless the works undertaken are performed using alternative measures that provide effective protection.

Absence of residual energy must be verified using the suitable equipment or process adapted to the machine and the kind of energy to be checked before start of work. *The contractor must procure suitable VAV instrument for verification of absence of voltage before implementing LOTO all by themselves*.

When the contractor is in charge of LOTO, each authorized person must be issued with an individual lock with a unique key. The contractor shall secure areas where energy sources have been de energized, so as to prevent the access of unauthorized personnel and erect suitable signs. All affected Personnel shall be notified.

Once an item of electrical equipment has been energized, an item of mechanical plant and/or System has been erected and released for Commissioning, no work will be allowed on such item of Equipment or System unless a valid Permit to Work (PTW) has been obtained from the relevant authority.

## 28. MONTHLY SAFETY REPORT

Agency has to submit the monthly safety activity report in the form of Lead-Lag indictor to NTPC Safety Deptt. Sample format attached as annexure –IV.

29. In case the Contractor doesn't adhere to any of the provisions of the NTPC Safety Rules for Construction and Erection of Power Plants, corresponding payment for the provisions not adhered, shall not be made and/or necessary action as per provisions of the Bidding documents shall be taken by NTPC.

# SECTION-II
# 1. Safety at workplace and equipment

## 1.0 GENERAL PROVISIONS:

### 1.1. Housekeeping:

a. The contractor shall be primarily responsible for maintaining Good housekeeping and safety standards in the workplace;
b. Loose materials that are not required for use shall not be placed or left behind so dangerously as to obstruct workplaces or passageways;
c. All projecting nails shall be removed or bent to prevent injury;
d. Equipment, tools and small objects shall not be left lying unattended or unsecured from where they could fall or cause a person to trip;
e. Scrap, waste or rubbish shall not be allowed to accumulate in the site as these combustibles can create serious fire hazards and affect safe working;
f. Workplaces and passageways that become slippery owing to spillage of oil or other causes shall be cleaned up or strewn with sand, ash or the like;
g. Portable equipment shall be returned after use to their designated storage place.

**1.2. Means of access and egress** shall consist of

a. Adequate and safe means of access and egress shall be provided in all workplaces;
b. The means of access and egress shall be maintained in a safe condition;

**1.3 Lighting and ventilation**

a. All practical measures shall be taken to prevent smoke, fumes etc. from obscuring any workplace or equipment at which any worker is engaged;
b. Adequate and suitable artificial lighting shall be provided where natural lighting is not sufficient as per IS 3646 (Part II). The artificial lighting so provided shall not cause any incidental any danger, including that of producing glare or disturbing shadows;
c. To prevent danger to health from air contamination by dust generated during grinding, cleaning, spraying or manipulation of materials as also to provide protection against dangerous gases, fumes, vapours, mist, etc. effective arrangements shall be made for ventilation;
d. Workers shall be provided with suitable respiratory protective equipment, if it is not technically possible to have uncontaminated air. To this end, a study by a competent person shall be made to decide on the due protection. Sufficient illumination at all times for maintaining safe working conditions shall be provided where building workers are required to work or pass, and for passageways, stairways and landings such illuminations shall not be less a than 0.5 foot candles at the floor level;
e. Where natural lighting is not adequate to prevent danger, adequate and suitable lighting shall be provided as per IS: 3646 – Part II;
f. Artificial lighting shall not cause any danger due to a brightness greater than 10 foot candles per square inch, except where the angle of inclination from the eye to the source or the part pf the fitting as the case may be exceeds $20^0$, including that of producing glare or disturbing shadows;
g. Where necessary to prevent danger to health from air contamination by dust from the grinding, cleaning, spraying, or manipulating of materials or objects, arrangements shall be made to limit the concentration of the pollutants by thorough ventilation, and dust generated due to movement of earthmoving machinery and other construction equipment, by spray of water in the area from time to time;
h. Adequate ventilation by the circulation of fresh air shall be maintained in such places where the concentration of pollutants is likely to affect the health of the workers;

i. Special care shall be taken to ventilate the workplace where gas cutting, welding or other operations involving generation of dangerous fumes, vapours, mists, gases etc is likely;
j. Where it is technically not possible to eliminate dust or noxious or harmful fumes or gases sufficiently to prevent injury to the health of the workers, the contractor shall provide suitable respiratory equipment like dust mask or gas/fume mask or breathing apparatus or other suitable respiratory equipment.

**1.4. Dangerous and harmful environment:**

a. When an internal combustion engine exhausts into confined space or excavation or tunnel or any other workplace where neither natural ventilation nor artificial ventilation system is adequate to keep the carbon monoxide content of the atmosphere below fifty parts per million, adequate and suitable measures shall be taken at such workplace in order to avoid exposure of building workers to health hazards;

b. No building worker shall be allowed to enter any confined space or tank or trench or excavation wherein there is given off any dust fumes or other impurities of such nature and to such extent as is likely to be injurious or offensive to the building worker or in which explosives, poisonous, noxious or gaseous material or other harmful articles have been carried or stored or in which dry ice has been used as a refrigerant, or which has been fumigated or in which there is a possibility of oxygen deficiency, unless all practical steps have been taken to remove such dust, fumes or other impurities and dangers which may be present and to prevent any further ingress thereof, from such workplace or tank or trench or excavation;

c. No worker shall be allowed to enter any such space unless a responsible person has certified it safe and fit for the entry of such building workers.

**1.5. Fumes/gases due to Welding and gas-cutting operations:** When welding or cutting operations are carried out in a confined space:

a. Adequate ventilation, by means of exhaust fans or forced draught, as the condition may require, shall be constantly provided; otherwise enough quantity of air shall be circulated by means of air compressors to dilute the contaminant within permissible limits;

b. Workers shall take necessary precautions to prevent unburned combustible gas or oxygen from escaping inside a tank or vessel or other confined space;

c. Welding or cutting operations on any container that has held explosives or where inflammable gases may have been generated, shall be undertaken after the container has been thoroughly cleaned by steam or other effective means; and

d. Gas-test shall be carried out ensure that the confined space is completely free from combustible gases and vapours.

**1.6. Dust, gases, fumes**

a. Concentration of dust, gases or fumes shall be prevented by providing suitable means to control their concentration within the permissible limit so that they may not cause injury or create health hazard to a building worker;

b. For protection against such hazardous substances, besides efficient and effective means of control, personal protective equipment like dust masks, breathing apparatus, other respiratory appliances, goggles, as the case may be, shall be provided.

**1.7. Excessive noise:**

a. Adequate measures shall be taken against the harmful effects of an excessive noise;
b. Use of earplugs/muffs and anti-vibration gloves shall be ensured to protect the workers from the impact of exposure to such dangers;
c. The noise level in no case shall exceed as prescribed in the concerned Rules and exposure in excess of 115 dBA over the period of a quarter of an hour cannot be permitted:

**1.8. Corrosive substances:**

a. All corrosive substances, including alkalis and acids, shall be stored and used by a person dealing with such substances at a building or other construction work in such a manner that it does not endanger the building worker and suitable protective equipment shall be provided by the employer to a building worker during handling or use of such substances at a building or other construction work and in case of spillage of such substances on the building worker, immediate remedial measures shall be taken;

b. While protection of the body could be ensured by use of corrosion resistant apparel/overalls, suitable goggles, gloves, apron, gum boots etc. shall be made available to all concerned personnel;

c. To deal with an accidental spillage of a corrosive substance on the body of a worker, the facility of eyewash fountain or water shower, as the case may be, shall be installed, within the easy reach of the workplace.

**1.9. Eye protection:**

a. Suitable personal protective equipment for the protection of eyes shall be provided and used by the building worker engaged in operations like welding, cutting, chipping, grinding or similar operations which may cause hazard to his eyes;

b. Goggles or face shield or welding screen with suitable shade of glass/filters etc shall be provided for the protection of the eyes.

**1.10. Overhead protection:**

a. It shall be ensured that at the building or other construction site, overhead protection is erected along the periphery of every building under construction that shall be of fifteen meters or more in height when completed;

b. Overhead protection shall not be less than two meters wide and shall be erected at a height not more than five meters above the base of the building and the outer edge of such overhead protection shall be one hundred fifty millimeters higher than the inner edge thereof or shall be erected at an angle of not more than twenty degrees to its horizontal sloping into the building;

c. It shall be also ensured that at the building and other construction work that any area exposed to risk of falling material, articles or objects is roped or cordoned off or otherwise suitably guarded from inadvertent entry of persons other than building workers at work in such area.

**1.11. Lifting and carrying of excessive weight:**

a. No building worker lifts by hand or carries overhead or over his back or shoulders any materials, articles, tools or appliances exceeding in weight the maximum limits as set out in the following table unless aided by any other building worker or a mechanical device;

b. No worker aided by other workers, lift by hand or carry overhead or over their back or shoulders any materials, articles, tools or other appliances exceeding in weight the sum total of the maximum limits as prescribed in the concerned Rules, unless aided by a mechanical devices:

**1.12. Protections against fall of persons –**

a. All scaffolds/working platforms at height of two metres or more shall be fenced;
b. All guard-rails for the fencing of floor openings, gangways, elevated workplaces shall be made of sound material, good construction and possess adequate strength and be between 1 m and 1.5 m above platform level, consist of two rails (two ropes or chains may be used if they are sufficiently taut) and supporting stanchions;
c. Intermediate rails, ropes or chains shall be midway between the top and lower of edges of the top rail;
d. Sufficient number of stanchions or standard poles or uprights shall be maintained to ensure the required stability and resistance;
e. Guard-rails shall be free from sharp edges and be maintained in good repair;
f. Floor openings through which persons could fall, shall be guarded by covering or fencing;
g. If the means of protection is removed to allow the passage of persons or goods or other purpose, the same shall be replaced as soon as possible, while making temporary arrangements for reasonable degree of safety in the meanwhile;
h. Covers for floor opening shall be safe to walk on and if vehicles operate thereon it shall be safe for the same. This will require the contractor to have prior assessment of expected loads;
i. Cover for floor opening shall be secured by hinges, grooves, stops or other effective means against sliding, falling down or lifting out or any other inadvertent displacement;
j. Covers for any openings shall not constitute any hindrance to traffic and, as far as practicable, be flush with the floor;
k. If covers constitute as grids, the bars shall be spread not more than 5 cm apart;
l. Elevated workplaces at more than 2 m above the floor or ground shall be protected on all open sides by guardrails. It is commonly observed that fragile barricade tapes are used as a substitute of a strong and dependable fencing. This practice is prohibited. The barricade tapes can be used as markers/route guide only;
m. Elevated workplaces shall be provided with safe means of access and egress such as stairs, ramps or ladders according to suitability;
n. Persons employed at elevated workplaces or other situations at more than 2m from which they may fall, shall be protected by means of adequate safety nets, or platforms, or be secured by

safety belts with the lanyard properly anchored above the head level of the user. All possible effort shall be made to have strong and dependable mechanical arrangement.

**1.13. Protection against fall of objects and materials:**

a. Materials and objects such as scaffolding materials, waste materials or tools shall not be thrown up or down from heights, as they are liable to cause injury;
b. If materials and other objects cannot be safely lowered from heights, adequate precautions such as the provision of fencing, lookout men or barriers shall be provided to protect any person from injury.

**1.14. Protection against entry of unauthorized persons:**

a. Construction zones in the site and built up areas alongside main traffic routes shall be barricaded;
b. Unauthorized persons shall not be allowed access to construction sites and visitors shall be provided with the required protective equipment and it be ensured that they use them effectively.

**1.15. Head protection and other protection apparel:**

Every building worker who is required to –

a. Pass through or working within the areas where there is hazard of his being struck by falling objects or materials, shall be provided with safety helmets of the type approved and tested in accordance with the national standards;
b. Work in water or in wet concrete or in other similar work, shall be provided with suitable waterproof;
c. Work in rain or in similar wet condition, shall be provided with waterproof coat with hat;
d. Workers using or handling of alkalis, acid or other similar corrosive substances shall be provided with appropriate protective equipment in accordance with the approved standards;
e. Every building worker engaged in handling sharp objects or materials at a building or other constriction work, which may cause hand injury, shall be provided with suitable hand gloves in accordance with the approved standards.

**1.16. Stability of structures:**

a. No wall, chimney or other structure or part of a structure shall be left unsupported in such condition that it may fall, collapse or weaken due to wind pressure, vibration or due to any other reason. Entry of persons into such locations where tall structures are being built shall be regulated without a let up.

**1.17. Safety of Structures and equipment and other safety concerns**

a. Safety of structures like scaffoldings, platforms, gangways/walkways, towers, stairs, ladders, ramps, safety in excavation, formwork, falsework, demolition work, storage, handling and use of explosives, inflammable substances and hazardous materials, gas cutting and welding, use of electricity etc.; and equipment viz. construction machinery, crushers and batching plant, boiler and other pressure vessels, transport and material handling equipment, lifting appliances, vehicles etc., shall be operated and maintained as per approved norms and –
   i. They shall be made of sound material and of good construction, free from patent defects, provided with adequate safe guards, properly maintained, periodically inspected and strong enough to withstand safely the loads and stresses to which they may be subjected;
   ii. They shall carry enough factor of safety bearing in mind that the possibility of their abuse, which otherwise shall be prevented by constant and adequate supervision, cannot be ruled out altogether;
   iii. It is incumbent on the contractor to ensure that only competent and authorized persons operate the equipment or attend to electrical and mechanical systems and repair of faults or breakdowns etc.
b. Working in the confined space may involve certain serious hazards. Strict adherence to the conditions of Permit-to-work issued for the purpose is required;
c. Control of energy sources shall be ensured through Log-out/Tag-out practices.

**1.18. Slipping, tripping, cutting, drowning and falling hazards:**

a. The contractor shall keep all passageways, platforms and other places free from accumulations of dust, debris or similar material and from other obstructions that may cause tripping;

b. Any sharp projections or protruding nails or similar projections which may cause any cutting hazard to a building workers shall be removed or otherwise made safe by taking suitable measures;

c. No contractor shall allow any building worker at construction work to use the passageway, or a scaffold, platform or any other elevated working surface which is in slippery and dangerous condition and shall ensure that water, grease, oil or other similar substances which may cause the surface slippery, be removed or sanded/saw-dusted or covered with suitable material to make it safe from slipping hazard;

d. Wherever building workers are exposed to the hazarded of falling into water, they shall be provided with rescuing arrangement from such hazard and if it is considered necessary, well equipped boat or launch manned with trained personnel shall be provided by the contractor at the site of such work;

e. Every open side or opening into or through which a building worker, vehicle or lifting appliance or other equipments may fall at a building or other construction work shall be covered or guarded suitably to prevent such fall except where free access is necessary by reasons of their nature of the work;

f. Wherever building workers are exposed to the hazards of falling from height while employed on such work they shall be provided by the employer with adequate equipment or means for

saving them from such hazards, Such equipments or means shall be in accordance with the standards as laid down;

g. Whenever there is a possibility of falling of any martial, equipment or building worker at a construction site relating to a building or other construction work, adequate and suitable safety net shall be provided in accordance with the above stipulation;

# 2.0 SAFETY IN MATERIAL HANDLING AND WASTE DISPOSAL

## 2.1. GENERAL PROVISIONS:

a. All building materials stored in tiers shall be stacked, racked, blocked, interlocked or otherwise secured safely to prevent sliding, falling or collapse and in an orderly manner to avoid obstruction of any passageway at the place of work. Piles of materials shall be stored or stacked in such a manner as to ensure their stability;

b. Maximum safe load limits of floors within buildings and structures in $kg/cm^2$ shall be conspicuously posted in all storage areas, except for floor or slab on gradient. Maximum safe load shall not be exceeded. Material or equipment shall not be stored upon any floor or platform in such quantity as to exceed its safe carrying capacity;

c. Ailes and passageways shall be kept clear to provide for the free and safe movement of material handling equipment or persons. Such areas shall be kept in good repair;

d. When a difference in road or working levels exist, means such as ramps, blocking or grading shall be used to ensure the safe movement of vehicles between two levels;

e. Material stored inside buildings under construction shall not be placed within 2 m of any hoist way or inside floor openings nor within 3.2 m of exterior wall which does not extend above the top of material stored;

f. Persons employed required to work on stored material in silos, hoppers and similar storage areas shall be equipped with lifelines and safety belts;

g. Non-compatible materials shall be segregated in storage;

h. Bagged materials shall be stacked by stepping back the layers and cross-keeping the bags at least every 10 bags high;

i. Materials shall not be stored on scaffolds or runways in excess of supplies needed for immediate operations;

j. Bricks stacks shall not be more than 2.2 m in height. When a loose brick stack reaches a height of 1.3 m it shall be tampered back 5 cm in every foot of height above the 1.25 m level;

k. When masonry blocks are stacked higher than 2 m, the stack shall be tapered back on half block per tier above the 2 m level;

l. Material or equipment shall not be stored or placed so close to any edge of a floor or platform as to endanger the safety of persons below or working in the vicinity. Where stacking, unshackling, stowing or unstaring of construction material or article, or handling in connection therewith cannot be safely carried out unaided, reasonable measures to guard against accident or dangerous occurrences shall be taken by shoring or otherwise to prevent any danger likely to be caused by such handling;

m. Stacking of material or article shall be made on firm foundation not liable to settle and such material or article and shall not overload the floor on which such stacking is made;

n. The material or articles shall not be stacked against partition or walls o f a warehouse or stores unless it is known that such partition or the wall is of sufficient strength to withstand the pressure of such materials or articles;

o. The materials or articles shall not be stacked to such a height and in such a manner as would render the pile of such stack unstable and cause hazards to the building workers or the public in general;

p. Where the building workers are on stack exceeding one point five meters in height, safe means of access to the stack shall be provided;

q. All stacking or unshackling operations shall be performed under the supervision of a responsible person for such stacking or unstacking;

r. The stacking of construction materials or articles shall not be made near the site of excavation, shaft, pit or any other such opening;

s. Stacks that may lean heavily or become unstable or collapse are barricaded shall be avoided;

t. Structural steel, poles, pipe, bar stock and other cylindrical materials, unless racked, shall be stacked and blocked so as to prevent sliding, spreading or tilting.

## 2.2. LUMBER:

a. Used lumber shall have all nails withdrawn before stacking;

b. Lumber shall be stacked on level and solidly supported sills;

c. Lumber piles shall not exceed 6 m in height provided that lumber is handled manually, shall not be stacked more than 5 m height;

d. Lumber shall be so stacked as to be stable and self-supporting.

## 2.3. STACKING OF CEMENT AND BAGS CONTAINING OTHER MATERIALS:

a. The cement or other material in bags shall be stacked in a header and stature-wise in rows alternately in not more than 10 numbers and there will be circulation of space of at least 600 mm in between two such rows;

b. While removing bags from the stack pile the stability of such stack pile shall be ensured;

c. Bags containing cement or lime shall be stored on a firm ground;

d. The materials like bricks, tiles or blocks shall also be stored on a firm ground;

e. Reinforcing steel shall be stored according to its shape, size and length and stack of reinforcing steel kept as low as possible;

f. No pipe shall be stored on rack or in stack where such pipe is likely to fall by rolling;

g. The angle of repose shall be maintained where loose materials are stacked;

h. When dust laden material is to be stored or handled, measures shall be taken to suppress the dust produced by such storing or handling and suitable personal protective equipment supplied to and used by the building workers working for such storing or handling.

### 2.4. DISPOSAL OF DEBRIS AND WASTE MATERIAL:

a. It shall be ensured that debris is

i. Handled and disposed of by a method, which does not cause danger to the safety of a person and not allowed to accumulate so as to constitute a hazard;

ii. Kept sufficiently moist to bring down the dust under control;

iii. Not thrown inside or outside from any height of such building or other construction work;

b. Brought down by suitable means/chutes provided for the purpose and on completion of work, leftover building material, article or other substance or debris shall be disposed off as soon as possible to avoid any hazard to any traffic or person;

c. Whenever materials are dropped more than 6 m to any point lying outside the exterior walls of the building an enclosed chute of wood, or equivalent material shall be used;

d. When debris is dropped through holes in the floor without the use of chutes, the area where the material is dropped shall be completely enclosed with barricades not less than 1.1 m high and not less than 1.9 m back from the edge of the opening above. Signs warning of the hazard of falling material shall be posted at each level;

e. All scrap lumber, waste material and rubbish shall be removed from the immediate work area as the work progresses;

f. Disposal of waste material or debris as per the guideline issued by CPCB in compliance of Rule 10 sub-rule 1(a) of C & D Waste Management Rules, 2016).

g. All bio-degradable material shall be disposed off in the pit for making compost. Pellets can also be made from bio-degradable material

h. All solvent wastes, oil rags and flammable liquids shall be kept in fire resistant covered containers until removed from the work site.

### 2.5. HANDLING GAS CYLINDERS:

a. Gas cylinders shall not be lifted on bare slings. For lifting the cylinders, cage of suitable size shall be used and all cylinders shall be horizontally positioned in it. Such cage shall have fencing in such a way that there is no possibility of fall of cylinders from this cage.

### 2.6. RIGGING EQUIPMENT FOR MATERIAL HANDLING:

a. Rigging equipment for material handling shall be inspected prior to use in each shift as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service;

b. Rigging equipment shall not be loaded in excess of its recommended safe working load, as prescribed in the Indian standards;

c. Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to persons engaged in the area;

d. Special custom designed grabs, hooks, clamps, or other lifting accessories, for such units as modular panels, prefabricated structures and similar materials, shall be marked to indicate the safe working loads shall be proof tested prior to use 125% of their rated load;

e. Welded alloy steel chain slings shall have permanently affixed-durable identification standing size, grade, rated capacity and manufacturer.

## 2.7. FENCING OF MOTORS ETC

a. All motors, cogwheels, chains and friction gearings, flywheels, shafting and the other dangerous and moving parts of machinery (whether or not driven by mechanical power) and steam pipes shall be securely fenced and the fencing of dangerous parts of machinery not removed while such machinery is in motion or in use;

b. No part of any machinery which is in motion and which is not securely fenced, shall be examined, lubricated, adjusted or repaired except by a person skilled and trained for such examination, lubrication, adjustment or repairs and machine parts cleaned only when such machine is stopped;

c. When a machine is stopped for servicing or repairs, adequate measures shall be taken to ensure that such machine does not restart inadvertently and not only tag-out sign is required; it is also essential that an active system of isolating the power be applied.

## 2.8. PROTECTION AGAINST LIGHTNING

**a.** Where necessary, installations shall be protected against lightning, provided further that;

b. No bare conductors or bare current-carrying parts of equipment be permitted to be installed unless adequate precautions are taken to prevent direct pr indirect contact;

c. Only flame-proof equipment and conductors shall be installed at places where explosives or inflammable substances are stored, handled or used or where explosive atmosphere exits;

d. Persons competent and authorized only shall attend to electrical breakdowns and other operational faults and give or restore power to an equipment and such persons shall be easily identifiable by their dress or special helmet worn;

e. It will constitute a standard practice to switch off portable tools while shifting from one place to another or while leaving them behind unattended;

f. The contractor shall ensure that a system is in place to always keep tools well maintained.

## 2.9. VEHICULAR TRAFFIC

a. Whenever any building or other construction work is being carried on, or is located in close proximity to a road or any other place where any vehicular traffic may cause danger to building workers, it shall be ensured that such building or other construction work is barricaded and suitable warning signs and lights displayed or erected to prevent such danger and if necessary, a request in writing made to the concerned authorities to control such traffic;

b. All vehicles used at construction site shall comply with the requirements of the Motor Vehicles Act, 1988 (59 of 1988) and the Rules made hereunder;

c. The driver of a vehicle of any class or description operating at a construction site shall hold a valid driving license under the Motor Vehicles Act. 1988 (59 of 1988).

### 2.10. USE OF SAFETY BELT OR OTHER FALL ARREST SYSTEMS:

Wherever any work at a height of 3 m or more is carried out, use of a suitable fall arrest system is mandatory if the workplace has already not been provided with an otherwise reliable means of protection for preventing the fall of persons from that height, provided further that:

a. Safety belt, lanyard, life lines and devices for the attachment of such life lines shall conform to the approved standards;
b. Every building worker shall be supplied with safety belt and safety life lines for his protection and such building worker shall use such belts and life lines during the performance of his work;
c. All building workers using safety belt and safety life lines shall have the knowledge of safe use and maintenance of such belts and life lines and shall be supplied with necessary instructions for its use;
d. The responsible person for supervising the use of safety belts and safety lifelines shall inspect and ensure that such safety belts and lifelines are fit for use before taking them into use.

### 2.11. SAFETY NET AND ITS USE

a. Every safety net shall be of adequate strength, made of sound material and suitable for use and conform to the approved standards;
b. The responsible person for maintenance of safety nets and their use shall ensure safe fixing of such safety nets and provide such safety nets with suitable and sufficient anchorage so that the purposes for which such safety net is intended for use is served;
c. Use of multi-layer safety net to be ensured to avoid fall of material/objects.

### 2.12. STORAGE OF SAFETY BELTS AND NETS, ETC:

a. Proper arrangement shall be made for the safe storage of safety belts, safety lifelines and safety nets when they are not in use and are protected against mechanical damage, damages from chemicals and damages from biological agents.

### 2.13. SAFETY HELMETS AND SAFETY FOOTWEAR

a. The Engineer in-charge may declare whole or part of a site as the hardhat area and in such an eventuality it shall be the responsibility of the contractor to provide safety helmet of the approved quality to all personnel engaged in construction and erection work, including the visitors to the site;
b. Accordingly, wherever safety footwear is required for the safety of the personnel, the contractor shall provide the same of the approved type free of charge.

# 3.0 WELDING AND GAS CUTTING OPERATIONS

## 3.1 GAS WELDING:

### 3.1.1 GENERAL PROVISIONS:

a. All welders shall be provided with fire resistant protective clothing and equipment, such as fire resistant gauntlets and aprons, helmets and goggles with suitable filter lenses and its usage shall be ensured;
b. The welders shall not be allowed to wear clothing that is not free from grease, oil and other flammable material;
c. Adequate precautions shall be taken to protect persons working or passing near welding operations from dangerous sparks and radiation;
d. When welding or cutting is being done on materials containing toxic or harmful substances or liable to produce toxic or harmful fumes, adequate precautions shall be taken to protect workers from the fumes, either by
    i) Exhaust ventilation, or
    ii) Respiratory protective equipment;
    iii) Arrangement shall be made so that welding sparks do not fall down on the persons working below or material, which are combustible in nature and may be damaged with such sparks.
e. The oxygen pressure for welding shall always be high enough to prevent acetylene flowing back into the oxygen cylinder;
f. Acetylene shall not be used for welding at a pressure exceeding 1 atmosphere gauge;
g. Adequate precautions shall be taken to prevent:
    i) Fire being stated by sparks,
    ii) Slag or hot metal; and
    iii) Damage to fibre ropes from heat, sparks, slag or hot metal;
h. Precautions shall be taken to prevent flammable vapours and substances from entering the working area;

## 3.2. WELDING AT PLACES WITH FIRE RISKS:

a. Unless adequate precautions are taken, no welding or cutting operations shall be allowed near the place where combustible materials are stored, or near materials or plant where explosive or flammable dusts, gases or vapours are likely to be present or given off. If hot work permit system exists at the site, the same shall be followed;
b. Combustible materials and structures that cannot be removed from the vicinity of welding operations shall be shielded by asbestos or protected by other suitable means.

## 3.3. WELDING IN CONFINED SPACE:

When welding or cutting operations are being carried out in a confined space;

a. Adequate ventilation, by means of exhaust fans or forced drought as the condition may require, shall be constantly provided; otherwise enough quantity of air shall be flown in by means of compressors to dilute the pollutants;

b. No blow pipe shall be left unattended inside a tank or vessel or other confined space during meal break or other interruption of the work;
c. The worker shall take all necessary precautions to prevent unburned combustible gas or oxygen from escaping inside a tank or vessel or other confined space; and
d. When necessary to prevent danger, an attendant shall watch the welders from outside.

### 3.4. WELDING ON CONTAINERS FOR EXPLOSIVE OR FLAMMABLE SUBSTANCES:

Welding or cutting operations on containers in which they are explosives or flammable substances shall not be allowed;

i) Welding or cutting operations on any container that has held explosive or where flammable gases may have been generated, shall only be undertaken,
ii) After the container has been thoroughly cleansed by steam or other effective means; and
iii) Found by air tests to be completely free from combustible gases and vapours; or
iv) After the combustible gas in the container has been completely replaced by an inert gas or by water;
v) If an inert gas is used as laid down in clause 4.2.3, after the vessel has been filled with gas, the gas shall continue to flow slowly into it thorough out the welding or cutting operations;
vi) Before starting any welding operations on, or otherwise applying heat to, closed or jacketed containers or other hollow parts, such containers or parts shall be adequately vented in suitable manner.

### 3.5. GAS CYLINDERS

a. Gas cylinders shall be inspected, stored, handled and transported in conformity with the requirements of Gas Cylinders Rules, 1981;
b. When in use, cylinders shall be held in upright positions by straps, collars or chains;
c. Devices referred to in clause 6.2 shall be such that the cylinders can be rapidly removed in an emergency;
d. Welders shall not temper with or attempt to repair safety devices and valves on gas cylinders;
e. When acetylene cylinders are coupled, flash back arrestor shall be inserted between the cylinder and the coupler block, or between the coupler bock and the regulator;
f. Only acetylene cylinders or approximately equal pressure shall be coupled;
g. No gas shall be taken from a cylinder unless a pressure reducing regulator has been attached to the valve;
h. Only the right pressure reducing regulator shall be used for the gas in the cylinder;
i. Cylinder valves shall be kept free from gases, grease, oil, dusts and dirt;
j. Leaky cylinders charged with acetylene or liquefied fuel gas shall be taken into the open air at a safe distance from any open flame or sparks.

### 3.6 HOSE

a. Only hose especially designed for welding and cutting operations shall be used to connect an oxy-acetylene torch to gas outlet;
b. Hose lines for oxygen and for oxy-acetylene shall be of different colours and preferably of different size;
c. Hose connections shall be sufficiently light to withstand without leakage a pressure twice thee maximum delivery pressure of the pressure regulators in the system;

d. Care shall be taken that hose does not become kinked or tangled, stepped on or run-over or otherwise damaged;
e. Any length of hose in which a flashback has burned, shall be discarded;
f. No hose with more than one gas passage shall be used;
g. Only soapy water shall be used for testing hose for leaks.

## **3.7.** TROCHES

a. When torches are being changed, the gases shall be shut off at the pressure reducing regulators and not by crimping hose;
b. Torches shall be lit with friction lighters or other safe source but not with matches.
c. Electric welding equipment:
d. Welding machines shall be controlled by a switch mounted on or near the machine framework that, when opened, immediately cuts off the power from all conductors supplying the machine;
e. Welding circuit shall be so designed as to prevent the transmission of high potential from the source of supply to the welding electrodes;
f. The maximum open circuit voltage shall be in accordance with Indian Standards;
g. Electrode conductors or cables shall not be excessive in length and shall not be longer that necessary to perform the work;
h. Return conductors shall be taken directly to work and securely connected mechanically and electrically to it or to the work bench, floor etc. and to an adjacent metallic object;
i. Cable shall be supported so as not to create dangerous obstruction;
j. Motors, generators, rectifiers and transformers in arc welding or cutting machines, and all current carrying parts, shall be protected against accidental contact with uninsulated live parts;
k. Ventilating slots in transformer enclosures shall be so designed that no live part is accessible through any slot;
l. Frames of arc welding machines shall be effectively earthed;
m. In hand-operated arc welding machines, cables and cable connectors used in arc welding circuits shall be effectively insulated on the supply side;
n. The outer surface electrode holders of hand-operated arc welding machines, including the jaw so far as practicable, shall be effectively insulated;
o. Electrode holders of hand-operated arc-welding machines shall, if practicable, be provided with discs or shields to protect the operator's hands from the heat of the arcs;
p. Only heavy-duty cable with unbroken insulation shall be used;
q. Circuit connections shall be waterproof;
r. When lengths of cable have to be joined, only insulated connectors shall be used on the earth line and the electrode holder line;
s. Connections to welding terminals shall be made at distribution boxes, socket outlets, etc. by bolted joints;
t. Welding terminals shall be adequately protected against accidental contact by enclosures, covers or other effective means;
u. Electrode holder shall
    i. Have adequate current capacity;
    ii. Be adequately insulated to prevent shock, short-circuiting or flashovers.

### 3.8. OPERATIONS

a. Arc welding and cutting operations that are carried on at places where persons other than the welders are working or passing shall be enclosed by means of suitable stationary or mobile screens;
b. Walls and screens of both permanent and temporary protective enclosures shall be provided to absorb harmful rays from the welding equipment and prevent reflection, and if necessary, be painted or otherwise treated for the purpose;
c. When arc welding is done in damp confined spaces;
    i) Electrode holders shall be completely insulated; and
    ii) The welding machines shall be outside the confined space;
d. Welders shall take adequate precautions
    i) To prevent any part of their body from completing an electric circuit
    ii) To prevent contact between any part of the body and the exposed part of the electrode, or electrode when in contact with metal; and
    iii) To prevent wet or damaged clothing, gloves and boots from touching any live part;
e. Welding circuits shall be switched off when not in use;
f. Electrodes shall only be inserted in the holder with insulating means such as insulating gloves;
g. Electrode and return leads shall be adequately protected against damage;
h. Live parts of electrode holders shall be inaccessible when they are not in use;
i. Electric arc-welding equipment shall not be left unattended with current switched on.

# 4.0 SAFETY IN THE USE OF ELECTRICITY

## 4.1. GENERAL PROVISIONS

a. Before commencement of any building or other construction work, adequate measures shall be taken to prevent any worker from coming into physical contact with any electrical equipment or apparatus, machines or live electrical circuit which may cause electrical hazard during the course of his employment and suitable warning signs shall be displayed and maintained at conspicuous places in Hindi and in local language understood by the majority of the building workers;

b. In workplaces where the exact location of underground electric power line is not known, the building workers using jack hammers, crow bars or other hand tools which may come in contact with a live electrical line shall be provided with approved insulated protective gloves and footwear;

c. As far as practicable, no wiring or cable, which may come in contact with water or which may be mechanically damaged or which may result in electric shock shall be left on ground or;

d. All electrical appliances and current carrying equipment used shall be made of sound material and adequately earthed;

e. All temporary electrical installations shall be provided with earth leakage circuit breakers;

f. It is required that all portable power-driven hand tools are provided with double insulation to secure a high degree of protection from electrical hazards;

g. Electrical installations shall comply with the requirements of any law for the time being in force, especially the Indian Electricity Act/Rules in particular with specific reference to the following:

   i) All parts of installations shall be of standard construction not lower, from the safety point of view, than the national standards, as applicable. All parts of electrical installations shall be so constructed, installed and maintained so as to prevent electrical fires, explosion and shock;

   ii) Earthing of metal work of electrical equipment, other than the parts which carry current, shall be provided and will conform to Electricity Act and IS: 3042 – 1966 (code of practice for earthing);

h. All parts of electrical installation shall be adequate size and characteristics for the work they may be called upon to do and in particular they shall:

   i) Be of adequate mechanical strength to withstand working conditions in construction operations; and

   ii) Be not liable to damage by water, dust or electrical, thermal or chemical action to which they me subjected to in construction operations;

i. All parts of electrical installations shall be so constructed, installed and maintained as to prevent the danger of electric shock; fire and external explosion;

j. It shall be made impossible for circuit breakers to be opened or closed inadvertently, by gravity or by mechanical impact;

k. Before operation of OCBs, oil level must be checked and the event of short, extra quantity must be filled;

l. Use of rubber gloves and rubber gum boots of tested quality where electric shock is likely to occur shall be provided, but these shall not be considered as providing adequate protection against the risk of electric shock in lieu of inbuilt safety arrangement in the system;

m. First-aid boxes, instruction for restoration of persons affected by electric shock shall be made;

n. Arrangement shall be made for sufficient number of $CO_2$/chemical powder type fire extinguishers/sand buckets etc.;

o. No electrical circuits shall ever be overloaded to the dangerous extent or beyond the rated capacity;

p. In confined areas, only 24 volt supply shall be used for every equipment, including hand-held portable tools and hand lamps;

q. All electrical appliances and outlets shall be clearly marked to indicate their purpose and voltage.

## 4.2. FUSES

a. Fuses shall bear markings indicating their rated current, whether they are of the fast or slow-breaking type and, as far as practicable, and their rated breaking capacity. Fuses as per need and of correct rating shall be used in the circuit;
b. Effective measures shall be taken to ensure that persons removing or inserting fuses will not be endangered, in particular by any adjacent live parts;
c. In case of blow of fuses only after finding out and correcting of the fault, new fuses shall be provided in the circuit.

## 4.3. SWITCHES

a. All switches shall be of enclosed type and so installed and earthed as to prevent danger in their operation;
b. Use of switches, which may connect or disconnect circuit through gravity, shall not be used.

## 4.4. MOTORS

a. All motors shall be equipped with a switch;
b. When a motor can be cut off from more than one place, where practicable, a stopping device shall be installed in the immediate vicinity of the motor;
c. Motors shall be so installed as to ensure that they can be adequately cooled;
d. Motors shall be effectively protected against over current;
e. Whenever the motors installed are in the open area where there is the possibility of fall of liquid corrosives or otherwise, it shall be suitably protected with covering;
f. Earthing shall be connected to all motors, generators etc. as prescribed in the Indian Electricity Rules, amended from time to time.

## 4.5. CONNECTIONS

a. At points where conductors are joined, branched or led into apparatus, they shall be:
   i. Mechanically protected, and
   ii. Properly maintained;

b. Conductors shall be joined, branched or led into an apparatus through junction boxes, bushings, glands or equivalent connecting devices;

c. Junction boxes or plug-out-socket couplings shall be used for joining cables wherever practicable;

d. When parts of conductors are joined together, or conductors are joined to one another or to an apparatus, the attachment shall be made by screwing, clamping, soldering, riveting, brazing, crimping, or equivalent means. Loose connections shall not be provided in any case;

e. Cable joints, junction boxes and connectors shall be protected as far as practicable, against traffic, fall of ground, water and other sources of damage;

f. Whenever armoured cables are joined, the junction boxes shall be bridged by a suitably conducive bond between the armouring of the cables.

## 4.6. TRANSPORTABLE AND PORTABLE ELECTRICAL EQUIPMENT:

a. The supply of electricity to portable apparatus shall not exceed 250v;

b. Hand-held and portable machines shall be equipped with a built-in switch to switch off power in case of emergency;

c. Hand-held electrically operated tools shall be provided with built-in switch to disconnect the circuit when the tool is not being used;

d. Portable electrical tools, unless flameproof, shall not be used in flammable or explosive atmosphere;

e. Only three-core cable shall be used for single-phase operated tools with the third core connected to earth

## 4.7. HAND LAMPS

a. Hand lamps shall be equipped with strong cover of glass or other transparent material;

b. Portable lamp holders shall have:

   i) All current –carrying part s enclosed;

   ii) Insulated handle; and

   iii) They shall operate at 24 v;

## 4.8. INSPECTION, MAINTENANCE

a. All electrical equipment shall be inspected before it is taken into use to ensure that it is suitable for its purpose of use;

b. At the beginning of every shift every person using electrical equipment shall make a careful external examination of the equipment and conductors for which he is responsible, especially flexible cables;

c. Periodic inspections, testing, maintenance of all electrical equipment is to be made and record of test of transformer oil and pit earthing shall be maintained;

d. Electrical conductors and equipment shall be repaired by the electrician only as far as practicable, no work shall be done live conductors or equipment;

e. Before any work is begun on conductors or equipment that does not have to remain live;

   i) The current shall be switched off;

   ii) Adequate precautions shall be taken to prevent the current from being switched on again;

   iii) The conductors or the equipment shall be tested to ascertain that they are dead;

   iv) The conductor and equipment shall be earthed and short-circuited; and

   v) Neighbouring live parts shall be adequately protected against accidental contact;

f. After work on conductors and equipment, the current shall only be switched on again on the orders of a competent person;

g. Electricians shall be provided with adequate tools, and person protective equipment, such as rubber gloves, mats etc.;

h. All conductors and equipment shall be considered to live unless there is certain proof to the contrary.

## 4.9. WORK IN THE VICINITY OF ELECTRICAL INSTALLATION

a. When work is to be done in the neighborhood of electrical conductors or installations, the contractor shall ascertain the voltage carried and the works shall not be allowed to reach to unsafe distance from them;
b. When any excavation is to be made or any bore-holed sunk, the contractor shall ascertain whether there are any underground conductors, in or in dangerous proximity to, the zone of operations;
c. No work shall be done in dangerous proximity to a conductor or an installation until it has been made dead;
d. Before work begins, work permit shall be obtained from the Engineer in-charge if live electricity lines/circuit are passing in close vicinity;
e. Before the current is restored, the contractor shall ensure that no work remain on the work site;
f. If conductor or an installation in the neighbourhood of which work is io be done can not be made dead, special precautions shall be taken and special instructions given to the workers so as to prevent danger by adequately enclosing or fencing;
g. If mobile equipment has to be employed in the neighbourhood of conductors or installations that cannot be made dead, its movement shall be so controlled as to keep it as a safe distance from them.

# 5.0 SAFETY IN THE USE OF HAND TOOLS AND POWER-OPERATED TOOLS

## 5.1 GENERAL PROVISIONS

a. All hands and power tools and similar equipment, shall be maintained in safe condition.

b. When power operated tools are designed to accommodate guards, they shall be equipped with such guards, when in use;

c. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;

d. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapours, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazards;

e. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive **on-off control**.

f. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

## 5.2. HAND TOOLS

a. The contractor shall not issue or permit the use of unsafe hand tools;

b. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;

c. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;

d. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

## 5.3. POWER OPERATED TOOLS

a. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;

b. The use of electric cords for hoisting or lowering loads shall not be permitted;

c. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected;

d. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled;

e. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm$^2$ pressure at the tool a safety device on the

muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;

f. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm$^2$ and that too with effective chip guarding. The 2 kg/cm2 pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;

g. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;

h. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;

i. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's recommended procedure;

j. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;

k. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;

l. Loaded tools shall not be left unattended;

m. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;

n. Driving into materials that can be easily penetrated shall be avoided unless backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;

o. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;

p. Only non-sparking tools shall be used in an explosive or flammable atmosphere;

q. All tools shall be used with the correct shield, guard or attachment as recommended by thee manufacturer.

## 5.4. ABRASIVE WHEELS AND TOOLS

a. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;

b. Grinding machines shall be equipped with suitable safety guards;

c. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than $90^0$, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed $120^0$. In either case, the exposure shall begin not more than $65^0$ above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;

d. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;

e. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;

f. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of accidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed $180^0$;

g. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;

h. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of accidental breakage, shall be used;

i. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from cracks or defects;

j. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;

k. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

## 5.5. WOODWORKING TOOLS

a. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the **off-position**;

b. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is retensioned for a different speed, the marking shall be corrected to show the new speed;

c. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;

d. All portable power driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

# 6.0 SAFETY IN THE USE OF LADDERS AND STAIRS

## 6.1. GENERAL ASPECTS OF SAFETY RELATED TO USE OF LADDERS

a. Every ladder or step-ladder used in building or other construction work shall be of good construction, made of sound material and of adequate strength for the purpose for which such ladder or step-ladder is used;
b. When a ladder is used as a means of communication, such ladder shall be lashed to a fixed structure so that while working on such ladder it does not slip;
c. A ladder or step ladder shall not stand on loose bricks or other loose packing and have a level and firm footing;
d. No ladder shall be used which has a missing or defective rungs or rungs, which depend for support solely on nails, spikes or other similar fixing.

## 6.2. MATERIALS FOR LADDERS

a. Shall be constructed with upright of adequate strength and are made of straight-grained wood, free from defects and having the grain of such wood running length wise;

b. Shall have rungs made of straight-grained wood free for defects and mortised or securely notched into the upright, reinforcing metal ties, if wedges shall not secure the tenors of such ladders;

c. Where it is required, in case of use of fixed ladders, sufficient foot-hold and hand-hold shall be provided for use by the building worker;

d. Every ladder shall be -

    i. Secured so as to prevent undue swaying;
    ii. Equally and properly supported on each of its upright;
    iii. So used as not to cause undue sagging; and
    iv. Placed as nearly as possible at an inclination of four in one;

e. The use of all ladders and stepladders shall conform to the approved standards;
f. Wooden ladders shall be constructed with uprights of adequate strength as well as rungs made of wood free from visible defects and having the grains of the wood in the ladders running lengthwise and rungs mortised or rebutted into the uprights;
g. Uprights and rungs of metal ladders shall have a cross-section adequate to prevent dangerous deflection, shall be equal and not less than 25 cm or more than 35 cm;
h. Rungs of metal ladders shall be kept clean so as to prevent them from becoming slippery;
i. Portable ladders shall not exceed 9 m in length;
j. Every ladder or run of ladders rising to a height exceeding 9 m shall be provided with an intermediate landing, providing further that the intervals between landings shall not exceed 9 m. The landings shall be of suitable size and protected by railings;
k. Defective ladders that cannot be satisfactorily repaired shall be tagged Not Fit For Use and destroyed;
l. Wooden ladders shall not be painted, but oiled or covered with clean varnish or other transparent preservatives;
m. Metal ladders shall be protected against corrosion by being coated with rust-proof paint or by other means unless they are made of non-corrosive metals;

n. Every ladder shall rise at least 1 m above the highest point to be reached and have one of the uprights continued to that height to serve as a hand-rail at the top;
o. Ladders shall not stand on loose bricks or other loose packing but have a level and firm footing so that they are equally supported on each upright;
p. Every ladder shall be securely fixed so that it cannot move from its top and bottom points of rest and if it cannot be secured at the top, it shall be securely fastened at the base and if fastening at the top is also impracticable, it shall have a man stationed at the foot holding the end to prevent it from slipping;
q. Where a run of two or more ladders connects different floors, the ladders shall be staggered and a protective landing with the smallest practicable opening shall be provided at each floor;
r. A ladder having only one upright or a missing or dangerously defective rung shall not be used;
s. When a ladder is placed in position, the distance between the foot of a ladder and the base of the structure against which it rests shall be about one-quarter of its length;
t. Workers using ladders shall leave at least one hand free for climbing up and down, face the ladder, avoid wearing slippery footwear and avoid carrying heavy or bulky loads;
u. A ladder shall not be placed in front of a door that opens towards it unless the door is fastened or locked or guarded;
v. A ladder shall not be placed against a window frame unless the ladder is fitted with a board at the top so that the applied load is safely distributed over the frame;
w. Metal ladders shall not be used in the vicinity of live electrical equipment;
x. Adequate means shall be provided to prevent displacement of the ladder set up in public thoroughfare or where persons, vehicles etc. may accidentally collide with it.

### 6.3. PORTABLE STEPLADDERS

a. The length of portable stepladders shall not exceed 6 m and their back legs shall be adequately braced;
b. Stepladders exceeding 1.5 m in length shall have two or more cross-ties;
c. The spread between the front and back legs shall be restricted by means of hinged metal flat bars or high-grade fibre or other effective means;
d. When in the open position, treads of stepladders shall be horizontal.

### 6.4. PORTABLE TRESTLE LADDERS

a. The height of the trestle ladders shall not exceed 5.5 m;
b. The spread between the front and back legs shall be restricted by means of hinged metal flat bars or high-grade fibre or other effective means;
c. The front and back legs shall be joined at the top by bolted steel hinges of adequate dimensions or other effective means;
d. Both legs of trestle ladders shall be equipped with sufficient number of steel crossties.

### 6.5. EXTENSION LADDERS

a. The length of extension ladders shall not exceed 15 m;
b. Extension ladders shall be equipped with an effective lock and guide brackets by which the ladder can be extended, retracted or locked in any position;

c. The rungs of overlapping sections shall coincide so as to form double treads and shall be equipped with one or more extension ropes;
d. Extension ropes shall be securely anchored and run over suitable pulleys.

## 6.6 MECHANICAL LADDERS

a. Mechanical ladder is that ladder, which is a mechanically extendable ladder, mounted on a wheeled frame;
b. Mechanical ladder shall be equipped with guard-rails and toe-boards and a cage of heavy-gauge steel mesh;
c. If mechanical ladder has no railed platform or cage, workers using it shall be secured by suitable safety belt;
d. Mechanical ladders shall not be moved, while a person is on them, unless they have specially designed to ensure that perfect stability is maintained during movement.

## 6.7. FIXED LADDERS

a. Uprights of fixed ladders shall be at least 40 cm and shall be set an angle of $15^0$ to the vertical;
b. Clearance at the back of the rungs shall be at least 15 cm and no obstruction within 75 cm of the face of the ladder;
c. There shall be at least 7.5 cm clearance between the ladder and the nearest fixed object;
d. When it is necessary for a ladder to pass closely through a hole in a platform or a floor, the edges of the hole shall be padded so as to prevent injury to the users;
e. The length of the runs of fixed ladder shall not exceed 9 m;
f. Landing platform shall be provided for each 9 m or fraction thereof;
g. As far as practicable, runs shall be staggered;
h. Runs from which a person could fall from more than 6 m shall be enclosed in a cage of heavy-gauge mesh or hoops;
i. Fixed ladders shall be firmly bolted or welded in position.

## 6.8. STAIRS

a. Stairs shall be of adequate strength to withstand safely the loads that they will have to carry;
b. Stairs used for the purpose of construction work shall have a clear width of at least 60 cm;
c. Stairs made of perforated material shall not have openings exceeding 1.2 cm in width;
d. No step of a stairway shall depend for its support solely on nails, spikes, screws or other similar fixing;
e. No stairway with missing or dangerously defective steps shall be used;
f. Every stairway that is at an angle of less than $30^0$ from the vertical shall be provided with a secure handhold at the top landing place, either by extending one upright for at least 1 m or by other effective means;
g. Movable and removable stairs shall be adequately secured in the position of use;
h. In all building structures permanent stairs shall be constructed as soon as practicable;
i. When work on a building has progressed to a height of more than 18 m above the ground and it has not been practical to construct the permanent stairs, sufficient number of stairs shall be provided to ensure safe access to the working levels.

# 7.0 SAFETY IN THE USE OF LIFTING APPLIANCES & GEARS

## 7.1. CONSTRUCTION AND MAINTENANCE OF LIFTING APPLIANCES:

All lifting appliances, including their parts and working gear, whether fixed or movable, and any plant or gear used in anchoring or fixing of such appliances -

a. Shall be of sound construction, sound material, and of adequate strength to serve the purpose for which these are to be used and all such appliances shall be free from patent defects, and
b. Maintained in good repair and working condition;
c. Every drum or pulley around which the rope of any lifting appliance is carried, shall be of adequate diameter and sound construction in relation to such rope;
    i. Any rope that terminates at the winding drum of lifting appliance shall be securely attached to such drum and at least three dead turns of such rope remain on such drum in every operating position of such lifting appliance;
    ii. The flange of a drum projects twice the rope diameter beyond the last layer of such rope and if such rope and if such projection is not available, other measures like anti-slackness guards shall be provided to prevent such rope from coming off such drum;
d. Every lifting appliance shall be provided with adequate and efficient brakes which shall be:
    i) Capable of preventing fall of suspended load (including any test load),
    ii) Effectively controlling such load while it is being lowered, acting without shock and shall be attached with shoes that can be easily removed for running and which shall be simple and have easily accessible means of adjustment;
e. Provided that nothing contained above shall apply to **steam-winch** that can be operated as safely as with brakes.

## 7.2. CONTROLS OF EVERY LIFTING APPLIANCE SHALL BE SO;

a. Situated that the driver of such appliance at his stand or seat has ample room for operating and has an unrestricted view of building or other construction work, as far as practicable, and that he remains clear of the load and the ropes, and that no load passes over him;
b. Positioned with due regard to ergonomic considerations for proper operation of such appliance;
c. Located that the driver of such appliance remains above the appliance and shall have upon them or adjacent to them clear markings to indicate their purpose and mode of operations;
d. Provided, where necessary, with a suitable locking device to prevent accidental movement or displacement and shall move, as far as practicable, in the direction of the resultant load movement;
e. Wherever automatic brakes are provided, they shall automatically come to the neutral position in case of power failure.

## 7.3. TEST AND PERIODICAL EXAMINATION

**7.3.1 Test:** all lifting appliances including all parts and gears thereof, whether fixed or movable, shall be tested and examined by a competent person before being taken into use for the first time or after it

has undergone any alteration or repairs liable to affect its strength or stability or after erection on a site and also once at least in every five years, in the manner as specified;

**7.3.2. Examination**: all lifting appliances shall be thoroughly examined by a competent person at least in every twelve months and where the competent person making such examination forms the opinion that the lifting appliance cannot continue to function safely, he shall forthwith give notice in writing of his opinion to the contractor.

## 7.4. AUTOMATIC LOAD INDICATOR

a. Cut-out shall be provided which automatically arrests the movement of the lifting parts of every crane if the load exceeds the safe working load, wherever possible;

b. Wherever the above provisions cannot be applied and if it is not possible to install an automatic safe load indicator, in that case, provision of a table showing the safe working loads at the corresponding inclinations or radii of the jib on the crane shall be considered sufficient.

## 7.5. INSTALLATION:

Fixed lifting appliances shall be installed by a competent person in a manner that

a. Such appliances cannot be displaced by the load, vibration or other influences;

b. The operator of such appliance is not exposed to danger from loads, ropes or drums;

c. The operator can either see over the zone of operation or communicate with all loading and unloading points by signal, or other communication system;

d. Adequate clearance is provided between parts or loads of lifting appliances and between the fixed objects such as walls and posts, or electrical conductors;

e. The lifting appliances; when exposed to wind loading, are given sufficient additional strength, stability and rigidity to withstand such loading safely;

f. No structural alterations or repairs are made on any part of the lifting appliances that affect the safety of such appliances without obtaining the opinion of the competent person to this effect.

## 7.6. WINCHES

a. Winches shall not be used if their control levers operate with excessive friction or play;

b. Double gear winches shall not be used unless a positive means of locking the gearshift is provided;

c. There shall be no load other than the fall and the hook assembly on the winch while changing gears on a two-gear winch;

d. Adequate protection shall be provided to the winch operator against abnormal weather;

e. Temporary seats or shelters for winch operators that may pose hazard to the winch operator or any other building workers shall not be allowed to be used;

f. Control levers shall be secured in the neutral position and, whenever possible, the power shall shut off if the winch is left unattended.

### 7.7. IN USE OF EVERY STEAM-WINCH

a. Measures shall be taken to prevent escaping steam from obscuring any part of the construction site or other workplace or from otherwise hindering or injuring any building worker;

b. Extension control levers which tend to fall off their own weight shall be counter-balanced;

c. Winch operators shall not be permitted to use the which control extension levers except for short handles on wheel type controls and that such levers shall be of adequate strength, secure and fastened with metal connections at the fulcrum and at the permanent control lever;

d. In use of every electric winch, no building worker shall be permitted to transfer, alter or adjust electric control circuits in case of any defect in such winch;

### 7.8. ELECTRIC WINCHES SHALL NOT BE USED FOR BUILDING WORK WHERE

a. The electromagnetic brake is unable to hold the load; or

b. One or more control points either hoisting or lowering are not operating properly.

### 7.9. BUCKETS:

It shall be ensured that tip-up buckets are equipped with a device that effectively prevents accidental tipping.

### 7.10. IDENTIFICATION AND MARKING OF SAFE WORKING LOAD:

a. Every lifting appliance and loose gear shall be clearly marked for its safe working load and identification by stamping or other suitable means;

b. Every derrick (**other than derrick crane**) shall be clearly marked for its safe working load when such derrick is used either in single purchase with lower block or in union purchases in all possible block positions;

c. The lowest angle to the horizontal, to which the derrick may be used, shall be legibly marked;

d. Every lifting appliance having more than one working load shall be fitted with effective means to enable the operator to determine safe working load at each point under all conditions of use;

e. Means to ascertain the safe working load for lifting gears under such conditions in which such gears may be used shall be provided to enable a worker using such gears and such means safely, which shall comprise:

   i) Marking of the safe working load in plain figures or letters upon the sling or upon a tablet or ring of durable material attached securely thereto in case of chain slings; and

ii) The means specified or notices so exhibited as can be easily read by any concerned building worker stating the safe working load for the various sizes of the wire rope slings used.

### 7.11 LOADING OF LIFTING APPLIANCES AND LIFTING GEARS

a. No lifting appliance, lifting gear or wire rope shall be used in an unsafe way and in such a manner as to involve risk to life of building workers and they are not loaded beyond their safe working load except for testing purposes under the direction of a **competent person** in the manner as specified in schedule;

b. No lifting appliance and lifting gear, or any other material-handling appliance shall be used if the Inspector having jurisdiction under the Building and Other construction (regulation of employment and conditions of service) Act/Rules is not satisfied with reference to a certificate of test or examination or to an authenticated record maintained as provided under the Rules or if in his view the lifting appliance, lifting gear or any other material handling appliance is not safe for use in building or other construction work;

c. No pulley block shall be used unless the safe working load and its identification are clearly marked on such block.

### 7.12. OPERATOR'S CAB OR CABIN SHALL

a. Be made of fire resistant material;

b. Have a suitable seat, a foot rest and protection from vibration;

c. Afford the operator an adequate view of the area of operation**;**

d. Afford the necessary access to working parts in the cab;

e. Afford the operator adequate protection against the weather;

f. Be adequately ventilated; and

g. Be provided with a suitable fire extinguisher.

### 7.13. OPERATION OF LIFTING APPLIANCES:

Operator of every crane or lifting appliance shall possess adequate skill and training in the operation of the particular lifting appliances, provided further that

a. No person under eighteen years of age shall be in control of any lifting machine, scaffold winch, or give signals to the operator;

b. Precaution shall be taken by the trained operator to prevent lifting appliance from being set in motion inadvertently;

c. The operation of lifting appliances shall be governed by signals in conformity with the approved standards;

d. The operator's attention shall not be distracted while he is working;

e. No crane, hoist, winch or other lifting appliance or any part of such crane, hoist, winch or other lifting appliance shall, except for testing purposes, be loaded beyond the safe working load;

f. During the hoisting operation, effective precaution shall be taken to prevent any person from standing or passing under the load in such operation;

g. Operator shall not leave lifting appliance unattended while power is on or the load is suspended to such appliance;

h. No person shall ride on a suspended load of any lifting appliance;

i. Every part of a load in course of being hoisted or lowered shall bee adequately suspended and supported to prevent danger;

j. Every receptacle used for hoisting bricks, tiles, slates or other material shall be suitably enclosed as to prevent the fall of any such material;

k. The hoisting platform shall be enclosed when loose material or loaded wheel barrows are placed directly on such platform or lowering such materials or wheel barrows;

l. No material shall be raised, lowered or slewed with any lifting appliance in such a way as to cause sudden jerks to such appliance;

m. In hoisting a barrow, any wheel of such barrow shall not used be as a means of support unless adequate steps have been taken to prevent the axle of such wheel from slipping out of its bearing;

n. Long objects like planks or girders shall be provided with tag line to prevent any possibility of danger while raising or lowering such objects;

o. During the process of landing or material, a building worker shall not be permitted to lean out into empty space for finding out the loading and unloading of such material;

p. When hoisting of load is done in an enclosed space, neither the lifting material nor the boom shall project outside the enclosed space;

q. Adequate steps shall be taken to prevent a load, in the course of being hoisted or lowered from coming into contact with any object to avoid any displacement of such load and appropriate appliances provided and used for guiding heavy loads when raising or lowering heavy loads to avoid crushing of hands of building workers during such raising or lowering of loads.

## 7.14. HOISTS

a. Hoist towers shall be designed according to the relevant national standards;

b. Hoist shafts shall be provided with rigid panels or other adequate fencing at the ground level on all sides of such shafts and at all other levels on all sides of the access to such shafts while the walls of hoist shafts, except at approaches, extend at least two meters above the floor or platform of access to such shifts;

c. Approaches to hoist shall be adequately lit and provided with gates that shall be guarded to maintain visibility at least of two meters height; and equipped with a device, which requires such gate to be closed before the platform of such hoist can leave the landing, and prevents the gate from being opened unless such platform is at the landing;

d. The guides of hoist platforms shall offer sufficient resistance to bending and to bucking in the case of jamming, by providing a safety catch;

e. Overhead beams and their supports are capable of holding the total maximum live and dead loads that such beams and supports will be required to carry, with a safety factor of at least five;

f. A clear space shall be provided –

   i. Above the highest stopping place of a cage or platform to allow sufficient unobstructed travel of such cage or platform in case of over-winding and

   ii. Below the lowest stopping place of such cage or platform;

g. Adequate covering shall be provided above the top of hoist shafts to prevent materials from falling into such shifts;

h. Outdoor hoist towers shall be erected on adequately firm foundations and securely braced, guyed and anchored;

i. A ladder way shall extend from the bottom to the top of every outdoor hoist tower in case no other ladder way exists within easy reach and such ladder way shall comply with the relevant national standards;

j. The rated capacity of a hoisting engine shall at least be one and a half times the maximum load that such engine will be required to move;

k. All gearing on a hoisting engine shall be securely enclosed;

l. Steam piping of hoisting engine shall be adequately protected against accidental contact of such piping with a building worker;

m. Electrical equipment of a hoisting engine shall be effectively earthed;

n. A hoist shall be provided with suitable devices to stop a hoisting engine as soon as the platform of such hoist reaches its highest stopping place;

o. A hoisting engine shall be protected by suitable cover against weather and falling objects;

p. A hoisting engine set up in a public thoroughfare shall be completely enclosed;

q. All exhaust steam pipes shall discharge steam in such a manner that the steam so discharged does not scald any person or obstruct the operator's view;

r. The motion of a hoist shall not be reversed without first bringing it to rest to avoid any harm from such reverse motion;

s. A hoist not designed for the conveyance of persons shall not be set in motion from the platform of such hoist;

t. Pawls and ratchet wheels of a hoist, requiring disengagement of such pawls from such ratchet wheels, before the platform of such hoist is lowered, shall not be used;

u. A platform of a hoist shall be capable of supporting such maximum load that such platform may carry with a safety factor of at least three;

v. A platform of a hoist shall be equipped with suitable safety gear which can hold such platform with its maximum load in case its hoisting rope breaks;

w. On platform of a hoist, the wheel barrows or truck shall be efficiently blocked in safe positions;

x. A cage of a hoist or platform where the building workers are required to enter into such cage or to go on such platform at landing levels, shall be provided with a locking arrangement to prevent such cage or platform from moving during the time a worker enters or leaves such cage or platform;

y. The sides of platform of a hoist which are not used for loading or unloading, shall be provided with toe-board and enclosures of a wire mesh or any other suitable means to prevent the fall of any part of a load from such platform, further provided that

   i. The platform of a hoist, which has any probability of falling of any part of a load from it, shall be provided with an adequate covering to prevent such fall;

   ii. The counter weights of a hoist consisting of an assemblage of several parts shall be so constructed that such parts shall be rigidly connected together;

   iii. The counter weights of a hoist shall run between guides;

   iv. At every level of work the building workers shall be provided with adequate platforms for performing such work;

   v. A legible notice in Hindi as well as in a local language shall be displayed in a conspicuous place of the platform of a hoist and that such notice shall state the maximum carrying capacity of such hoist in kilograms on the hoisting engine;

   vi. On a hoist authorized and certified for the conveyance of the persons on the platform or in the cage and such notice shall state the maximum number of persons to be carried on such hoist at one time;

   vii. On a hoist carrying goods and other materials such notice shall state that such hoist is not meant for carriage of persons.

### 7.15. FENCING AND MEANS OF ACCESS TO LIFTING APPLIANCES

a. Safe means of access shall be provided to every part of lifting appliances;

b. The operator's platform on every crane or tip driven by mechanical power shall be securely fenced and provided with safe means of access and where access to such platform is by a ladder, the sides of such ladder shall extend to a height reasonable beyond such platform or some other suitable handhold shall be provided in the platform;

c. The handling place on such platform shall be maintained free from obstruction and slipping; and

d. In case the height of such ladder exceeds six meters, the resting platforms shall be provided on such ladder at every six meters of its height and where the distance between last platform so provided and the top end of such ladder is more than two meters then on such top end.

### 7.16. RIGGING OF DERRICKS:

Every derrick shall have current and relevant rigging plans and any other information necessary for the safe rigging of such derrick and its gear.

### 7.17. SECURING OF DERRICK FOOT:

Appropriate measures shall be taken to prevent the foot of a derrick from being lifted out of its socket or supports.

## 7.18. CONSTRUCTION AND MAINTENANCE OF LIFTING GEAR

a. Every lifting gear shall be –

i. of good design and construction, sound material and adequate strength to perform the work for which it is used;

ii. free from patent defects; and

iii. properly maintained in good repair and working order;

b. Components of the loose gear, at the time of its use, shall be renewed if one of its dimensions at any point has decreased by ten per cent or more;

c. A chain shall be withdrawn from use when it is stretched and increased in length which exceeds five per cent of its length or when a link of such chain is deformed or is otherwise damaged or defects in the welds have appeared on it;

d. Rings, hooks, swivels and end links attached to a chain shall be of the same materials as that of such chain;

e. The voltage of electric supply to any magnetic lifting device shall not fluctuate by more than **plus** or **minus** 10%.

## 7.19. TEST AND PERIODICAL EXAMINATION OF LIFTING GEARS

a. A lifting gear shall be initially tested for the manufacturer by a competent person in a manner specified as per schedule annexed before taking into use or after undergoing any substantive alterations which renders its any part liable to affect its safety and such gear alter such test shall subsequently be retested for the use of its owner at least once in every five years;

b. A lifting gear in use shall thoroughly examined once at least in every twelve months by a competent person;

c. A chain in use shall be thoroughly examined at least once every month by a responsible person for its use;

d. Certificates of initial and periodical test and examinations of loose gears shall be obtained in the form annexed.

## 7.20. ROPES

a. No rope shall be used for building or other construction work unless -

i) It is of good quality and free from patent defects; and

ii) In the case of wire rope, it shall be tested and examined by a competent person in the manner annexed;

iii) Every wire rope of lifting appliance or lifting gear used for building or other construction work shall be inspected by a responsible person for such use, once at least in every there month;

b. Provided that after if any such wire is broken in such rope, the responsible person shall thereafter inspect it once at least in every month and ensure that;

c. No wire rope shall be used for building or other constructing work if in any length of eight diameters of such wires, the total number of visible broken wires exceed ten per cent of the total number of wires in such rope, or such rope shows signs of excessive wear, corrosion or other defects which in the opinion of the person who inspects it, is unfit for use;

d. Eye splices and loops of ropes for the attachment of hooks, rings and other such parts to wire rope shall be made with suitable thimble;

e. A thimble or loop splice made in any wire rope sling shall conform to the following standards, namely:

   i) Wire rope sling shall have at least three tucks with full strand of rope and two tucks with one-half of the wires cut out of each of such strand in all cased, such strands shall be tucked against the lay of the rope;

   ii) Protruding ends of such strands in any splice of wire rope slings shall be covered or treated so as to leave no sharp points;

   iii) A fiber rope or a rope sling shall have at least four tucks, tail of such tuck being whipped in a suitable manner; and

   iv) A synthetic fiber rope or rope sling shall have at least four tucks with full strands followed by further tuck with one-half filaments cut out of each of such strand and final tuck with one-halt of the remaining filaments cut out from such strands. Any portion of the splices containing such tucks, with reduced number of filaments, shall be securely covered with suitable tape or other materials;

   v) Provided further that nothing contained above shall apply where any other form of splice, which may be shown to be as efficient as the splice with above standards, shall be used.

## 7.21. HEAT TREATMENT OF LIFTING GEARS

a. All chains other than bridle chains attached to derricks and all rings, hooks, shackles and swivels used in hoisting or lowering of such derricks shall be effectively annealed under supervision of a competent person and at the following intervals, namely:

   i) Such chains, rings, hoods, shackles and swivels which are not more than twelve and a half millimeter of length annealed at least once in every six months; and

   ii) All other such chains rings hooks shackles and swivels shall be so annealed at least once in every twelve months;

b. Provided that the clause (a) above shall not apply to -

   i) Pitched chins, working on sprocket or sprocket wheels;

   ii) Rings, hooks and swivels permanently attached to pitched chains, pulley blocks or weighing machines, and

   iii) Hooks and swivels having ball bearings or other case hardened parts;

c. A chin or a loose gear made of high tensile steel or alloy steel shall be plainly marked with a mark indicating that it is so made;

d. No chain or loose gear made of high tensile steel or alloy steel shall be subjected to any form of heat treatment except where such treatment is necessary for the purpose of repair of such chain or loose gear and that such repair shall be made under the direction of the competent person;

e. That the wrought iron gear, the past history of which is not traceable, shall be suspected of being heat treated at incorrect temperature shall be normalized before using it on any building or other construction work.

### 7.22. CERTIFICATE TO BE ISSUED AFTER ACTUAL TESTING AND EXAMINATION ETC:

A competent person shall issue a certificate after actual testing or examination of the apparatus specified and record of such test or examination shall be maintained for inspection.

### 7.23. REGISTER OF PERIODICAL TEST, EXAMINATION AND CERTIFICATION THEREOF

a. A register in the form annexed shall be maintained and particulars of such test and examination of lifting appliances, lifting gears and heat treatment as required shall be entered in such register;

b. Certificate in respect of each of the following shall be obtained from a competent person:

   i) In cases of initial and periodical test and examination of the lifting appliances such as Winches, Derricks and their accessory gears, Cranes or Hoists and their accessory gears;

   (ii) In case of test, examination and re-examination of loose gears;

   (iii) In case of test and examination of wire ropes;

   (iv) In case of heat treatment and examination of loose gears;

   (v) In case of annual thorough examination of the loose gears, except where required particulars of such exemption have been enclosed in the register referred to in Form annexed and such certificates are attached to the register referred to as above and certificates kept at such construction site in case such register and certificate relate to lifting appliances, loose gear and wire ropes and

c. Produced on demand and retained for at least five years after the date of the last entry made in such register;

d. No lifting appliance or lifting gear in respect of which an entry is required to be made in register referred to above and certificate of test and examination are required to be attached in such register in the manner as specified, shall be used for building or other construction work unless the required entries have been made in such register and certificates.

### 7.24. VACUUM AND MAGNETIC LIFTING GEAR

a. No vacuum lifting gear, magnetic lifting gear or any other lifting gear where the load on it is held by adhesive power, shall be used while workers are performing operations beneath such gear;

b. A magnetic lifting gear used in connection with building or other construction work shall be provided with an alternative supply of power, such as batteries, which may come into operation immediately in the event of failure of the main power supply;

c. No building worker shall work within the swinging zone of the lifting gear or load or building or other construction material suspended to such lifting gear.

### 7.25. KNOTTING OF CHAINS AND WIRE ROPES:

No chain or wire rope with a knot in it shall be used in building or other construction work.

### 7.26. CARRYING OF PERSONS BY MEANS OF LIFTING APPLIANCES ETC.

a. No building worker shall be raised, lowered or carried by a power driven lifting appliance, except
   i. On the drive's platform in the cage of a crane; or
   ii. On as hoist; or
   iii. On an approved suspended scaffold;

b. Provided that a building worker may be raised, lowered or carried by a power driven lifting appliance:
   i. In circumstances where the use of a hoist or of a suspended scaffold shall not reasonably be practicable, or
   ii. On an aerial cableway or aerial ropeway, provided further that the following requirements are met:
   iii. That the appliance referred to above can be operated from one position only and that
   iv. Any winch used in connection with the appliance shall also comply with the requirements as laid down above.

c. The appliance referred to above shall not carry any person except:
   i. In a chair or cage,
   ii. In a skip or other receptacle at least three feet deep which shall be suitable for safe carriage of a person and any such chair, cage, skip or other receptacle shall be made of good construction, sound material, and adequate strength and properly maintained with suitable means to prevent any occupant therein from falling out of it and shall be free from any material or tools which may interfere with the handhold or foothold of such occupant or otherwise endanger him; and
   iii. Those suitable measures shall be taken to prevent the chair, cage skip or other receptacle from spinning or tipping in a manner dangerous to any occupant therein.

### 7.27. HOISTS CARRYING PERSONS

a. No building worker shall be carried with the help of a hoist unless it is provided with a cage which:
   i) Is so constructed as to prevent, when its gates are shut, any building worker carried by such hoist from falling out of it or from being trapped between any part of such cage and any fixed structure or other moving part of such hoist or from being struck by articles or materials falling down the hoist way on which such hoist is moving; and
   ii) Is fitted on each of its side from which access is provided to a landing place with a gate which has efficient interlocking or other devices to secure so that such gate cannot be opened except when such cage is at a landing place and that such cage cannot be moved away from any such place until such gate is closed;

b. Every gate in the hoist way enclosure of such hoist used for carrying persons shall be fitted with efficient interlocking or other devices to secure so that such gate cannot be opened except when the cage of such gate is at the landing place and that such cage cannot be moved away from the landing place until such gate is closed;

c. In every hoist used for carrying building workers there are provided with suitable and efficient automatic devices to ensure that the cage of such hoist comes to rest at a point above the lowest point to which such gave may travel.

## 7.28. ATTACHMENT OF LOADS

a. When a sling is used to hoist long materials, a lifting beam shall be used to space the sling legs for proper balance and when a load is suspended at two or more points with slings, the eyes of the lifting legs of such slings shall be shackled together and such shackled or eyes of the shackled slings shall be placed on the hook or the eyes of such lifting legs shall be shackled directly to the hoisting block, ball or balance beam, as the case may be;

b. Every container or receptacle used for raising or lowering stone, bricks tiles, slates or other similar objects shall be so enclosed with the hoist as to prevent the fall of such objects;

c. A loaded wheel barrows placed directly on a platform of a hoist for raising or lowering of such wheel barrows shall be so secured that such wheel barrows cannot move and such platform shall be enclosed to prevent the fall of the contents kept in such wheel barrows;

d. Landings of hoists shall be so designed and arranged that building workers on such hoist be not required to lean out into empty space for loading and unloading on any material from such hoist

## 7.29. TOWER CRANES

a. No person other than the operator trained and capable to work at heights shall be employed to operate tower cranes;

b. The ground on which a tower crane stands shall have adequate bearing capacity;

c. Bases for tower cranes and trucks for rail mounted tower cranes shall be firm and leveled and such cranes erected at a reasonably safe distance from excavations and operated within gradient limits as specified by the manufacturer of such cranes;

d. Tower cranes shall be sited where there is a clear space available for erection, operation and dismantling of such cranes;

e. Tower cranes shall be sited in such a way that the loads on such cranes shall not be handled over any occupied premises, public thoroughfares, railways or near power cables, other than construction works for which such cranes are used;

f. Where two or more tower cranes are sited and operated, every care shall be taken to ensure positive and proper communication between operators of such cranes to avoid any dagger or dangerous occurrences;

g. Tower cranes shall not be used for loading magnet, or demolition ball service, piling operation or other similar operations which could impose excessive load stresses on the crane structure of such cranes;

h. The instruction of the manufacturer of a tower crane and standard safe practices regarding such cranes shall be followed while operating or using such cranes.

## 7.30. QUALIFICATION OF OPERATOR OF LIFTING WINCHES AND OF SIGNALER ETC.

a. No person shall be employed to drive or operate a lifting appliance whether driven by mechanical power or otherwise or to give signals to driver of operator of such lifting appliance or to work as an operator of a rigger or derricks unless he is

i) Sufficiently competent and reliable;

ii) Possesses the knowledge of he inherent risks involved in the operation of lifting appliance;

iii) Medically examined periodically as specified and

iv) Is above eighteen years of age.

# 8.0 SAFETY IN THE USE OF TRANSPORT, EARTHMOVING EQUIPMENT & OTHER CONSTRUCTION MACHINERY

## 8.1 EARTHMOVING EQUIPMENT AND VEHICLES

a. All vehicles and earthmoving equipment shall be made of good material, proper design and sound constructional and be sufficiently strong for the purpose for which such equipment are properly used in accordance with standard safe operating practices;

b. Provided that the truck or trailer employed for transporting freight containers shall be of the size sufficient to carry the containers, without over hanging and provided with twist locks conforming to approved standards, at all the four corners of each of such use by an authority under the relevant law for the time being in force and is inspected by a responsible person, at least once in a month and record of such inspection shall be maintained:

c. All transport or earth moving equipment and vehicles shall be inspected at least once a week by a responsible person and in case any defend is noticed in such equipment or vehicle it shall be immediately taken out of use;

d. Power trucks and tractors shall be equipped with effective brakes, headlights and tail lamps and maintained in good repair and working order;

e. Side stanchions on power trucks and trailers for crying heavy and long objects shall be

   i. Of sound construction and free from defects;

   ii. Provided with tie chains attached to the top across the loads for preventing such stanchions from spreading out; and

   iii. Kept in position while loading and unloading;

   iv. Safe gangways provided for to and fro movement of building workers engaged in loading and unloading of lorries, trucks, trailers and wagons;

   v. Trucks and other equipment shall not be loaded beyond their safe capacity and carry workers engaged in loading and unloading of lorries, trucks trailers and wagons in an unsafe condition;

   vi. Handles of trucks shall be so designed as to protect the hands of the building workers working on such trucks, or such handles provided with knuckle guards;

   vii. No unauthorized person shall ride the transport equipment employed in such work;

   viii. A driver of a transport equipment shall maneuver such equipment under the direction of a signaler;

   ix. Adequate precaution such as isolating the electric supply or erecting overhead barriers of a safe height shall be taken when earth moving equipment or vehicles are required to operate in dangerous proximity to any live electric conductor;

   x. Vehicles and earth moving equipment shall not be left on a slope with the engine of such vehicles or equipment running;

xi. All earth moving equipment, vehicles or other transport equipment shall be operated only by such person who are adequately trained and possess such skills as required for safe operation of such equipment, vehicle or other transport equipment.

### 8.2. POWER SHOVELS AND EXCAVATOR

a. A shovel or an excavator whether operated by steam or electric or by internal combustion, shall be constructed, installed, operated, tested and examined as per approved standards;

b. Excavator equipped for use as a mobile crane shall be examined and tested in accordance with the requirements for such mobile cranes as laid down by the manufacturer; and

c. Fitted with an automatic safe working load indicator;

d. Buckets or grabs of power shovels shall be propped to restrict the movement of such buckets or grabs while being repaired or while the teeth of such buckets or grabs are being changed.

### 8.3. BULLDOZER

a. Operator of every such bulldozer before leaving the dozer shall take the following steps:

i) Apply the brakes;

ii) Lower the blade and sipper and

iii) Put the shift lever into neutral;

iv) Dozer left on level ground at the close of the work for which such bulldozer is used;

v) The blade of a bulldozer kept low when such bulldozer is moving uphill;

vi) The bulldozer blades not used as brakes except in an emergency.

### 8.4. SCRAPERS

a. A tractor and scraper shall be joined by safety line at the time of its operation;

b. The scraper bowls shall be propped while blades of such scraper are being replaced;

c. A scraper moving downhill shall not be left in gear.

### 8.5. MOBILE ASPHALT LAYERS & FINISHERS

a. A mixture elevator shall be located within a wooden or sheet metal enclosure with a window for observation, lubrication and maintenance;

b. Bitumen scoops shall have adequate covers;

c. When asphalt plants are working on public road, adequate traffic control shall be established on such road and the building workers working with such plant provided with reflective jackets;

d. A sufficient number of fire extinguishers shall be kept in readiness at such workplace where fire hazards may exist;

e. The materials shall be loaded on the elevator after the drying drain has warmed up of such elevator;

f. No open light shall be used for ascertaining the level of asphalt;

g. Inspection opening shall not be opened till there is a pressure in the boiler, which may cause injury to building workers.

### 8.6. PAVERS:

Pavers shall be equipped with guards suitable to prevent building workers from walking under the skip of such pavers.

**8.7. Road rollers:** Before a road roller is used on the ground, such ground shall be examined for its bearing capacity and general safety, especially at the edges of slopes such as embankment on such grounds and shall not be moved downhill with the engine out of gear.

### 8.8. GENERAL SAFETY IN RESPECT OF POWERED CONSTRUCTION MACHINERY

a. Every vehicle or earthmoving equipment shall be equipped with -

i) Silencers;

ii) Tail lights

iii) Power and hand brakes;

iv) Reversing alarm; and

v) Search light for forward and backward movement, which are required for safe operation of such vehicle or earthmoving equipment;

b. The cab of vehicle or earthmoving equipment shall bee kept at least one meter from the adjacent face of a ground being excavated;

c. When cranes of shovel are traveling, the boom of such crane or shovel shall be in the direction of such travel and the bucket or scoop attached to such crane or shovel raised and without load except when such traveling is downhill.

# 9.0 SAFETY IN THE PROVISION OF RUNWAYS AND RAMP

## 9.1. USE OF RUNWAYS AND RAMPS:

a. Runway or ramps shall not be less than 430 mm in width and constructed of not less than 25 mm thick planking or any other material of adequate strength to withstand the required load, supported substantially in relation to the span and braced with such runway or ramp, and design and construction of such runway or ramp shall be in accordance with the approved standards;

b. Every runway or ramp located more than 3 m above the floor or ground shall be on open sides and provided with a guardrail of adequate strength and height of not less than 1 m.

c. Use of runways and ramps by vehicles:

   i. All runways and ramps shall be of sound construction, strength and securely braced and supported;

   ii. Every runway or ramp for the use of transport equipment like trailers, trucks or heavier vehicles shall have a width of not less than 3.7 m and provide with timber curbs or any other material of adequate strength with not less than 200 mm by 200 mm in width placed parallel to, and secured to, the sided of such runway or ramp and such runways or ramps or ramps shall be designed in accordance with the approved standards.

## 9.2. SLOPE OF RAMPS:

Every ramp shall have a slope not exceeding one in four and the total rise of a continuous ramp used by building workers carrying material or using wheelbarrows shall not exceed 3.7 m, unless broken by horizontal landing of at least 1.2 m in length.

## 9.3. USE OF RUNWAYS OR RAMPS BY WHEELBARROWS, ETC.

a. Every runway or ramp used for wheelbarrows and carts or hand trucks shall not be less than 1 m width and constructed of not less than 50 mm thick planking, and supported and braced suitably for such use;

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

# 10. SAFETY IN HANDLING AND USE OF EXPLOSIVES

## 10.1 GENERAL PROVISIONS:

a. The use of explosives shall be carried out in a safe manner to avoid injury to any person and under the direct supervision of a responsible person;

b. No person other than authorized and competent one shall be allowed to handle and use explosives;

c. Before using any explosive, necessary warning and danger signals shall be erected, at conspicuous places of such use to warn the building workers and the general public of the danger involved in such use.

d. No person other than authorized and competent one shall be allowed to handle and use explosives.

e. Smoke, open lamps, other type of hot or heat producing items and sparks shall be prohibited in or near explosives magazines or while explosives are being handled, transported or used.

f. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors or dangerous drugs.

g. The explosives shall be accounted for at all times. No explosives or blasting agents shall be abandoned.

h. No fire shall be fought where the fire is in the imminent danger of contact with explosives. All employees shall be removes to a safe area and the fire area shall be guarded against intruders.

i. Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including but not limited to visual and audible warning signals, flags, or barricades to ensure employee safety.

j. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by induced voltage, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity or otherwise. These precautions shall include:

k. Short-circuiting of detonators in holes, which have been primed and shunted until wired into the blasting circuit.

l. The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.

m. The prominent display of adequate signs, warning against the use of radio transmitters, on all roads within 1000 ft of blasting operations. Whenever adherence to the 1000 ft distance would create an operational handicap, a competent and expert person shall be consulted to evaluate the particular situation, and an alternative provided, which are adequately designed to prevent any premature firing of electric blasting of caps. A description of any such blasting shall be reduced to writing and shall be certified as meeting the purposes of this subdivision by the competent person consulted. The description shall be maintained at the construction site during the duration of the work, and shall be available for inspection.

n. Empty boxes and paper and fiber packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

o. Explosives, blasting agents and blasting supplies that are obviously deteriorated or damaged shall not be used.

p. Delivery and issue of explosives shall only be made authorized persons into authorized magazines or approved temporary storage or handling areas.

q. Blasting operations in the proximity of overhead power lines, communication lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken. In such situations controlled blasting shall be restored to.

r. All loading and firing shall be directed and supervised by competent persons thoroughly experienced in this field.

s. Loaded boreholes shall not be left unattended after the end of the shift.

t. Suitable and sufficient means of egress to ground level shall be provided in all cases of excavations, trenches, all other places where explosives are handled above or below ground level.

u. At an appropriate time before the final blasting warnings, workers in the area shall be removed to a designated safe place.

v. An unmistakable, audible, final warning shall be sounded one minute prior to the detonation of explosives; after completion, when the person in charge has established that safe conditions prevail, an “all clear” shall be sounded.

w. To prevent persons entering any danger zone during blasting operations notices shall be given to all concerned.

x. Notices referred above shall indicate:

   i. that explosives are in use;

   ii. the audible warning sound and the “all clear” and state when they will be sounded; and

   iii. the warning flags in use, including an “all clear” flag.

y. Precautions against lightning shall be provided in accordance with the Indian Electricity Act and Indian Explosives Act and Rules and regulations framed there under.

z. Package containing explosives shall not be dragged, dropped or handled roughly.

aa. Non-sparking tools shall be used to open keys.

bb. The explosives shall not be carried in the box or otherwise on any individual.

cc. Nothing shall be inserted in the open end of the blasting cap except fuses.

dd. Deteriorated or damages explosives shall not be used but shall be disposed or destroyed strictly in accordance with the approved methods and in the doing so the manufacturers or the appropriate authority's instructions shall be followed.

ee. lightning shall be in accordance with Indian Electricity Act/Rules

## 10.2. TRANSPORTATION OF EXPLOSIVES

a. Keep safe distance and to use non-sparking tools while opening packages containing explosives;

b. Stop the use of explosives and handling thereof while the weather conditions are not suitable for such use or handling;

c. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by induced voltage, lightning, adjacent power-lines, dust storms or other sources of extraneous electricity or otherwise. These precautions shall include –

   i. Suspension of all blasting operations and evacuation of persons;

   ii. All warning signs shall be displayed within 200 m of blasting operations and in case putting up a sign at 200 m is impractical, the contractor shall consult the Engineer-in-charge for alternatives;

   iii. All loading and firing shall be directed and supervised by competent persons thoroughly experienced in the field;

   iv. To prevent persons entering any danger zone during blasting operations, notices shall be given to all concerned;

d. In addition to these provisions, all measures and precautions that are required to be observed for use, handling, storing or transportation of explosives under the Rules framed under the Explosives Act, 1884 (4 of 1884) shall be observed;

e. All the relevant statutory provisions, local laws and rules and regulations shall be complied with.

f. Where the magazine is located near the construction site and blasting operation continues daily, actual requirement of explosives shall be drawn from the magazine and transported to the site. Any leftovers shall be returned to the magazine each time after the blast. In case of work at scattered places and for a small duration, portable magazines shall be used and kept within a fence in safe place and properly guarded.

g. For carrying higher quantity (more than 5 kg of explosives) specially designed insulated containers shall be used. These containers shall be constructed of finished wood not less than 5cm thick or plastic not less than 6mm thick or pressed fibre not less than 10mm thick. There shall be no metal parts (not even nails, bolts, screws etc.) and the containers shall be provided with suitable non-conductive carrying device, such as rubber, leather or canvas handle or strap.

h. Vehicles to be used for transportation explosives shall be in good working condition and shall have a tight wooded or non-sparking metal (copper, brass and the like) floor with sides and

ends high enough to prevent the explosives from failing off the vehicle. In open bodied vehicles, the explosives shall be covered with a waterproof and fibre tarpaulin.

i. Electrical wiring in vehicle shall be fully insulated so as to prevent the danger of short-circuiting and at least two fire extinguishers of carbon dioxide type shall be carried. The vehicle shall be properly marked indicating adequate warning to the public in regard to the nature of cargo.

j. No metals except approved metal truck shall be allowed to come in contact with cases of explosives, metal, flammable, or corrosive substance shall not be transported with explosives. As far as possible, transportation of any material along with explosives shall be prohibited.

k. Smoking shall be prohibited in the vehicle carrying explosives.

l. No unauthorized person shall be allowed in the vehicle, carrying explosives.

m. Loading and unloading of explosives shall be done carefully.

n. Explosives and detonators or blasting caps shall not be permitted to be transported in the same vehicle.

o. Detonators and other explosives for blasting shall be transported to the site of work in the original containers or in securely locked separate non-metallic containers and shall not be carried loose or mixed with other materials.

## 10.3. STORAGE OF EXPLOSIVES AND BLASTING AGENTS

a. Explosives and related materials shall be stored in approved facilities.

b. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents.

c. Smoking and open flames shall not be permitted within 50 feet of explosives and detonators storage magazine.

d. No Explosives or blasting agents shall be permanently stored in any underground area until the area has been developed to the point where at lease two modes of exit have been provided.

e. Permanent underground storage magazine shall be at least 300 feet from any shaft or other active under ground working area.

f. Permanent underground magazines containing detonators shall not be located closer than 50 feet to any magazine containing other explosives or blasting agents.

## 10.4. DRILLING AND LOADING

a. Before planning out the drilling operations for blasting purposes, nature of stratum and the over burden shall necessarily be examined to avoid possibilities of landslides after blasting.

**b.** The face or rock shall be carefully examined before drilling to determine the presence of unfired explosives**.** No attempt shall be made to drill at a site if un-detonated explosives are suspected. In such case the boreholes shall be thoroughly cleaned before a cartridge is

inserted. Wooden tamping rods (not pointed, but cylindrical throughout) shall be used in the charging the holes. The cartridge will be on the top.

**c.** The borehole shall be carefully checked for length, presence of water dust, etc. with a wooden temping pole or a measuring tape before loading.

d. Surplus explosives shall not be stacked near working areas during loading/unloading.

e. The line of detonating fuse extending into a borehole shall be cut from the spool before loading the remainder of the charge.

f. A bore shall not be loaded with explosives after springing (enlarging the hole with explosives) or upon completion of drilling without making sure it is cool and it does not contain any hot smoldering material. Temperatures in excess of $65^{o}$ C are dangerous.

g. A bore near another hole loaded with explosives shall not be sprung.

h. No force shall be used for inserting cartridges or any explosives into a bore hold or pass any obstruction in a borehole.

i. No force shall be used for inserting a blasting cap or an electric blasting cap into explosive. The cap shall be inserted into a hole made with a pickers designed for the purpose. A hitch of the electric blasting cap leading wire shall be made on the primer cartridge so as to prevent pulling out the electric blasting cap from the explosive charge. In case of fuse, the fuse shall be tied to the explosive cartridge so that the blasting cap is not pulled out. Care shall be taken so that the blasting cap is not pulled out. Care shall be taken so that the electric blasting cap, leading wire or the length of the fuse does not get damaged during loading of the charge.

j. No attempt shall be made to slit, drop, deform or abuse the primer.

k. Blasting caps or electric blasting caps shall not be connected to detonating fuse except by methods recommended by the manufacturers of caps.

l. Explosive cartridge shall not be cut, nor explosive removed from the cartridge for use.

m. Metallic devices of any kind shall not be used in tamping. Wooden tamping tools with not exposed metal parts except non-sparking metal connectors for jointed poled shall be used. Violent tamping shall be avoided. Primer shall not be tamped.

n. Care shall be taken to confine the explosives in the bore hold with sand, earth clay or other suitable combustible stemming material.

o. Kinking or injuring of fuse or electric blasting cap wires shall be avoided when tamping.

## 10.5. ELECTRICAL SHOT-FIRING CIRCUIT

a. In deciding the sizes of wires, fuses, circuits, blasting switches, etc., instructions issued by the manufacturers of these articles shall be followed, if they do not contradict with Indian Explosives Act or framed under it.

b. No person shall attempt to uncoil the wires and open out the short-circuited bare leading wires of the electric blasting cap during approach of dust storm or near any source of large

charge of static electricity or near a radio transmitter. The manufacturer of the cap or the Inspectorate of Explosives shall be consulted regarding the distance from the transmitter beyond which electric short firing shall be conducted.

c. Firing circuit shall be kept completely insulated from the ground of the other conductors, such as wires, rails, pipes or other paths or stray current.

d. There shall not be any electric live wires or cables of any kind near electric blasting caps or other explosives except at the time and for the purpose of firing the blast.

e. All electric blasting caps shall be tested singly and also when connected in a circuit in series using only an approved type of circuit continuity tester or ohmmeter.

f. No attempt shall be made to use in the same circuit either electrical blasting caps made by more than one manufacturer or electric blasting caps of different design or function even if made by the same manufacturers unless such use is approved by the manufacturers.

g. No attempt shall be made to fire a circuit of electric blasting caps with less than the minimum current specified by the manufacturer of that electric blasting cap.

h. Care shall be taken to ensure that all wire ends to be connected are bright and clean.

i. The electric cap wires or leading wires shall be kept short circuited until ready to fire.

j. When energy for blasting is taken from power circuits the voltage shall not exceed 220v. The wiring controlling arrangements shall conform to the following:

k. The blasting switch shall be strictly according to the specifications, externally operated double-throw switch, which when locked in the open position will short circuit and ground the leading wires. The switch shall be installed at the location where the firing is to be controlled.

l. A 'safety' switch of the same type as the blasting switch shall be installed between the blasting switch and the firing circuit and lead lines, at a distance not to exceed 180cm from the blasting switch.

m. Both the safety switch and the blasting switch shall be locked in the open position immediately after the shot and before any person is permitted to return to the blasting area. Key to the switches shall remain in the possession of the blaster at all times.

n. Rubber covered or other adequately insulated copper wires in good condition shall be used for firing lines and shall have solid cores of appropriate gauge. Sufficient firing line shall be provided to permit the blaster to be located at a safe distance from the blast. Single conductor lead lines shall be used.

o. Blasting operations in the proximity of overhead power lines, communication lines, utility lines, or other structures shall not be carried on until the operator or the owner, or both of such lines as been notified and precautionary measures deemed necessary, have been taken.

p. All holes loaded on a shift shall be fired on the same shift.

q. As far as possible, blasting shall be carried out using suitable exploder with 25 per cent excess capacity. Electric power from the mains shall be used only when it is absolutely necessary.

## 10.6. SHOT-FIRING WITH SAFETY FUSE

a. The fuse shall be carefully handled to avoid damaging the covering. In very cold weather the fuse shall be slightly warmed before using so as to avoid cracking the waterproofing.

b. Short fuse shall not be used. The length of a fuse shall not be less than 120cm. The rate of burning of the fuse shall be known and it would be necessary to make sure that it will take sufficient time in burning so as to enable all persons to reach a place of safety. The burning rate of the fuse shall not be more than 60 cm/min.

c. The fuse shall not be cut until the operation to insert the fuse into a blasting cap is ready. The fuse shall be cut off about 2.5 to 5 cm to ensure a dry end. It shall be cut squarely across with a clean and sharp blade. The fuse shall be seated lightly against the cap charge and care shall be taken to avoid twisting after it has been placed in position.

d. Blasting caps shall not be crimped by any means except by a cap crimper designed for the purpose. It shall be necessary to make sure that the cap is squarely crimped to the face.

e. The fuse shall be lighted with a fuse lighter designed for the purpose. If a match is used, the fuse shall be slit at the end and the match head held in then slit against the power core and then the match head rubbed against an abrasive surface to light the fuse.

f. The fuse shall not be lighted until sufficient stemming has been placed over the explosives to prevent sparks of live match heads from coming into contact with the explosives.

g. The explosives shall not be held in hands when lighting the fuse.

## 10.7. UNDERGROUND WORK

a. Only permissible explosives and in the manner as specified by the appropriate authority shall be used.

b. Excessive quantities of explosives shall not be taken underground at any time. Black blasting powder or pellet powder shall not be used with any other explosive in the same borehole.

## 10.8. BEFORE AND AFTER FIRING

a. Before firing, sufficient warning shall be given to enable the people working in the area to get off the danger zone. The danger zone shall be suitable cordoned off and flag men posted at important points.

b. No loose materials, such as tools, drilling implements etc. Shall be left on the rock surfaces to be blasted.

c. Blasting in the open shall be carried out during the fixed hours every day or on fixed days in the week. This information shall be amply publicized and the following precautions observed:

d. On the project sites, where blasting operations are carried out, daily blasting hours shall be clearly printed on the sign-boards on all the roads approaching that area.

    i. Road closing barriers should be provided to close the traffic on these roads, at least 400 meters away when the firing is to take place.

ii. The beginning of the firing shall follow loud sirens and similarly loud sirens shall succeed the completion of the firing.

e. The shot-firer shall not be allowed to return to the blasting site after firing, until at least 5 min have elapsed. In case of electric shot firing, the shot holes shall be examined after firing and in case of misfire no person shall be allowed to approach the blasting site for at lease 5 min. In case of shot firing with safety fuse, utmost care shall be taken to count the number to ensure that all the shots have fired and in the event of misfire, no person shall be allowed to approach the blasting site for at least 30 min. In any case, a careful inspection for the remaining un-detonated explosive shall be made after firing the shots. All misfired shot holes shall be cross-marked. No other person than those duly authorized shall approach the holes until one of the following operations has been performed in respect of each of the misfired holes:

f. If the misfire is due to a faulty cable or faulty electrical connection the defect shall be remedied and the shot fired.

g. The stemming shall be floated out by use of water or air jet from hose until the hole has been opened to within 60 cm of the charge, whereupon water will be siphoned or pumped out, then a fresh new charge placed and duly detonated. Or

i. A careful search shall be made of unexploded material in the debris of the charge.

ii. If a shift charge is unavoidable, the person in-charge of one shift before leaving the work shall inform the person relieving him for the next shift of any cases misfired and shall point out their position duly cross marked and also state clearly what action has to be taken in the matter.

Note: The rules are made considering statutory provisions and other National/International standards. However, if any statutory provision overruling these laws is made, the statutory provisions shall overrule the NTPC Rules.

# 11.0 SAFETY IN EXCAVATION & TUNNELING WORK

## SAFETY IN EXCAVATION

### 11.1GENERAL PROVISIONS

a. Before undertaking any activity, the soil shall be tested and in case of availability of any explosive gas, necessary arrangements must be made to remove/dilute such gases and in case they are found to be toxic or poisonous, the workplace must be purged and continuous ventilation maintaining the contamination below the permissible level ensured;

b. The position of underground installations such as sewers, water pipes and electrical cables shall be verified and in case of their existence, they must be isolated;

c. If they cannot be isolated or removed or shutdown, they shall be fenced, hung up or otherwise protected. On every part likely to be visited by persons or where transport vehicles ply, the area shall be suitably fenced, guarded or barricaded to prevent fall of persons, vehicles or livestock into the excavated area;

d. Warning signs shall be erected and the in the night hours the area shall be illuminated to warn pedestrians and vehicular traffic;

e. Arrangements shall be made to prevent external vibrations due to rail/road traffic;

f. Blasting shall be carried out in accordance with the norms applicable in this regard. Special care shall be taken to control the impact of vibrations/tremor caused by blasting to protect excavations from cave-ins;

g. Arrangements shall be made to save other buildings/structures in the affected zone or in the vicinity of the area of excavation, from collapse;

### 11.2 SHORING AND TIMBERING

a. Site of excavations, where workers are exposed to danger from moving ground, shall be made safe by maintaining due slope not exceeding the angle of repose of different types of soil or otherwise by shoring, portable shields or other effective means;

b. All trenches in the soil, other than rock or hard compact soil more than 1.5 m deep into which men enter, shall be securely shored and timbered under the supervision of a competent person and only the trained workers shall be allowed to substantially alter or dismantle the shoring or timbering;

c. All struts, braces and walls in excavation shall be adequately secured so as to prevent their accidental displacement;

d. In all excavations in soft or fissured rock or hard soil exceeding 2 m in depth, except those which are sloped to within 1.5 m of the bottom into which men enter, shall be securely shored and timbered;

e. Where the sides of the excavations are sloped as outlined above, but not within the 1.5 m of the bottom, vertical sides shall be shored and the shoring shall extend at least 30 cm above the vertical sides. When open spaced sheathing is used, a toe-board shall be provided to prevent material rolling down the slope and falling into the excavated.

## 11.3. SHEATHING

a. The sheathing should be placed against the side of the trench so that length of each piece of sheathing is vertical. It should be held securely in place against the wales by ensuring that sheathing is kept firmly pressed against the wall of the trench. Where the trench excavated is loose, sandy or soft soil or soil which has been previously excavated or soil which is under hydrostatic pressure, each piece of sheathing shall be driven into the bottom of the trench so as to firmly hold it in place;

b. Where two or more pieces of sheathing are used one above another, the sheathing shall be so arranged that the lower pieces of sheathing shall overlap the lowest wales supporting the piece of sheathing next above it. These pieces of sheathing shall be firmly driven into the soil and securely supported by wales and struts, as the trench is made deeper.

## 11.4. WALES

a. The wales shall be parallel to the bottom or the proposed bottom of the trench. Each wale shall be supported on cleats spiked to the sheathing or by posts set on the wales next below it and in the case of the lowest wale on the bottom of the trench itself. Where necessary, wedges may be provided between a wale and the sheathing it supports so that roughly uniformity is given to all individual pieces of sheathing.

## 11.5. STRUTS

a. Struts shall be horizontal and at right angles to the wales or sheathing supported thereby. Struts shall be cut to the proper length required to fit in tightly between the wales. Where necessary, the struts shall be held securely in place by wedges, driven between the struts and the wales;

b. Struts shall be placed on cleats spiked or bolted to the posts supporting the Wales.

## 11.6. LOOSE SITE MATERIALS:

No loose material shall be kept very close to the excavation creating possibility of its fall into the excavated area. A safe distance of at least 1 m shall be maintained.

## 11.7. PLANT & MACHINERY:

Movement of vehicles and heavy equipment shall be kept at a distance least equal to the depth of the excavation or at least 6 m for excavation deeper than 6 m and the workers shall be provided with proper tools.

## 11.8. MEANS OF ACCESS

a. For trenches deeper than 1.5 m, safe means of access and egress shall be provided at intervals of every 15 m. Where it is not possible to provide safe means of access and egress as above, ladders shall extend from the bottom of the trench to at least 90 cm above the ground;

b. Walkways, runways and sidewalks shall be kept clear of excavated materials or other obstructions and no side walls shall be undermined-undercut unless it is capable of carrying a minimum live load of 125 lbs per square feet;

c. If planks are used for raising walkways, runways or sidewalks, they should be parallel to the length of the walk and fastened together against displacement;

d. Lone worker shall not be allowed to work in the excavated area.

### 11.9. INSPECTIONS:

A competent person shall make inspections every day and necessary measures shall be taken to safeguard against possible cave-ins or slide or collapse of the excavations.

### 11.10. NOTIFICATION OF INTENTION TO CARRY OUT EXCAVATION AND TUNNELING WORK

a. Within thirty days, prior to the commencement of such excavation or tunneling work, the contractor shall inform in writing the detailed layout plans, method of construction and schedule of such excavation or tunneling work to the Engineer in-charge of NTPC;

b. In case compressed air is used in such excavation or tunneling work or any work incidental to or required for such excavation or tunneling work, the technical details and drawings of all man-locks and medical-locks together with names and addresses of all construction medical officers duly qualified and so appointed by such contractor for the purpose of such excavation or tunneling work shall be sent to the Engineer in-charge.

### 11.11. PROJECT ENGINEER

a. The contractor undertaking any excavation or tunneling work shall appoint a Project Engineer for safe operation of such projects;

b. Such Project Engineer shall exercise overall control of the operations and the activities at such project and be responsible for carrying out the activities safely.

### 11.12. RESPONSIBLE PERSON

a. The contractor undertaking excavation or tunnel ling work at construction site of a building or other construction work shall appoint a responsible person for safe operation of such excavation or tunneling work;

b. The name and addresses of such responsible persons shall be forwarded to the Engineer in-charge;

c. Duties and responsibilities of the responsible person referred to above person shall include

   i. To carry out smoothly such excavation or tunneling work;

   ii. To inspect and rectify any hazardous situation relating to such excavation or tunneling work;

   iii. To take remedial measures to avoid any unsafe practice or conditions relating to such excavation or tunneling work.

### 11.13. WARNING SIGNS AND NOTICES

a. Suitable warning signs or notices, required for the safety of building workers carrying out the work of an excavation or tunneling, shall be displayed or erected at conspicuous places in Hindi

and in language understood by the majority of such building workers at such excavation or tunneling work;

b. Such warning signs and notices with regard to compressed air working shall include:

   i) The danger involved in such compressed air work;

   ii) Fire and explosion hazards;

   iii) The emergency procedures for rescue from such danger or hazards.

## 11.14. REGISTER OF EMPLOYMENT

a. The contractor shall ensure that at a construction site of a building or other construction work where an excavation or tunneling work is being carried on, a register of employment of building workers carrying out such excavation or tunneling work is maintained and produced on demand;

b. Periods of work of such excavation or tunneling work shall be maintained in a register on day-to-day basis and such register shall be produced on demand

## 11.15. ILLUMINATION

a. All contractors carrying out excavation or tunneling work at a construction site of a building or other construction work shall provide for emergency generators on such construction site to ensure adequate illumination at all work places where such excavation or tunneling work is being carried out;

b. In case of power failure, all workplaces where excavation or tunneling works are carried out shall be adequately illuminated

## 11.16. PNEUMATIC TOOLS:

Supply lines to pneumatic tools used within a tunnel are fitted with water trap or safety chain or safety wire, as the case may be.

## 11.17. STABILITY OF STRUCTURE DURING GENERAL EXCAVATION & TUNNELING:

The contractor shall ensure that where there is any doubt as to the stability of any structure adjoining the workplace or other areas to be excavated or where tunneling work is to be carried out –

a. The Project Engineer shall arrange for measures like underpinning, sheet piling, shoring, bracing or other similar means to support such structure and to prevent injury to any building worker working adjacent to such structure or damage to property or equipment adjacent to such structure;

b. Where any building worker engaged in excavation is exposed to hazard of falling or sliding material or article from any bank or side of such excavation which is more than 1.5 m above his footing, such worker shall be protected by adequate piling and bracing against such bank or side;

c. The excavation and its vicinity shall be checked by a responsible person after every rain, storm or other occurrences carrying hazards and in case a hazard is noticed at such checking, adequate protection against slides and cave-in to prevent such hazard shall be provided;

d. Temporary sheet piling installed for the construction of a retaining wall after excavation shall not be removed, except on the advice of the responsible person after an inspection carried out by such responsible person;

e. Where banks of an excavation are undercut, adequate shoring shall be provided to support the material or article overhanging such bank;

f. Excavated material shall not be stored at least 0.5 m from the edge of an open excavation or trench and the banks of such excavation or trench shall be stripped of loose rocks and other materials which may slide, roll or fall upon a building worker working below such bank;

g. Adequate and suitable warning signs shall be put-up at conspicuous places at the excavation work to avoid any person falling into the excavations or trenches;

h. The responsible person shall ensure at the excavation that no building worker is permitted to work where such building worker may be struck or endangered by the excavation machinery or material or article used in such excavation.

### 11.18. SAFE ACCESS AND EGRESS:

Ladders, staircases or ramps are provided, as the case may be, for safe access to and egress form excavation where the depth of such excavation exceeds one point 1.5 m and such ladders, staircases or ramps comply with the relevant national standards.

### 11.19. TRENCHES

a. A trench or excavation shall be protected against falling of a person by suitable measures if the depth of such trench or excavation exceeds 1.5 m and such protection shall be an improved protection in accordance with the design and drawing of a Professional Engineer, where such depth exceeds 4 m;

b. Where the depth of a trench requires two lengths of sheet piling, one above the other, the lower piling shall be set inside the bottom strings or wales of the upper piling and such sheet piling shall be driven down and braced as the excavation continues;

c. All metal sheet piles used in excavation or a trench shall be welded end-to-end and secured by other similar means.

### 11.20. POSITIONING AND USE OF MACHINERY:

Any machinery used in excavation and tunneling work shall be positioned and operated in such a way that such machinery will not endanger the operator of such machinery or any other person in the vicinity.

### 11.21. BREATHING APPARATUS:

Suitable breathing apparatus shall be provided to a building worker while working in compressed air environment for his use at excavation or tunneling work and such breathing apparatus shall be maintained in good working condition at all times.

## 11.22. SAFETY MEASURES FOR TUNNELING OPERATIONS

a. Where there is a danger of falling or sliding of material from the roof face or wall of a tunnel, adequate measures such as shoring, supporting by means of rock bolts, segments or steel sets shall be taken for the safety of building workers;

b. The excavated areas shall be made safe by use of suitably designed and installed steel sets, rock bolts or similar other safe means;

c. The responsible person shall examine and inspect the workplaces in a tunnel before the commencement of work in such tunnel and at regular intervals thereafter to ensure safety of the building workers in such tunnel;

d. The portal areas of a tunnel with loose soil or rock, likely to cause injury to a person shall be adequately protected with supports.

## 11.23. SURROUNDINGS OF A SHAFT

a. Surroundings of a shaft used in excavation or tunnel work shall be protected from being washed away by construction of sufficient height;

b. Where a building worker is required to enter a shaft at an excavation or tunneling work, safe means of access shall be provided for such entry;

c. Every shaft at excavation or tunneling work shall be provided with a steel casing, concrete piping, timber shoring or other materials of adequate strength for the safety of building workers working in such shaft;

d. Such casing and bracing shall be provided to shafts at an excavation or tunneling work according to the appropriate design for such casing and bracing;

e. A reinforced concrete raft and beam shall be provided around the opening of a shaft at an excavation or tunneling work if the ground surrounding such opening is unstable or unsafe.

## 11.24. LIFT FOR SHAFT:

Lift shall be provided for transport of building workers and materials or articles at an excavation or tunneling work required to descend more than 50 m in a shaft.

## 11.25. MEANS OF COMMUNICATION

Reliable and effective means of communication such as telephone or walkie-talkie shall be provided and maintained in working order for arranging better and effective communication at an excavation or tunneling work at the following locations, namely:

i. Working chamber of an excavation;

ii. Intervals of hundred meters along the tunnel;

iii. Working chamber side of a man lock near the door of such man lock;

iv. Interior or each chamber of a man lock;

v. Location conspicuous lock attendant's situation;

vi. A compressor plant;

vii. A first-aid station, and

viii. Outside the portal or the top of a shaft;

ix. Such number of bells and whistles shall be made available at all times at the locations as are necessary for the safety of persons at such locations.

### 11.26. SIGNALS:

The standard audio or video signals shall be used in excavation or tunneling work and conspicuously located or displayed near entrance to the workplace and in such other locations as may be necessary to bring such signals to notice of all building workers employed in such excavation or tunneling work.

### 11.27. CLEARANCES

a. The minimum lateral clearances of 0.5 m shall be maintained between any part of a vehicle and any fixture or any equipment used in an excavation or tunneling work after allowing the throw or swing of such fixture or equipment;

b. The overhead clearance for a locomotive drive at excavation or tunneling work shall not be less than 1.20 m above the seat of such driver and not less than 2 m above the platform where such driver stands or of any other dimension in accordance with the approved standard.

### 11.28. SHELTERS:

The adequate number of shelters for the safeguard of the building workers are provided where, in the course of working, they are liable to be struck by a moving vehicle or other material handling equipment in a tunnel.

### 11.29. USE OF INTERNAL COMBUSTION ENGINE:

No internal combustion engine shall be used underground in excavation or tunneling work unless such engine is so constructed that the air entering the engine gets cleared before entry and the engine emits no fumes or sparks.

### 11.30.INFLAMMABLE OILS:

Inflammable oils with the flash point below the working temperature that is likely to be encountered in a tunnel shall not be used in excavation or tunneling work.

### 11.31. COUPLING AND HOSES:

All high-pressure hydraulic hoses and couplings shall be adequately protected against any possible damage in excavation or tunneling work.

### 11.32. HOSE INSTALLATION:

All hydraulic lines and plants working at a temperature exceeding 750 c shall be protected by adequate insulation or otherwise against accidental human contact in excavation or tunneling work.

### 11.33. FIRE RESISTANT HOSES:

No fire hydraulic hoses other than fire resistant hydraulic hoses are used when hydraulically activated machinery and equipment are employed in tunnels.

### 11.34. FLAMEPROOF EQUIPMENT:

Only flameproof equipment of appropriate type as per approved standards shall be used where there is a danger of flammable or explosive atmosphere being prevalent inside the tunnel.

### 11.35. STORING OF OIL AND FUEL UNDERGROUND:

All oils, greases or fuels stored underground in excavation or tunneling work shall be kept in tightly sealed containers and in fire resistant areas at safe distances away from explosive and other flammable chemical and appropriate flameproof installation shall be used in such storage areas.

### 11.36. USE OF GASES UNDERGROUND

a. Petrol or liquefied petroleum gas or any other flammable substances shall not be used or stored inside the tunnel except with the prior approval of the Project Engineer;

b. After the use of the petroleum or liquefied petroleum gas, or highly inflammable substances, all remaining petroleum or liquefied petroleum gas or highly inflammable substances shall be removed immediately from such tunnel;

c. No oxy-acetylene gas shall be used in a compressed air environment in excavation or tunneling work.

### 11.37. WATER FOR FIRE FIGHTING

a. Adequate number of water outlets shall be provided on excavation or tunneling work and readily made accessible throughout the tunnel for fire fighting purposes and such water outlets shall be maintained for effective fire lighting;

b. All air locks shall be equipped with fire fighting facilities at excavation or tunneling work;

c. An audible fire alarm shall be provided to warn the building workers whenever a fire breaks out on an excavation or tunneling work;

d. Adequate number and types of fire extinguishers, in accordance with relevant national standards, shall be provided and made readily available to fight any outbreak of fire at an excavation or tunneling work;

e. Fire extinguishers with vaporizing liquids and high pressure carbon dioxide shall not be used in tunnels or other confined spaces;

f. The instructions regarding steps to be followed to fight outbreak of fire, at an excavation or tunneling work, written in Hindi or local language understood by the majority of the building workers employed on such excavation or tunneling work, shall be displayed at conspicuous and vulnerable places of such excavation or tunneling work.

### 11.38. FLOODING

a. Water tight bulkhead doors shall be installed at the entrance of a tunnel to prevent flooding during a tunneling work where more than one tunnel is driven from a shaft;

b. All necessary measures shall be taken to ensure that no building worker is trapped in any isolated section of a tunnel when any bulkhead door of such tunnel is closed;

c. Where there is likelihood of flooding or water rushing into a tunnel during a tunneling work, arrangements shall be made for immediate starting of water pumps to take out water of such flooding or water rushing and for giving alert signals to the building workers and other persons to keep them away from danger.

d. Airtight steel curtains shall be provided in areas liable to flooding at tunneling work and in case of descending tunnels, such curtains shall be provided in the top half of such tunnels to ensure the retention of pockets of air for rescue purpose.

### 11.39. REST SHELTERS

a. Where building workers employed in a compressed air environment in a tunneling work are required to remain at the work site for one hour or more after de-compression from pressure exceeding one bar, adequate and suitable facilities shall be provided for such building workers to rest;

    a. Every man-lock, medical-lock and any other facility inside these locks in a tunneling work shall be maintained in a clean state and in good repairs;

    b. A first-aid room shall be provided and readily available at a construction site of a tunneling work;

    c. Each man-lock attendant at the station shall be provided with a first-aid box.

### 11.40. PERMISSIBLE LIMIT OF EXPOSURE OF CHEMICALS

a. The working environment in a tunnel or a shaft in which building workers are employed shall not contain any of the hazardous substances in concentrations beyond the permissible limits;

b. The responsible person referred to shall conduct necessary test before the commencement of a tunneling work for the day and at suitable intervals as fixed by the Engineer in-charge, to ensure that the permissible limits of exposure are not exceeded and a record of such test shall be maintained and made available for inspection.

### 11.41. VENTILATION:

All working areas in a free air tunnel shall be provided with the approved ventilation system and the fresh air supplied in such tunnel shall not be less than 6 $m^3$ per minute for each building worker employed underground in such tunnel and the free air-flow movement inside such tunnel not less than 9 $m^3$ per minute.

### 11.42. AIR SUPPLY INTAKE POINT:

The air intake points for all air compression shall be located at places where such intake air does not get contaminated with dust, fumes, vapor and exhaust gases or other contaminants.

### 11.43. EMERGENCY GENERATORS

a. Every compressed air system in a tunnel shall be provided with emergency power supply system for maintaining continued supply of compressed air in such compressed air system, which shall be capable of operating air compressor and ancillary systems of such compressed air system;

b. The emergency power supply system shall be maintained and made readily available at all times.

### 11.45. AIR MAINS:

Every air-main supplying air to the working chamber, man-lock or medical-lock used at an excavation or tunneling work shall be protected against accidental damage and where it is not practicable to provide such protection, a stand-by air-main shall be provided.

### 11.46. BULKHEAD AND AIR LOCKS

a. A bulk head or air tight diaphragms retaining compressed air, when used within a tunnel or a shaft, shall be constructed to withstand the maximum pressure at 1.25 the maximum working pressure of such bulk head or diaphragm and such bulk head or diaphragm shall be tested before its each use by a responsible person to ensure that such bulk head or diaphragm is in proper working order;

b. Such responsible person shall keep the record of each test and such record shall be produced for inspection.

c. The bulk head or diaphragm shall be made of sound material of adequate strength, which shall be able to withstand the maximum pressure on which they are subjected to at any time of their use;

d. A bulkhead anchorage and air lick shall be tested at its work place at an excavation or tunneling work immediately after their installation at such place.

### 11.47. DIAPHRAGM:

All diaphragms, which are in the form of horizontal decks across a shaft used at excavation or tunneling work, shall be securely anchored

### 11.48.PORTABLE ELECTRICAL HAND TOOLS:

All portable electrical hand tools and inspection lamps used underground or in a confined space shall be operated at a voltage not exceeding 24 V.

### 11.49. CIRCUIT BREAKER

a. Adequate numbers of differential ground fault circuit breakers shall be installed for every electrical distribution system and its sub-systems used at an excavation or tunneling;

b. Work and the sensitivity of each of circuit breaker shall be adjusted in accordance with the requirement set out in accordance with the approved standards;

c. No semi-enclosed fuse unit shall be used in underground place.

### 11.50. TRANSFORMER:

The contractor shall ensure no transformer is used in any section of a tunnel under compressed air unless such transformer is of the dry type and conforms to the approved standards.

### 11.51. LIVE WIRES:

There shall be no exposed live wire in working areas at an excavation or tunneling work which are accessible to building workers other than those authorized to work on such live lines.

### 11.52. WELDING SETS:

All welding sets used in a tunnel shall be of adequate capacity and of suitable type, duly approved.

### 11.53. QUALITY AND QUANTITY

a. Every working chamber at an excavation or tunneling work where compressed air is used, the supply of such air shall be maintained at not less than 0.3 $m^3$ per minute per person working therein;

b. A reserve supply of compressed air shall be made available at all times for man-locks and medical locks used at a tunneling work;

c. The air supplied in a compressed air environment at a tunneling work shall be, as far as practicable, free from contaminants, namely, dust, fumes and other toxic substances.

### 11.54. WORKING TEMPERATURE:

The temperature in any working chamber at an excavation or tunneling work where building workers are employed shall not exceed $29^0$ c and the arrangement shall be maintained for kipping records in which the temperatures measured by dry bulb and wet bulb inside such working chamber once in every hour and for producing such records for inspection on demand.

### 11.55. MAN-LOCKS AND WORKING IN COMPRESSED AIR ENVIRONMENT

a. Man-locks used at a tunneling work shall be of adequate strength, made of sound material and designed to withstand any pressure, internal or external, to which it may be subjected in the normal use or in an emergency;

b. Doors of man-locks at an excavation or tunneling work shall be made of steel and used at a tunneling work for keeping the work airtight and devices shall be provided for sealing the doors when such locks are under pressure. The anchorage of a man-lock used at tunneling work shall have adequate strength to withstand the pressure exerted by air on the man-lock. There shall be adequate room available for the workers for working in the man-locks;

c. Where work is carried out in any compressed air tunnel, a Man-lock in accordance with the approved standards shall be used;

d. Where a man-lock is used, safety Instructions in Hindi and in local language understood by majority of building workers employed there, shall be displaced at conspicuous places;

e. Except in an emergency, compression and de-compression operations shall be carried out in a man-lock and in an emergency any material-lock may be used;

f. A record of compression and de-compression shall be kept in writing and produced for inspection on demand;

g. Material lock shall be used with the permission of the Engineer in-charge where it is impracticable to install both the man-lock and the material-lock at;

h. The man-lock at tunneling work shall not be used for any purpose

i. other than compression or de-compression of building workers;

j. No de-canting of building workers at tunneling work shall be carried

k. out without prior approval of the Engineer in-charge except in an emergency;

l. In case a building worker collapses or is taken ill during his de-compression in a man-lock, the lock attendant of such man-lock shall raise the pressure to a level equal to the maximum pressure which that building worker was exposed to in the working chamber prior to such de-compression and such lock attendant shall immediately report the matter relating to such collapse to the medical lock attendant and medical officer on duty;

m. A building worker who had previously received training with a trained building worker to work in a compressed air environment at tunneling work shall be employed to work independently in such a compressed air environment;

n. A building worker who had undergone three de-compressions from a pressure exceeding one bar in a period of eight hours at tunneling work shall not be allowed to enter a compressed air environment except for the purpose of carrying out rescue work;

o. A building worker employed in a compressed air environment for a period of eight hours in a day at tunneling work shall not be employed again in such environment unless he has spent not less than twelve consecutive hours of rest at atmospheric pressure;

p. No building worker shall be engaged in a compressed air environment at a pressure, which exceeds three bars at a tunneling work unless prior permission, in writing, has been obtained from the Engineer in-charge;

q. No building worker shall be employed in a compressed air environment for more than fourteen consecutive days in a month;

r. A register of employment of all building workers in compressed air environment shall be maintained;

s. An identification badge shall be supplied to a building worker employed in compressed air environment;

t. The badge of a building worker shall contain particulars of his name, location of the medical-lock allotted to him for work, the telephone number of the Construction Medical Officer concerned for his treatment and the instructions in case of his illness of unknown and doubtful causes;

u. Record of all identification badges supplied to building shall be kept in a register;

v. Every building worker whose name appears in the register shall wear the badge supplied to him at all times during his duty hours;

w. Suitable warning signs shall be displayed in the compressed air for the prohibition of the following, namely:

    i) Use of alcoholic drinks;

    ii) Use and carrying of lighters, matches or other sources of ignition;

    iii) Smoking; and

iv) No entry to person who has consumed alcoholic drink

### 11.56. SAFETY INSTRUCTION:

All building workers employed in compressed air environment at tunneling work shall follow the instructions issued for their safety in the course of such employment.

### 11.57. MEDICAL-LOCK

a. A suitably constructed medical lock shall be maintained at tunneling work where building workers are employed in a working chamber at a pressure exceeding one bar;

b. Where more than one hundred building workers are employed in a compressed air working environment exceeding one bar at tunneling work, one medical-lock is provided for every one hundred building workers or part thereof and such medical lock shall be situated as near as possible to the main-lock used at such tunneling work.

# 12.0. SAFETY IN PILING WORK

## 12.1. GENERAL PROVISIONS

a. All pile driving equipment shall be of good design and sound construction, taking into account the ergonomic principles and properly maintained;

b. A pile driver shall be firmly supported on a heavy timber sill, concrete bed or other secured foundation;

c. In case a pile driver is required to be erected in dangerous proximity to an electrical conductor, all necessary precautions shall be taken to ensure safety;

d. The hoses of steam and air hammer shall be securely lashed to such hammer so as to prevent them from whipping in case of connection or break;

e. Adequate precaution shall be taken to prevent the pile driver from over turning and hammer from missing the pile;

f. A responsible person for inspecting pile-driving equipment shall inspect such equipment before taking it into use and takes all appropriate measures as required for the safety of building workers before commencing piling work by such equipment;

g. Where there is any question of stability of a structure for its adjoining areas to be piled, such structure shall be supported, where necessary, by underpinning, sheet pilling, shoring, and bracing or by other means to ensure safety and stability of such structure and to prevent injury to any person.

## 12.2. PROTECTION OF OPERATOR:

The operator of every pile driving equipment shall be protected from falling objects, steam, cinders or water by substantially covering or otherwise or by other means.

## 12.3. INSTRUCTION TO AND SUPERVISION OF BUILDING WORKERS WORKING ON PILE-DRIVING EQUIPMENT:

Every building worker working on a pile driving equipment shall be given instructions regarding safe work procedure to be followed in piling operation and shall be supervised by a responsible person throughout such work.

## 12.4. ENTRY OF UNAUTHORIZED PERSON:

The contractor shall ensure at a construction site of a buildings or other construction work that all piling areas where pile-driving equipment is in use are effectively cordoned off to prevent entry of unauthorized persons.

## 12.5. INSPECTION AND MAINTENANCE OF PILE DRIVING EQUIPMENT

a. Pile-driving equipment shall not be taken into use until it has been inspected by a responsible person and found to be safe for such use;

b. A responsible person for such inspection at suitable intervals to ensure safety to the building worker working on such equipment shall inspect pile driving equipment in use;

c. All pile lines and pulley blocks shall be inspected by a responsible person before the beginning of each shift of piling operations.

## 12.6. OPERATION OF PILE-DRIVING EQUIPMENT

a. Only experienced and trained building worker shall operate pile driving so as to avoid any probable danger from such operation;

b. Pile-driving operations shall be governed generally prevalent and accepted signals so as to prevent any probable danger from such operations;

c. Every building worker employed in pile driving operation or in the vicinity of such pile driving operation shall wear ear protection and safety helmet or hardhat and safety shoes;

d. Piles shall be prepared at a distance, at least equal to twice the length of the longest pile, from the place of pile-driving operations;

e. When a pile driver is not in use, the hammer of such pile driver shall be blocked at the bottom of the heads of such pile driver.

## 12.7. WORKING PLATFORM ON PILING FRAMES:

Where a structural tower supports the lead of a pile driver, leads at which it is necessary for the building workers to work and such platforms except on the hammer of such pile driver or lead sides of such platform and where such platforms cannot be provided with such railing and toe boards, a safety belt shall be provided to each such building worker.

## 12.8. PILE TESTING

a. The testing of pile shall be conducted under the supervision of a responsible person for such testing;

b. All practicable measures like displaying of waning notices, barricading the area and other similar measures shall be taken to protect the area where the pile testing is carried out;

c. Entry to a pile testing area shall be prohibited to general public to ensure safety.

## 12.9. PILING, SHORING AND BRACING

a. Planks used for sheet piling in excavation or tunneling work shall be of sound material with adequate strength;

b. Shores and braces used in excavation or tunneling work shall be of adequate dimensions and so placed as to be effective for their intended purposes;

c. Earth supported shores or braces used in excavation or tunneling work shall bear against a footing of sufficient area and stability to prevent the shifting of such shores or braces.

# 13.0. SAFETY IN THE ERECTION, USE AND DISMANTLING OF SCAFFOLDS

## 13.1. SCAFFOLD CONSTRUCTION

a. Every scaffold and every component thereof shall be of adequate construction, made of sound material and free from defects and safe for the purposes for which it is intended for use;

b. In case bamboo is used for scaffolding, such bamboo shall be of suitable quality, good condition, free from protruding knots and stripped off to avoid any injury to building workers during handling such bamboo;

c. All metal scaffolds used in building or other construction work shall conform to the approved standards;

**13.2. SUPERVISION BY A RESPONSIBLE PERSON:** No scaffold shall be erected, added, altered or dismantled except under the supervision of a responsible person.

## 13.3. Maintenance

a. The scaffold used in building or other construction work shall be maintained in good repairs and the measures taken against its accidental displacement or any other hazard;

b. No scaffold or part thereof shall be partly dismantled and allowed to remain in such a condition unless –

i) The stability or safety of the remaining portion of such scaffold has been ensured by a responsible person for the safety of such scaffolds;

ii) In case the remaining part of such scaffold cannot be used by the building workers, necessary warning notice written in Hindi and in a language understood by the majority of the building workers that such scaffold is unfit for use, shall be displayed at the place where such scaffold is erected.

## 13.4. STANDARDS, LEDGERS, PUTLOGS

a. Standards of a scaffold shall be plumb, where practicable, fixed sufficiently close together to secure the stability of such scaffold having regard to all the possible working situations and conditions for the intended use of such scaffold, spaced, as close as practicable, to ensure safety and stability of such scaffold;

b. Adequate measures are taken to, prevent displacement of a standard of a scaffold either by providing sole plate or a base plate, as necessary;

c. Ledgers of metal scaffold are placed at vertical intervals with due regard to safety and stability of such scaffold;

d. Bamboo ledgers are kept as nearly as possible and are placed and fastened to the standards of a scaffold with due regard to the stability of such scaffold.

## 13.5. WORKING PLATFORM

a. Working platform shall be provided around the face or edge of a building adjoining at every upper most permanent floor of such building under construction and at any level where construction work of such building is carried out;

b. A platform shall be designed to suit the number of building workers to be employed on each bay of a scaffold work on such platform and the materials or articles and tools to be carried with them in such bay;

c. The safe working load and the number of building workers to be employed in each bay of a scaffold shall be displayed for the information of all the building workers employed at such construction site.

### 13.6. BOARD, PLANK AND DECKING

a. Board, plank and decking used in the construction of a working platform shall be of uniform size and strength and shall be capable of supporting the load and number of building workers keeping in view the safety of such building workers;

b. Metal decking, which forms part of a working platform, shall be provided with non-skid surface;

c. No board or plank which forms the working platform shall be projected beyond its end support unless it is effectively prevented from tripping or lifting and board, plank or decking shall be fastened and secured;

d. At any one time, not more than two working platforms per bay, shall be used to support building workers or materials or articles at such bay;

e. Adequate measures shall be taken to prevent injury which may be caused by falling material and objects by using safety nets or other suitable means;

f. Concrete, other debris or materials shall not be allowed to accumulate at any platform on a scaffold;

g. Where a work is to be done at the end of a wall, working platform at such workplace shall be faced or, wherever practicable, at least 0.6 m beyond the end of such wall.

### 13.7. REPAIR OF DAMAGED SCAFFOLD

a. No building worker shall be permitted to work on a scaffold that has been damaged or wakened unless adequate safety measures have been taken to ensure the safety of such building worker;

b. Necessary warning signs shall be displayed at such places where repairs of scaffold are undertaken.

### 13.8. OPENING

a. There shall be no opening in any working platform except for allowing access to such working platform;

b. Wherever opening on a platform is unavoidable, necessary measures for protection against failing of objects or building workers from such platform shall be taken by providing suitable safety nets, belts or any other similar means;

c. Access from one working platform to another platform on a scaffold, if required, shall be provided with suitable and safe ladder for the use of building workers working on such platforms;

d. Every opening or shaft in the floor shall be provided with suitable means to protect the fall of a person or material by providing suitable fencing or railing of height not less than 900 mm.

**13.9. GUARDRAILS:** Every side of a working platform from which a person is liable to fall shall be provided with suitable and safe guardrails and toe board of adequate strength to prevent fall of any building worker, material or tools from such platform.

**13.10. SCAFFOLD USED BY BUILDING WORKERS OF DIFFERENT EMPLOYERS**

a. Where a scaffold or a part of a scaffold is used, which has previously been used by another employer for his building workers, such scaffold or part thereof shall be used only after its inspection and examination by a responsible person for ensuring that such scaffold or part thereof is safe and fit for such use;

b. If any rectification, alteration or modification in a scaffold or part thereof, needed to suit its use, shall be made in consultation with the responsible person.

**13.11. PROTECTION AGAINST ELECTRIC POWER LINE:**

The contractor shall ensure that all necessary and practical measures for protection are taken to prevent any building worker, working on a scaffold, from coming into contact with the electric wires or dangerous equipment.

**13.12. SCREENING NET AND WIRE NETS:**

Where a scaffold is erected in an area where the construction activities may pose hazards to pedestrians or vehicular traffic nearby from the falling of objects, wire nets or screening nets shall be used to envelope such scaffold.

**13.13. TOWER SCAFFOLD**

a. The height of every tower scaffold used in building or other construction work shall not be more than eight times the lesser to the base dimension of such scaffold;

b. A tower scaffold shall be lashed to a building or a fixed structure before being used by the building workers;

c. Any tower scaffold which can be moved or castered shall be –

   i) Constructed with due regard to the stability and, if necessary, adequately weighted at the base;

   ii) Used only on plain and even surface; and

   iii) Has casters provided with positive locking devices to hold such scaffold in position;

d. No building worker shall remain on board scaffold or leave behind tools and material when it is being shifted from one position to another position.

**13.14. GEAR FOR SUSPENSION OF SCAFFOLD**

a. Chains, ropes or lifting gears used for suspension of a scaffold shall be of adequate strength, made of sound material and suitable for the purpose of their use and maintained in good repairs;

b. Chains, wires, ropes or metal tubes used for the suspension of a scaffold shall be:

i) Properly and securely fastened to every anchorage point and to the scaffold ledgers of other main supporting members used for the support of such scaffold; and

ii) So positioned as to ensure stability of the scaffold.

### 13.15. TRESTLE SCAFFOLD AND CANTILEVER SCAFFOLD

a. No trestle scaffold shall be constructed with more than three tiers or if its working platform is more than 4.5 m above the ground or floor or other surface upon which such scaffold is erected;

b. Trestle scaffold shall be designed by professional engineer and shall have the approval of the Engineer in-charge before being taken into use.

c. No trestle scaffold shall be erected on a suspended scaffold;

d. No cantilever or jib scaffold shall be used unless it is adequately supported, fixed and anchored on opposite side of its support and have out triggers of adequate length and, where necessary sufficiently, supported and braced to ensure safety and stability of such scaffold;

e. No working platform resting on bearers let into a wall at one end and without other support shall be used unless such bearers are of adequate strength, braced through the wall and securely fastened on the other side.

### 13.16. SCAFFOLD SUPPORTED BY BUILDING

a. No part of a building shall be used as support or part of a scaffold unless such part of the building is made of sufficient strength and made of sound material to afford safe support;

b. Overhanging eaves gutters shall not be used for supporting scaffold;

c. Suspended scaffold shall be made of in accordance with the approved standards before being used by the building workers.

### 13.17. USE OF WINCHES AND CLIMBERS FOR SUSPENDED SCAFFOLD

a. No scaffold shall be raised or lowered by winches or climbers unless such scaffold is made of sound material, adequate strength and has been tested and certified safe for use of winches or climber by a competent person before being taken into use;

b. All suspended scaffolds counter-balanced by counter weights shall be of approved types before being taken into use for building or other construction work;

c. The working platform of a suspended scaffold shall be securely fastened to the building or structure as to be safe and to prevent such platform from swing;

d. The safe working load that a suspended scaffold can carry, shall be displayed where such scaffold is being used

### 13.18. SAFETY DEVICES FOR SUSPENDED SCAFFOLD

a. Every suspended scaffold, raised or lowered by the winches or climbers, shall be provided at each of its suspension point with a safety rope with automatic safety device mounted on each of such rope so that such safety rope with such automatic safety device support the platform of such

scaffold in the event of failure of the primary suspension wire ropes, winches, climbers or any part of the mechanism used for raising or lowering such suspended scaffold;

b. Provided that the clause (a) shall not apply -

i) Where the platform of such scaffold is supported at two independent suspension wire rope at or near each end of such platform so that in the event of failure of one of such suspension wire rope, the other wire rope is capable of sustaining the weights of such platform and its load and prevent it from tilting; or

ii) Where a system is incorporated which operates automatically to support the platform of such scaffold and its load in the event of failure of the primary suspension wire rope of such scaffold.

# 14.0. SAFETY IN THE ERECTION OF STRUCTURAL FRAME & FORMWORK

## 14.1. GENERAL PROVISION

a. The trained building worker under the direct supervision of a person, responsible for structural frame and formwork, shall be employed for erection of such structural frame or formwork, dismantling of building and structure and performance of and engineering work formwork, false work and shoring work;

b. Adequate measures shall be taken to guard against hazards arising from any temporary state of weakness or unsuitability of a structure.

## 14.2. FORMWORK, FALSE WORK AND SHORING

a. Formwork and false work shall be so designed, constructed and maintained that such formwork and false work are able to support the load that may be imposed on them;

b. Such formwork shall be so erected that working platform, means of access, bracings, means of handling and stabilizing could easily be fixed with such formwork.

## 14.3. ERECTION OR DISMANTLING OF STEEL AND PREFABRICATED

a. Erection or dismantling of any pre-fabricated structure shall be made safe against danger by using appropriate means such as ladders, gangways or fixed platforms, buckets, boatswains chair or other appropriate means suspended from lifting appliances, safety harness, life lines, catch nets or catch platforms, power-operated mobile working platforms etc.;

b. The work of erection or dismantling of buildings or structures or formwork or false work or shoring or any other civil engineering work shall be carried out by trained building workers under the supervision of a person responsible for such work;

c. Steel or prefabricated structures shall be so designed and made that such structures can be safely transported or erected; and weight of each unit of such structures shall be clearly marked on such unit;

d. The design of each such part shall maintain stability of each part of the structures referred to in clauses above when erected, and to prevent danger, the design shall explicitly take into account –

   i) The relevant conditions and methods of attachment in the operations of stripping, transport, storing and temporary support during erection of such parts;

   ii) Safeguards, such as provision of railings with working platforms, and for mounting such railings and platforms easily on the structural steel or prefabricated parts;

e. The hooks and softer devices built in or provided on the structural steel or prefabricate parts that are required for lifting and transporting such parts shall be so shaped, dimensioned and positioned to withstand the stresses to which such hooks or other devices are subjected;

f. Prefabricated parts made of concrete shall not stripped or erected before such concrete has set and hardened sufficiently to the extent provided for in the plans, and such parts are examined by the responsible person for any sign of damage before their use;

g. Store-places shall be so constructed that –

   i) There shall be no risk of structural steel of prefabricated parts falling or overturning;

   ii) Storage conditions shall generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions; and

   iii) Racks shall be set on firm ground and designed so that units cannot move accidentally in such store-places;

h. Structural steel or pre-fabricated parts shall not be subjected to stresses prejudicial to their stability while they are stored or transported or raised or set down;

i. Tongs, clamps and other appliances for lifting structural steel and prefabricated part shall be:

   i) In such shape and dimensions as to ensure a secure grip without damaging and marked with the maximum permissible load in the most unfavourable lifting conditions; and

   ii) Structural steel or pre-fabricated parts shall be lifted by such methods and appliances that prevent them from spinning accidentally;

j. Structural steel or pre-fabricated parts shall be provided with railings and working platforms before raising such parts to prevent any danger of falling of building workers, materials or articles at the time of any work with such parts;

k. All reasonably practical measures shall be taken to avoid injury to building workers, building structure or equipment while structural steel or pre-fabricated parts are handled or stored or transported or raised or lowered;

l. Structures shall not be worked on during violent storms or high winds or any other such hazardous situation;

m. The risk of falling to which building workers, moving on high or sloping girders, may be exposed is limited by all means of adequate collective protection or by the use of a safety harness which shall be well secured to a sufficiently strong supports;

n. Structural steel parts, which are to be erected at a great height, shall, as far as practicable, be assembled on the ground;

o. When structural steel or pre-fabricated parts are being erected, a sufficiently extended area underneath the workplace shall be barricaded or guarded;

p. Steel trusses, which are being erected, shall be adequately shored, braced or guyed until they are permanently secured in position;

q. Structural members shall not be forced into place by the hoisting machine while any building worker is in such a position that he is likely to be injured by such operation.

## 14.4. FORMWORK

a. All formwork shall be properly designed keeping in view the safety of building workers, buildings or structures;

b. A responsible person for structural frame and formwork shall –

   i. Inspect and examine the material, timber, structural steel and scaffolding for its strength and suitability before being taken into use;

   ii. Lay-down procedures to cover all stages of such structural frame and formwork;

   iii. Supervise such structural frame and formwork;

   iv. Take all necessary steps or measure to correct any situation with a view to prevent accident or dangerous occurrence during performances of such structural frame and formwork.

## 14.5. DE-SHORING

a. When shoring is removed, sufficient props shall be left in place of such shoring to prevent any possible hazard; and

b. Deshoring shall be adequately braced and tied together with support to prevent any hazard.

# 15.0. SAFETY IN CONCRETE WORK

## 15.1. GENERAL PROVISIONS REGARDING USE OF CONCRETE

a. All construction with the use of concrete or reinforced concrete shall be based on plans including specification of steel and concrete and other material to be used in such construction –

   i. Giving technical details regarding methods for safe placing and handing of such materials and indicating the type, quality and arrangement of each part of a structure of such construction; and

   ii. Explaining the sequence of steps to be taken for completion of such construction;

b. Formwork and shores used for concrete work shall be structurally safe and properly braced or tied together so as to maintain position and shape of formwork or shores;

c. Formwork structure used shall have sufficient catwalks and other secure access for inspection of such structure if such structure is in two or more tiers;

d. No machinery or any object should fall below by using wire nets, screen nets etc.

## 15.2. PREPARATION AND POURING OF CONCRETE AND ERECTION OF CONCRETE STRUCTURE

a. A building worker handling cement or concrete shall –

   i) Wear close-fitting clothing, gloves, helmet or hardhat, safety goggles, proper footwear and respirator or mask to protect himself from danger in such handling;

   ii) Keep as much of his body covered as is required to protect himself from danger in such handling;

   iii) Take all necessary precautions to keep cement and concrete away from his skin in such handling;

b. Lime pits shall be fenced or enclosed and filled and emptied by such devices, which do not require workers to go into the pit;

c. Moving parts of the elevators, hoists screens bunkers, chutes, grouting equipment used for concrete work and of other equipment used for storing, transport and other handling ingredients of concrete shall be securely fenced to avoid contact of building workers with such moving parts;

d. Screw conveyors used for cement, lime and other dusty materials shall be completely enclosed.

## 15.3. BUCKETS

a. Concrete buckets used with cranes or aerial cableways shall be free from projections from which accumulations of concrete could fall;

b. Movements of concrete buckets shall be governed by signals necessary to avoid any danger by such movements.

## 15.4. PIPES AND PUMPS

a. A scaffolding carrying a pipe for pumped concrete shall be strong enough to support such pipe at a time when such pipe is filled with concrete or water or any other liquid and carry the combined load of the all the building workers who may be on such scaffold at such time, safely;

b. Every pipe for carrying pumped concrete shall be –

   i) Securely anchored at its end point and at each curve on it;

   ii) Provided near the top of such pipe with an air release valve;

   iii) Securely attached to a pump nozzle by a bolted collar or other adequate means;

c. The operation of concrete pumps shall be governed by standard signals;

d. Building workers employed around a concrete pump shall wear safety goggles;

## 15.5. MIXING AND POURING OF CONCRETE

a. The concrete mixture shall not contain any material, which may unduly affect the setting of such concrete, weaken such concrete or corrode steel used with such concrete;

b. When dry ingredients of concrete are being mixed in confined spaces such as silos –

   i) The dust shall be exhausted at the time of such mixing and

   ii) In case the dust the dust cannot be exhausted, as specified, the workers shall wear respirators at the time of such mixing;

c. When concrete is being tipped from buckets, building workers shall be kept out of the range of any kickbacks of such buckets;

d. Loads shall not be dumped or placed on settling concrete.

## 15.6. CONCRETE PANELS AND SLABS

a. All parts of a concrete panel or concrete slab shall be hoisted uniformly;

b. Concrete panels shall be adequately braced in their final positions and such bracings shall remain in such positions until such panels are adequately supported by other parts of the construction for which such panels are used;

c. Temporary bracings of concreter panels shall be securely fastened to prevent any part of such panels from falling when such panels are being moved.

## 15.7. STRESSED AND TENSIONED ELEMENTS

a. Building workers shall not stand directly over jacking equipment while stressing of concrete girders and beams is being done;

b. A pre – stressed concrete unit shall not bee handled except at points on such unit and by the devices specified for such work by the manufacture of such devices;

c. During transport, pre-stressed concrete girders or concrete beams shall be kept upright by bracing or other effective means;

d. Anchor fittings for pre-tensioned strands of pre-stressed concrete girders of concert beams are kept in a safe condition in accordance with the instruction of manufacturer of such anchor fittings;

e. Building workers shall not stand behind jacks or in line with tensioning elements and jacking equipment during tensioning operations of pre-stressed concrete girders of concrete beams;

f. Building workers do not cut wires of pre – stressed concrete girders or concrete beams under tension before such concrete used of such girder or beams is sufficiently hardened.

## 15.8. VIBRATORS

a. A building worker, who is in good physical condition, shall operate vibrators used in concreting work;

b. All practical measures shall be taken to reduce the amount of vibration transmitted to the operators working in concreting work and

c. When electric vibrators are used in concreting work

   i) Such vibrators shall be earthed;

   ii) The leads of such vibrators shall be heavily insulated; and

   iii) The current shall be switched off when such vibrators are not in use.

## 15.9. INSPECTION AND SUPERVISION

a. A person responsible for a concreting work shall supervise the erection of the formwork, shores, braces and other supports used for such concreting work, make a through inspection of every formwork to ensure that such formwork is safe, regularly inspect the formwork, shores, braces, reshores and other supports during the placing of concrete, keep all records of inspections referred to above at the workplace relating to such inspection and produce them for inspection upon the demand.

b. Any unsafe condition, which is discovered during the inspections, shall be remedied immediately.

## 15.10. BEAMS, FLOORS AND ROOFS

a. Horizontal and diagonal bracings shall be provided in both longitudinal and transverse direction as may be necessary to provide structural stability to formwork used in concreting work and shores used in such concreting work shall be properly seated on top and bottom and secured in their places;

b. Where shores used in concreting work rest upon the ground, base plates shall be provided for keeping such shores firm and in level;

c. Where the floor to ceiling height of a concreting work exceeds 9 m or where the formwork deck used in such concreting work is supported by shores constructed in two or more tiers, or where the dead, live and impact loads on the formwork used in such concreting work exceed 700 kilogram per $m^2$, the structure of such formwork shall be designed by a professional engineer in the relevant field and the specifications and drawings of such formwork kept at such construction site and produced on demand.

d. Where a professional engineer designs the structure of the formwork used in concreting work, such engineer shall be responsible for the supervision of construction and the stability of such structure.

## 15.11. STRIPPING

a. Stripping of formwork used in concreting work shall not commence until the concrete on such formwork is fully set, examined and certified to this effect by the responsible person and record of such examination and certification is maintained;

b. Stripped forms in concreting work shall be removed or stock piled promptly after stripping from all areas in which building workers are required to work or pass;

c. Protruding nail, wire ties and other formwork accessories not required for subsequent concreting work shall be pulled, cut or otherwise made safe.

## 15.12. RE-SHORING

a. Re-shoring used in concreting work shall be provided to a slab or beam for its safe support after its stripping or where such slab or beam is subjected to superimposed loads due to construction above such slab or beam;

b. The provisions applicable to shoring in a concreting work shall also be applicable to reshoring in such work or pass.

# 16.0. SAFETY IN CONSTRUCTION, REPAIR & MAINTENANCE OF STEEP ROOFS

## 16.1.WORK ON STEEP ROOFS:

All practicable measures shall be provided to protect the building workers against sliding when carrying outwork on steep roofs.

## 16.2. CONSTRUCTION AND INSTALLATION OF ROOFING BRACKETS

a. Roofing brackets shall be constructed to fit the pitch of steep roof and such brackets shall be used to provide level working platform;

b. Roofing bracket shall be secured in its place by nailing pointed metal projections attached to the underside of such bracket and securely driven into a steep roof on which it is used or secured by a rope passed over the ridgepole and tie of such roof.

## 16.3. CRAWLING BOARDS

a. All crawling boards used for work on steep roofs shall be of adequate strength, made of sound material and of the type approved for the purpose of their use;

b. Crawling boards shall be kept in good repairs and inspected by a responsible person before being taken into use;

c. Crawling boards shall be secured to a steep roof on which it is used by ridge hooks or other effective means;

d. A firmly fastened lifeline of adequate strength shall bee strung beside each crawling board throughout its length while using such crawling boards.

# 17.0. SAFETY IN CATCHES PLATFORMS, HOARDINGS & CHUTES

## 17.1. CATCH PLATFORM

a. Catch platform shall not be used for storage of material or as a working platform;

b. Catch platform shall at least be of 2 m wide and inclined so that the position of outer edge of such platform is 1500 mm higher than the inner edge;

c. The open end of catch platform shall be properly fenced to the height not less than 1 m.

## 17.2. HOARDINGS:

Hoardings shall be constructed when the Registering Authority / Assistant Labour Commissioner considers it necessary for protection of building workers and directs such employer to construct such hoardings**.**

## 17.3. CHUTES, ITS CONSTRUCTION AND USE

a. Wooden or metal chutes which are at an angle of more than $45^0$ to the horizontal and used for the removal of materials shall be closed on all sides except at their openings used for receiving or discharging of materials or articles;

b. All openings of chutes except their top openings shall be closed when not in use;

c. Every chute –

   i. Shall be constructed of sound material, adequate strength and suitable for the purpose it is intended for use;

   ii. Exceeding 12 m in height shall be constructed in accordance with the design and drawings of professional engineer for such;

   iii. A suitable warning notice shall be displayed at conspicuous locations, written in Hindi and in a local language, at the discharge end of every chute;

   iv. Shall be cleared when debris has accumulated to a height, which can pose danger to building worker, but such clearance shall be done in no case less frequently than once a day.

# 18.0. SAFETY IN WORK ON OR ADJACENT TO WATER

## 18.1. TRANSPORT OF WORKERS BY WATER

a. When any building worker has to proceed to or from any workplace by water for purposes of carrying on a building or other construction work, proper measures shall be taken to provide for his safe transportation and vessels used for such purpose shall be in charge of a responsible person, properly equipped for safe navigation and maintained in good condition;

b. Maximum number of persons which can be safely carried in a vessel shall be marked plainly and conspicuously on such vessel and such number shall not be exceeded during use of such vessel for carrying persons;

c. Adequate protecting shall be provided to the building workers in such vessel from inclement weather;

d. Such vessel shall be manned by adequate and experienced crew;

e. In case the bulwarks of such vessel are lower than 60 cm from the level of the deck of such vessel, the open edge of such bulwarks shall be fitted with suitable fencing to a height of at least 1 m above such deck and the post and stanchions and similar parts used in such fencing shall not be spaced more than 2 m;

f. The number of life buoys on deck of such vessel shall at least be equal to the number of crew members of such vessel and shall not be less than two;

g. All life buoys on deck of such vessel shall be kept in good state of maintenance and so placed that if such vessel sinks then they will remain afloat and one of such buoys shall be within the immediate reach of the Steersman of such vessel and another is situated after part of such vessel; and

h. The position of the steersman of the vessel shall be such that he has a reasonably free view of all sides.

## 18.2. PREVENTION FROM DROWNING

a. Where, on or adjacent to the workplace of any contraction site, there is water into which a building worker employed for work on such site, in the course of his employment, may fall and has the risk of drowning, suitable rescue equipment shall be provided and kept in an efficient state of ready use and measures shall be taken to arrange for the prompt rescue of such building worker from the danger of drowning and where there is a special risk of such fall from the edge of adjacent land or from a structure adjacent to or above the water, or from floating stage on such water, secure fencing shall be provided near the edge of such land, structure or floating stage, as the case may be, to prevent such fall, and such fencing may be removed or allowed to remain unerected for the time and to the extent necessary for the access of building workers to such work or the movement of material for such work;

b. For handling rescue equipment, at least two persons knowing diving should be available at such sites.

# 19.0 SAFETY IN COFFERDAMS & CAISSONS

## 19.1 EVERY COFFERDAM AND CAISSON SHALL BE

19.1.1 Of good construction, sound material and of adequate strength, provided with adequate means for workers to reach safely at the top of such cofferdam or caisson in the event of an in rush of water and safe means of access to every place where workers shall be employed;

19.1.2 Work relating to construction, positioning, modification, dismantling of cofferdams or caissons shall be carried out under the supervision of a responsible person and inspected by the responsible person at the specified intervals;

19.1.3 A worker shall be allowed to work in a cofferdam or caisson after such cofferdam or caisson has been inspected and found safe by responsible person within such preceding period as approved and a record of such inspection maintained.

## 19.2 WORK IN COMPRESSED AIR IN A COFFERDAM OR CAISSON SHALL BE

19.2.1 Carried out in accordance with the procedure laid down;

19.2.2 Carried out by such building workers who have completed eighteen years of age and are medically examined and found fit for the work;

19.2.3 Carried out under the supervision of a responsible person;

19.2.4 If the work in cofferdam or caisson is carried out in shifts, a record of the time spent by each worker in each such shift for carrying out the wok shall be maintained in a register with particulars or time taken for the compression of such building worker, if any;

19.2.5 At every work site or project in a cofferdam or caisson, where workers are employed to work in compressed air environment, a construction medical officer assisted by a nurse or trained first-aid attendant, shall be available at all times and there shall be one standby reserve compressor to meet the emergency.

## 19.3 PRESSURE PLANT AND EQUIPMENT

19.3.1 Pressure plant and equipment for which it is used shall be –

19.3.2 Properly maintained in good repairs and working condition and fitted with a suitable safety valve or other effective device to provide maximum safe discharge pressure from being exceeded at any time; a suitable pressure gauge with a dial range not less than 1.5 time and not exceeding twice the maximum working pressure, easily visible and designed to show at all times, the internal pressure in kilogram per square centimeter and marked with the maximum safe working pressure, a suitable stop valve or valves by which the pressure plant or the system of the pressure plant may be isolated from the source supply of pressure or otherwise;

19.3.3 Every pressure plant or equipment shall be thoroughly examined by the competent person, externally, once in every period of six months; internally, once in every period of twelve months; and by hydraulic test, once in a period of four years.

# 20. SAFETY IN DEMOLITION WORK

## 20.1 PREPARATION

20.1.1 All glass or similar material or article in exterior openings shall be removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines put off and suitably capped and the concerned department of the appropriate authority informed and permission obtained wherever required before commencing;

20.1.2 Wherever it is necessary to maintain water, gas or electric line or power during such demolition, such line shall be so located or protected with substantial coverings so as to protect it from damage and to afford safety to the building workers and the general public.

## 20.2 PROTECTION OF ADJACENT STRUCTURES

20.2.1 Examination of walls etc. of adjacent structures –

i) During demolition process, the contractor shall examine the walls of all structures adjacent to the structure to be demolished to determine the thickness, method of support to such adjacent structures and;

ii) In case, such employer has reason to believe that any of such adjacent structure is unsafe or may become unsafe during such demolition process, he shall not perform demolition activity unless stability to such unsafe adjacent structu4e from collapsing has been taken. All roads and open spaces adjacent to the site of demolition work shall be closed or suitably protected by bracketing.

## 20.3 DEMOLITION OF WALLS, PARTITIONS, ETC.

20.3.1 Any demolition of walls or partitions shall be proceeded in a systematic manner as per the standard safe operating practices approved and all work above each tier of any floor beams shall be completed before the safety of the supports of such beam is impaired;

20.3.2 Masonry shall be neither loosened nor permitted to fall in such masses or volume or weight as to endanger the structural stability of any floor or structural supports;

20.3.3 No wall chimney or other structure or part of a structure shall be left unguarded in such a condition that it may fall, collapse or weaken due to wind pressure or vibration;

20.3.4 In the case of demolition of exterior walls by hand, safe footing shall be provided for the workers employed in, such walls or partitions, which are to be demolished by hand shall be not left standing more than one storey high above the uppermost floor on which persons are working.

20.4 **METHOD OF OPERATION:** The contractor shall ensure that debris, bricks and other materials or articles are removed by means of chutes, buckets or hoists and through openings in the floors.

20.5 **ACCESS TO FLOOR**

20.5.1 Safe access to and egress from every building shall be provided at all times in the course of demolition by means of entrances hallways, stairways or ladder runs which shall be so protected as to safeguard the workers using such means from falling material or articles;

20.5.2 Demolition of structural steel etc. shall be demolished column by column and tier by tier and every structural member, which is being demolished, shall not be under any stress, and such structural member shall be suitably lashed to prevent it from any uncontrolled swinging, dropping or falling or falling;

20.5.3 Large structural members shall not be thrown or dropped from the building, but carefully lowered by adopting suitable safe method;

20.5.4 Where a lifting appliance like a derrick is used for demolition, the floor on which such lifting appliance rests shall be completely planked over or supported and such floor shall be of adequate strength to sustain bearing load for such lifting appliance and its operation.

### 20.6 STORAGE OF MATERIAL OR ARTICLE

20.6.1 No materials or articles shall be not stored or kept on platform, floor or stairways of a building being demolished, provided that this clause shall not apply to the floor of a building when such floor is of such strength as to support safely the load to be superimposed by storing such material or articles;

20.6.2 No access to any stairway or passageway shall be affected or blocked by storing any material or article;

20.6.3 Suitable barricades shall be provided so as to prevent materials or articles from sliding or rebounding into any space used by the workers.

### 20.7 FLOOR OPENINGS:

Every opening used for the removal of debris from every floor which is not closed to access, except the top or working floor, shall be provided with an enclosure from such floor to its ceiling, or such opening is so barricaded that no building worker shall access to within a horizontal distance of 6.0 m from such opening through which debris is being dropped.

### 20.8 INSPECTION:

A person responsible for demolition work shall make continuous inspections during demolition process so as to detect any hazard resulting from weakened or deteriorated floors or walls or loosened materials or articles, and that no building worker shall be permitted to work where such hazard exist unless remedial measured like shoring or bracing shall be taken to prevent such hazards.

### 20.9 WARNING SIGNS, BARRICADES, ETC.

20.9.1 Barricades and warning sign shall be erected along every side throughout the length and breadth of a building or other construction work to be demolished to prevent unauthorized persons from entering into the during demolition operations;

20.9.2 During the demolition of an exterior masonry wall or a roof from a point more than 12 m above the adjoining ground level of such wall or roof, if persons below such wall or roof are exposed to falling objects, suitable and safe catch platform shall be provided and maintained at a level not more than 6 m below the working level except where an exterior built-up scaffold is provided for safe and adequate protection of such persons;

20.9.3 Suitable and standard warning signs shall be displayed or erected at conspicuous places or position at the workplace;

### 20.10 MECHANICAL METHOD OF DEMOLITION

20.10.1 The following requirements shall be fulfilled in case the mechanical method of demolition like use of swinging weight, clamshell bucket, power shovel, bulldozer or other similar mechanical methods are used for the purpose of demolition namely –

i) The building or structure or structure or remaining portion thereof shall be not more than 12 m in height;

ii) Where a swinging weight is used for demolition, a zone of such demolition having a radius of at least 1.5 times the height of the structure of portion thereof being demolished shall be maintained around the points of impact of such swinging weight;

iii) Where a clamshell bucket is being used for demolition, a zone of demolition shall be maintained within eight metres of the liner of travel of such bucket;

iv) Where other mechanical methods are being used to affect total or partial collapse of a building or other construction work, there shall be maintained, in the area into which the affected portion of such building or other construction work may fall, a zone of demolition at least 1.5 times the height of such affected portion thereof; and

v) 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, which shall be provided with substantial barricades.

# 21. FIRE EXTINGUISHERS & OTHER APPLIANCES OF FIRE FIGHTING

## 21.1 FIRE EXTINGUISHERS & OTHER MEANS OF PREVENTION AND PROTECTION

21.1.1 Every contractor shall have a fire protection and prevention plan developed and implemented keeping in view the following:

i) The specific work practices requiring fire control measures;

ii) Response measures to be taken in case of fire;

iii) Equipment required;

iv) Personnel requirements and responsibilities;

v) Schedules of daily and weekly inspection;

vi) Open flames and fires are prohibited in all underground construction;

vii) Readily visible signs to be posted in the fire prone/inflammable/explosive areas prohibiting smoking use of open flames and other hot work.

viii) A system of Permit-to-Work.

27.1.2 For the protection of the workers from the outbreak of fire, the contractor shall Provide, maintain and regularly inspect the Fire extinguishing equipment, which shall be sufficiently provided to extinguish any probable fire;

| **Suitability of portable fire extinguishers** | | | |
|---|---|---|---|
| **Class of fire** | **Type of extinguisher** | | |
| | **Water** | **DCP** | **$CO_2$** |
| **A** | **Yes** | **Yes** | **Yes** |
| **B** | **No** | **Yes** | **Yes** |
| **C** | **No** | **Yes** | **Yes** |
| **D** | **No** | **Yes** | **Yes** |
| **Electrical** | **No** | **Yes** | **Yes** |

27.1.3 Ensure availability of an adequate supply of water at ample pressure;

27.1.4 Make available

i. Adequate number of trained persons required to operate the fire extinguishing equipment;

ii. Properly maintain Fire extinguishing equipment and inspect them at regular intervals of not less than once in a year by the responsible person and a record of such inspections maintained;

27.1.5 Portable fire extinguishers provided in the operator's cabin of earthmoving machinery, material handling systems, construction equipment etc. shall be regularly inspected, maintained and replenished/refilled;

27.1.6 The operators and the helpers of such equipment shall be trained in the methods operating the equipment and fighting the fire effectively;

27.1.7 All combustion engine power equipment shall be so located that the exhausts are well away from combustible material;

27.1.8 No smoking shall be allowed at or in the vicinity of operations, which constitute fire hazards and shall be conspicuously posted with No smoking or open flame **signs**;

27.1.9 In the flammable environment as described in IS: 9570, the electrical fittings and equipment shall be of flame proof type conforming to IS: 2206 & IS; 2148;

27.1.10 Arrangements shall be made to contain sparks generated during welding, cutting or other operations and spark shall not be allowed to fall down on combustible material kept below; All means of exit shall be kept free of obstruction at all times;

27.1.11 Appropriate type of fire extinguishers according to IS: 5698 shall be kept in fully charged condition at the places which have potential risk of fire;

27.1.12 The contractor shall educate his or his sub-contractors' men working in the vicinity of fire risk, on how to operate these equipment and know in particular circumstances which type of extinguishers is to be used;

27.1.13 The contractor shall take full responsibility for the upkeep and replenishment/refilling of the fixed and portable fire extinguishers.

# APPENDIX

**Annexure I**

## IMPORTANT INDIAN STANDARDS RELATED TO SAFETY

### Personal Protection

IS: 1179-1967 Equipment for eye and face protection during welding
IS: 4770-1991 Rubber gloves for electrical purposes
IS: 8519-1977 Guide for selection of industrial safety equipment for body protection
IS: 8520-1977 Guide for selection of industrial safety equipment for eye, face & ear protection
IS: 8807-1978 Guide for selection of safety equipment for protection of arms and hands
IS: 1224-1985 Safety shoes
IS: 2925-1984 Safety helmets
IS: 8940-1978 Code of practice for maintenance and care of industrial safety equipment eye and face protection
IS: 8990-1978 Code of practice for maintenance and care of industrial safety clothing
IS: 10667-1983 Guide for selection of industrial safety for protection of foot and leg
IS: 816-1969 Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 818-1968 Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 7194-1994 Assessment of noise exposure during work for hearing conservation purposes

### Civil Engineering Construction

IS: 2750- 1967(Part II) Steel scaffolds
IS: 875-1987 Structural safety of building: loading standards
IS: 4014-1967 Code of practice for steel tubular scaffolding
IS: 3696 Safety code of scaffolds and ladders
IS: 4138-1977 Safety code for working in compressed air
IS: 4912-1978 Safety requirements for floor and wall openings, railings and toe boards
IS: 7293-1974 Safety code for working with construction machinery
IS: 9944-1992 Recommendations on safe working load for natural and man-made rope slings
BS: 1129 Portable timber ladders, steps, Trestles & lightweight staging
BS: 1139 Metal scaffolds
BS: 5973 Code of practice for access & working scaffolds
BS: 5974 Code of practice for temporary installed scaffolds and access equipment
BS: 5975 Code of practice for falsework

### Fire Protection

IS: 2190-1992 Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers
IS: 5896 Code of practice for selection, operation and maintenance of fire-fighting appliances

IS: 8433-1984 Code of practice for dissolved acetylene cylinders

**Electrical**

IS: 3043-1987 Code of practice for earthing
IS: 5424-1969 Rubber mats for electrical purposes
IS: 3646 (Part II) Artificial lightings
IS: 2148 & IS: 2206 Flame proof electrical fittings

**Machinery**

IS: 1860-1980 Code of practice for installation, operation and maintenance of electric passenger and goods lifts
IS: 1991-1987 Safety requirements for the use, care and protection of abrasive grinding wheels
IS: 5903-1970 Safety devices for gas cylinders
IS: 8216-1976 Guide for inspection of lift wire ropes
IS: 8964-978 Recommendations for safety conditions for woodworking machines
IS: 9474-1980 Principles of mechanical guarding of machinery
IS: 11461-1985 Code of practice for compressors safety
IS: 13367-1992 Code of practice for safe use of cranes

**Annexure - II**

# BASIC STRUCTURE OF SAFETY PLAN

01- Safety Policy
02- When was the Safety Policy last reviewed
03- Details of implementation procedure / methods to implement Safety Policy / Safety Rules
04- Qualification & Experience of Safety Officers
05- Review of Accidents analysis - Methods to ensure safety & health and steps identified for prevention of accidents
06- Unit/site Executive responsible for ensuring safety at various levels in the workplace
07- List of Employees trained in safety at the commencement of execution of the job; details of training – its module and contents
08- Safety Training Targets, Schedules, Methods to be adopted for providing safety training to all employees
09- Details of checklists for different jobs/ work & responsible persons to ensure Compliance
10- Regular Safety Inspection Methods and Periodicity and the list of members authorized
11- Risk Assessment, Safety Audit by professional agencies, their Periodicity
12- Implementation of recommendations of Audit / Inspections. - Procedures for implementation & follow-up
13- Provision for treatment of Injured persons at work site
14- Review of overall safety by top Management and Periodicity
15- System for implementation of statutory provisions.
16- Issue of PPE to employees, Periodicity / stock on hand, etc.

**Signature**

**Head of Organization**

**With Date & Stamp**

**Annexure - III**

## CONFINED SPACE WORK PERMIT

| | | |
|---|---|---|
| Date of Work : | Initiator: | Permit No.: |
| Description of work : | | |
| Name of person supervising: | Dept./Function: | |
| Names of workmen involved in the job : | | |
| 1 | 2 | |
| 3 | 4 | |
| Exact Location of Work: | | |
| JSA Referance No. | | |
| Job Instruction & Confirmation Sheet Ref. No | | |
| Valid From : Time ……. Date: ……. To Time: ……. Date: ……. | | |
| Other relevant information (if any) | | |

| Initiated by Engineer / Supervisor of Agency | | Checked by Agency Safety Representative | |
|---|---|---|---|
| Name | | Name | |
| Signature | | Signature | |
| Date | | Date | |

Check list for Authorization of Work Permit

| Minimum and Mandatory Precautions | | Y/ N / NA |
|---|---|---|
| 1 | Permit form filled in completely? | |
| 2 | Have wind, atmospheric, and work area conditions (e.g. cold, hot, snow, poor lighting & Ventilation etc.) been considered throughout the job so that work can be done safely? | |
| 3 | All necessary Personnel Protective Equipment like Breathing Set, Waist Rope, Light Mounted Helmet etc. is put on by all the workmen? | |
| 4 | A lifeline, a rope tied on the safety belt of the person entering the confined space is provided? | |
| 5 | All practicable measures are taken to ensure that the atmosphere inside is not deficient in oxygen and does not contain flammable vapors and no hazardous gases like H2S. (Open at least 2 manholes & keep for 2 hours)? | |
| 6 | One fully trained person is stationed at ground level/outside to assist the inside workers and emergency contact No's available? | |
| 7 | All the workers trained for emergency? | |

| | | |
|---|---|---|
| 8 | Safe means of access and egress provided? | |
| 9 | Is the suitable fire extinguisher available at work location? | |
| 10 | Are they Using only 24V lamps & working tools inside the confined space? | |

Following additional precautions need to be taken before the start of the work

**Permit Issued By:**

| | Approved by Principal Agency work in charge | Endorsed by Principal Agency HSE Dept |
|---|---|---|
| Name | | |
| Signature | | |
| Date | | |

Permit Close Out by: Name & Signature (Principal Agency)

| | |
|---|---|
| Date : | Time : |

Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.

# HOT WORK PERMIT

| | | |
|---|---|---|
| Date of Work : | Initiator: | Permit No.: |
| Description of work : | | |
| Name of person supervising: | Dept./Function: | |
| Names of workmen involved in the job : | | |
| 1 | 2 | |
| 3 | 4 | |
| Exact Location of Work: | | |
| JSA Referance No. | | |
| Job Instruction & Confirmation Sheet Ref. No | | |
| Valid From : Time ……. Date: ……. To Time: ……. Date: ……. | | |
| Other relevant information (if any) | | |

| Initiated by Engineer / Supervisor of Agency | | Checked by Agency Safety Representative | |
|---|---|---|---|
| Name | | Name | |
| Signature | | Signature | |
| Date | | Date | |

| | | |
|---|---|---|
| Exact location of work | | |
| Relevant information | | |
| Check list for Authorization of Work Permit | | |
| Minimum and Mandatory Precautions | | Y/ N / NA |
| 1 | Permit form filled in completely? | |
| 2 | Form filled in correctly and in full. | |
| 3 | Has the work area been inspected for any abnormalities - specify on wind, atmosphere, surroundings, etc. | |
| 4 | Are the necessary PPE provided and do the workmen know their use? | |
| 5 | Is the fitter, experienced and knowledgeable enough to carry out the job? | |
| 6 | Area has to be cleared of any flammables and combustible material. | |
| 7 | Electrical equipment to be protected and grounded. | |
| 8 | Are fire-fighting equipment - extinguishers, water, sand buckets etc, located nearby for ready in case of any mishap? | |
| 9 | Gas cylinders in upright state/ trolleys/ flash-back arrestors/ hose condition/ NRVs, etc. | |
| 10 | Is the area easily accessible? | |

| | | |
|---|---|---|
| Additional precautions to be taken: | | |
| This permit is valid only for one week. A fresh hot work permit has to be taken for continued works for the next week. | | |
| **Permit Issued By:** | | |
| | Approved by Principal Agency work in charge | Endorsed by Principal Agency HSE Dept |
| Name | | |
| Signature | | |
| Date | | |
| Permit Close Out by: Name & Signature (Principal Agency) | | |
| Date : | | Time : |
| Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW. | | |

## PERMIT FOR LIFTING OF MATERIAL

| | | |
|---|---|---|
| **Date of Work :** | **Initiator:** | **Permit No.:** |
| **Description of work:** | | |
| **Name of person supervising:** | **Dept./Function:** | |
| **Names of workmen involved in the job :** | | |
| | | |
| | | |
| | | |
| Exact Location of Work: | | |
| JSA Reference No. | | |
| Job Instruction & Confirmation Sheet Ref. No | | |
| Valid From : Time ……. Date: ……. To Time: ……. Date: ……. | | |
| **Other relevant information: (If any)** | | |

| | | | |
|---|---|---|---|
| **Initiated by Engineer / Supervisor of agency** | | **Checked by Agency Safety Representative** | |
| Name | | Name | |
| Signature | | Signature | |
| Date | | Date | |

| | |
|---|---|
| **Check list for Authorization of Work Permit** | |
| 1 | Details of type of crane(s) to be used? |
| 2 | Name of Lift Co-ordinator, Rigger/Crane Operator? |
| 3 | Adequate and suitable lifting gears available and in good condition |
| 4 | Have soil, wind, atmospheric, and work area conditions (e.g. cold, hot , snow, poor lighting & Ventilation etc.) been considered throughout the job so that work can be done safely? |
| 5 | Lifting Equipments, Lifting gears and Slings are tested and certified? |
| 6 | Are all operators trained, competent and healthy (Having Licenses / Experience Certificate)? |
| 7 | Are all the examinations and tests carried out on the equipment (Crane) and certified by competent persons? |
| 8 | Is the safe working load (SWL) marked on all lifting tools & tackles? |
| 9 | Lifting area cordoned off? |
| 10 | Tag lines provided to control the swing of load? |
| 11 | Load tied properly and secured against toppling and falling? |
| 12 | Signalman/Rigger is provided and competent? |
| 13 | Proper communication available between operator and rigger? |
| 14 | Is the vehicle for transportation adequate for the load? |

| | | | |
|---|---|---|---|
| **Following additional precautions need to be taken before the start of the work:** | | | |
| Permit Issue b By: | | | |
| **Approved by Principal agency work incharge** | | **Endorsed by main agency HSE Dept** | |
| Name | | Name | |
| Signature | | Signature | |
| Date | | Date | |
| Permit Close Out by: Name & Signature (Main agency) | | | |
| **Date :** | | **Time :** | |
| **Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.** | | | |

# WORKING AT HEIGHT PERMIT

| | | | |
|---|---|---|---|
| Date of Work : | Initiator: | | Permit No.: |
| Description of work : | | | |
| Name of person supervising: | | Dept./Function: | |
| Names of workmen involved in the job : | | | |
| 1 | | 2 | |
| 3 | | 4 | |
| Exact Location of Work: | | | |
| JSA Referance No. | | | |
| Job Instruction & Confirmation Sheet Ref. No | | | |
| Valid From : Time ……. Date: ……. To Time: ……. Date: ……. | | | |
| Other relevant information | | | |
| Initiated by Engineer / Supervisor | | Checked by Agency Safety Representative | |
| Name | | Name | |
| Signature | | Signature | |
| Date | | Date | |

| Check list for Authorization of Work Permit | | |
|---|---|---|
| Minimum and Mandatory Precautions | | Y/ N / NA |
| 1 | Permit form filled in completely? | |
| 2 | Work area below is temporarily cordoned/barricaded | |
| 3 | The scaffold erected has pipes and clamps in good condition. | |
| 4 | Diagonal / lateral bracings pipes are provided to ensure stability | |
| 5 | Access ladder is provided to reach the work location | |
| 6 | Planks / sheet used in temporary platform are in good condition | |
| 7 | Planks / sheets are tied properly using binding wire | |
| 8 | Temporary platform is having temporary side railing | |
| 9 | Workers are wearing Helmet, Shoes & Safety belt in good condition. | |
| 10 | For Anchoring of safety belt at height rigid support / life rope line is provided | |
| 11 | Experienced workers are engaged for work | |
| 12 | Portable elect equip/fibre body checked for its healthiness including earthing | |
| 13 | The sling / pulley blocks / ropes are tested for fitness | |

| | | |
|---|---|---|
| 14 | Workers are briefed on Safety Precautions to be taken | |
| | Power hand tools used at eight are connected through 30mA ELCB. | |

Following additional precautions need to be taken before the start of the work

**Permit Issued By:**

| | Approved by Principal Agency work in charge | Endorsed by Principal Agency HSE Dept |
|---|---|---|
| Name | | |
| Signature | | |
| Date | | |

Permit Close Out by: Name & Signature (Principal Agency)

| | |
|---|---|
| Date : | Time : |

Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.

**Annexure - IV**

# DEFINITIONS

1. **Building or other construction work:** means the construction, alteration, repairs, maintenance or demolition, of or, in relation to, buildings, streets, roads, railways, tramways, airfields, generation, transmission and distribution of power, water works, oil and gas installations, electric lines, tunnels, bridges, viaducts, pipelines, towers, cooling towers and such other work as may be specified.

2. **Building worker:** means a person who is employed by a contractor to do any skilled, semi-skilled or manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment be expressed or implied, in connection with any building or other construction work;

3. **Establishment:** means an establishment who or which employs building workers in any building or other construction work, and includes an establishment belonging to a contractor;

4. **Contractor:** means a person who undertakes to produce a given result for any establishment, other than a mere supply of goods or articles of manufacture by the employment of building workers or who supplies building workers for any work of the establishment, and includes a sub-contractor or any other agency engaged on his behalf;

5. **Employer:** in relation to an establishment, means the owner thereof that is the contractor himself.

6. **Competent Person:** means a person so approved by the Central Government who belongs to a testing establishment in India possessing adequate qualification, experience and skill for the purpose of testing, examination or annealing and certification of lifting appliances, lifting gears, wire ropes or pressure plant or equipment;

7. **Responsible Person:** means a person appointed by the employer to be responsible for the performance of specific duty or duties and who has sufficient knowledge and experience and the requisite authority for the proper performance of such duties;

8. **Danger:** means danger of accident or of injury or danger to health;

9. **Hazard:** means danger or potential danger;

10. **Hazardous substance:** means any substance, which due to its explosiveness, inflammability, radioactivity, toxic or corrosive properties and similar hazardous characteristics may Cause injury; or Affect adversely the human system; or Cause loss of life or damage to property or environment;

11. **Hazardous Process:** comprises roof work, steel erection, and work under and over water, demolition and work in confined space;

12. **National Standard:** means standards as approved by the Bureau of Indian Standards (BIS) and in the absence of such standards, the standards approved by the Central Government for a specific purpose;

13. **Lifting Appliance:** means a crane, hoist, derrick, winch, jack, pulley block or other equipment used for lifting materials, objects or building workers;

14. **Lifting gear:** means ropes, chains, hooks, slings and other accessories of a lifting appliance;

15. **Safe Operating Practice:** Means the practice followed in building and construction activities for the safety of workers and for safe operation of machinery and equipment used in such activities. Such practices shall conform to all or any of the following:

    Relevant Standards approved by BIS;

    National Building Codes;

    Manufacturer's instruction on safe use of equipment and machinery;

    Code of practice on safety in construction industry published by International Labour Organization .

16. **Safe working load**: in relation to an article of lifting gear or lifting appliance, means the load which is the maximum load that may be imposed on such article or appliance with safety in the normal conditions as assessed and certified by a competent person;

17. **Workplace**: means all places where building workers are required to be present or to go for work and which are under the control of an employer;

18. **Personal Protective Equipment (PPE):** are the protective devices made available for individual or collective use of the workers likely to be affected by the hazards of the workplace or process;

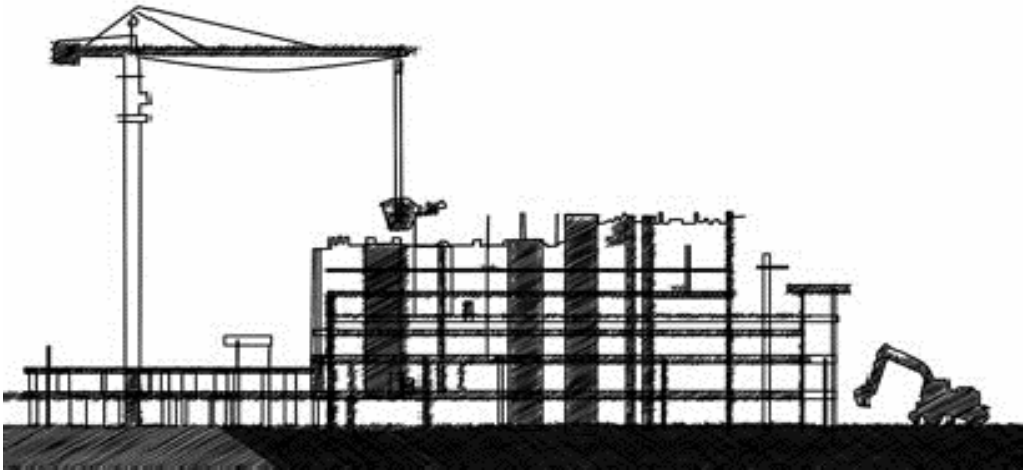
19. **Construction & Erection Manual (E&C) Rules**: all references to E&C Manual shall mean the Construction & Erection Rules that are detailed hereunder;

20. **Engineer in-charge**: All references to the Engineer in-charge shall mean the person in-charge of a building and construction of the NTPC.

21. **Interpretation of words not defined: words and expressions not defined or used in this Manual shall have the same meaning as generally assigned in common engineering practices**

# HSEP14

# Health, Safety & Environment Plan for Site Operations by Subcontractors



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# SECTION A

# CRITICAL RESOURCES FOR HSE IMPLEMENTATION

# 1. SHARING OF OPERATING COSTS OF FACILITIES

**TABLE A.1**

| SN | FACILITY |
|---|---|
| 1 | Ambulance with 24 hr. First Aid Trained Driver (Specs in Annexure A) |
| 2 | Operation of Medical center, Nurses, Medical Consumables etc. (Specs in Annexure A) |
| 3 | Training Center Consumables |
| 4 | Water sprinkling for dust suppression |
| | (Others:) |

**Note:**

i. Responsibility of operation of above facilities shall rest with BHEL
ii. Operating cost of the above shall be deducted from subcontractors on 'proportional to contract' value basis. Sample deduction table enclosed as Annexure A.1
iii. "Contract value" defined above & subsequently in the document shall be considered as "Awarded contract value".
iv. No overhead cost/ enabling cost of BHEL shall be levied on the contractors for common facilities.
v. These running costs shall be recovered from all the available subcontractors at site for the complete operational duration of the site
vi. No overheads shall be charged on shared operating costs

# 2. RESOURCES TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

**TABLE A.2**

| SN | ITEM | SPECIFICATIONS |
|---|---|---|
| 1. | HSE DISPLAYS, Posters and signage | Annexure B |
| 2. | HSE Tools/ Equipment/ Devices | Annexure C |
| 3. | Rest Sheds for Workers | Annexure D |
| 4. | Labor Colony | Annexure E |
| 5. | Toilets (Latrines & Urinals) - in Site and Labor Colony | Annexure F |
| 6. | Fire Extinguishers | Annexure G |

**Note:**

In case subcontractor fails to provide the required resources, same will be procured and deployed by BHEL with applicable overhead on total procurement cost

# 3. ESTABLISHMENT OF COMMON FACILITIES

In green field projects BHEL shall arrange and provide the following facilities which shall be used by all subcontractors for their employees and workers. These shall be

i. Medical Centre
ii. Safety park with facilities of audio-visual training & vertigo test center.
iii. No cost shall be deducted from the subcontractors for the structure part only.
iv. The running cost with basic inputs already mentioned at Point 1 above shall be shared by all contractors.
v. The sub-contractors shall be required to ensure participation in trainings, medical checkup and vertigo test as per the guidelines laid in this document and required as per statutory HSE requirements.

vi. However, in projects where in these facilities are not provided by BHEL, subcontractors shall ensure the training, medical/ vertigo test of all workers at site in consultation and guidance of BHEL HSE team at site in line with provisions of this document.

vii. The overall onus of compliance to HSE practices pertaining to training, medical checkup including vertigo test shall lie on the subcontractor only.

# 4. CRITICAL REQUIREMENTS W.R.T. EQUIPMENT & PPES

i. Conventional Hydra crane with carriage in front shall not be permitted. Pick & carry tyre mounted Front Cabin mobile crane (FX or TRX/ NextGen series of 'ESCORT" or equivalent make) shall only be permitted.

ii. Any Heavy equipment (cranes, winch machines, etc.) shall be deployed only after pre-safety Inspection by safety dept. Valid AMCs/ Fitness/ other statutory clearances as per local rules shall be required to be submitted before mobilizing the equipment at site.

iii. All other Hand tools and power tools should not be older than 5 years.

iv. For Chimney passenger lift, winch to have double drum rope for passenger and double safety devices must be used. Winch should not more than 3 years old and winch rope must be inspected with valid certificate from competent authority within 6 months and should meet the IS standard 9507 provision of OLR and push back button arrangement or dead man switch.

v. Gate pass for all the lifting T&Ps and construction machinery/ equipment shall be made after obtaining written acceptance (Pre-entry Safety Clearance) from BHEL Site Safety Department after physical verification and checking all requisite documents/ compliance to Safety norms

vi. All motor vehicles should have valid registration certificate, insurance, Pollution under control (PUC) and fitness certificate as per Motor Vehicle Act 2020. The certificates should be pasted in the glass from inside.

vii. PPEs shall be from reputed manufactures viz. 3M, Udyogi, Karam, Frontier, Freedom, Honeywell, Liberty, Bata, Nomex, Acme, Unicare, Life Gear or equivalent. In case Subcontractor recommends any other name the same can be approved at site level by the Construction manager & Site HSE

viii. For height work, where fall could result in death or disability, a secondary means of fall protection (Safety Net, Retractable Fall Arrestor etc.) shall be mandatorily provided by the subcontractor, failing which, a penalty of INR 10000 per case will be imposed. In addition, there should be constant supervision for such critical height work. Any non-erection activities at height eg. Housekeeping etc. shall also fall under the category of height work

ix. **Scaffold Tagging**

Scaffolds being erected, modified or dismantled must be tagged as suitable for use. Tagging shall be done with standard tag holder. Scaffolding tag should be certified by scaffolding inspector having valid certificate.

- **GREEN** scaffold tag- shall be fixed when scaffold is complete and safe for use, signed and dated by the scaffolding competent person daily.
- **RED** scaffold tag – to be fixed if scaffold is in some way defective and cannot be used or is still under erection.
- **YELLOW** scaffold tag – to be fixed if scaffold is in under construction/ maintenance.

**FIG. A.4.1 SAMPLE SCAFFOLD TAGS AND TAG HOLDER**

x. **T&P Color Coding:**

a. Inspections and tests shall be documented by means of color coding which shall verify that inspections or testing are current and that all receptacles, portable Power tools, Lifting Tools & Tackles have been inspected and tested as required. The color codes used on the project shall be:

| GREEN | BLUE | YELLOW | PURPLE |
|---|---|---|---|
| January | April | July | October |
| February | May | August | November |
| March | June | September | December |

**TABLE. A.4.2: T&P COLOR CODES**

b. The cycle of colors shall be Quarterly as a minimum or as decided by BHEL. The color code tape / Sticker shall be clearly visible to designate the period for which the inspections and tests were conducted.

c. Following the initial inspection, the equipment must be color-coded quarterly as per color-coding instructions that will be issued by the subcontractor.

d. Fire extinguisher with the current month color-coding inspection sticker must be provided and secured in the platform.

e. All slings shall be regularly inspected in accordance with the requirement of the project for frequent and periodic inspections and discard immediately if they fail to meet the minimum requirements of the project.

f. The Subcontractor's HSE Officer shall ensure that all PPE is inspected prior to its issue. He is to ensure all subcontractor personnel are using safe and proper PPE equipment. Regular

inspections on the PPE shall be carried out and personnel not adhering to those inspections shall be removed immediately from the site.

g. A Ten (10) day interval period shall be given into each monthly color code change. During this Ten (10) day period either color shall be acceptable.

xi. **T&P Tagging:**

All deployed Wire Rope Slings, Chain Pulley Blocks, Hooks, slings etc. shall be Tagged using aluminum or any other metal tag with punching.

# 5. HSE PERSONNEL TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

## 5.1. NUMBERS OF HSE PERSONNEL (APPLICABLE FOR EACH WORK SHIFT)

Number of HSE Officers and Supervisors shall be in proportion to number of workers as per Table A.6 below

**TABLE A.5**

| No. of Workers | No. of HSE Supervisors | No. of HSE Officers |
|---|---|---|
| Up to 100 | 1 | 1 |
| 101 to 250 | 2 | 1 |
| 251 to 500 | 4 | 1 |
| 501 to 1000 | 6 | 2 |
| 1000 to 2000 | 6+ One additional supervisor up to every additional 250 workers | 3 |
| 2000-3000 | 10+ One additional supervisor up to every additional 250 workers | 4 |
| 3000-4000 | 14+ One additional supervisor up to every additional 250 workers | 5 |

### 5.1.1. DEPLOYMENT PLAN

i. Above requirement is for every shift for each unit.

ii. The dynamic deployment plan of Safety manpower at various locations containing names, areas, time periods, shifts etc. shall be submitted to BHEL for approval by subcontractor

iii. BHEL may modify the deployment plan based on nature and volume of jobs, Risks and hazards associated etc.

iv. For less than 20 workers HSE Officer is not mandatory. In case the number of workers exceed 20 for 3 consecutive months, HSE Officer is to be engaged. The HSE Officer shall be deployed for a minimum period of 6 months even if the number of workers fall below 20 in any month subsequent to deployment. If within that 6-month period, the number of workers is more than 20 for at least 3 months, the deployment duration of HSE Officer will extend further 6 months after completion of previous 6-month period.

v. For Site Material Management/ Handling (Loading/ Unloading) contracts, 1 no. HSE Officer shall be required irrespective of the total manpower deployed.

vi. HSE Officers/Supervisors of all the vendors may be required to report directly to BHEL HSE Officer at site & shall comprise as a total team for handling all HSE issues. However, each safety officer/ agency shall be individually responsible for the safe execution of work in their respective areas.

## 5.2. Qualification & Experience Requirements Of HSE Personnel

### 5.2.1. HSE Officer

First HSE Officer to be mandatorily as per Option I as under and shall be designated Senior HSE Officer. In case of non-availability of HSE Officers with Option I configuration, the subsequent HSE Officers can be as per Option II below with recorded reasons and approval of Site Construction Manager of BHEL. All these deviations should be reported to Region HSE and PSHQ HSE.

**A. Option I**

i. possesses a recognized degree in any branch of engineering or technology or architecture and had a practical experience of working in a building or other construction work in a supervisory capacity for a period of not less than two years or possesses a recognized diploma in any branch of engineering or technology and has had practical experience of building or other construction work in a supervisory capacity for a period of not less than five years;

ii. possesses a recognized degree or diploma in industrial safety with at least one paper in construction safety (as an elective subject/ part thereof);

iii. has adequate knowledge of the language spoken by majority of building workers from the construction site in which he is to be appointed.

**B. Option II:**

Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (All Degrees/ Diploma from any Indian institutes recognized by AICTE or State Council of Technical Education of any Indian State) with practical experience of working in a building, plant or other construction works (as HSE Officer, in line with Indian Factories Act, 1958 or BOCW Act, 1996) for a period of not less than five years

**Note:**

i. HSE Officer as per Option II shall be valid only on availability of Senior HSE Officer as per Option I at site.

ii. In case of resignation of the Senior HSE Officer, the same has to be replaced within 15 days else all subsequent HSE Officers as per Option II (in case of multiple HSE Officers with a single agency) shall not be considered as valid.

iii. The penalty shall be deducted considering non-availability of any HSE Officer at site.

### 5.2.2. HSE Supervisor: Either of X or Y below

X. Recognized Degree in any branch of Engineering OR Diploma in any branch of engineering with at least one-year construction experience

OR

Y. A recognized graduation Degree in Science (with Physics & Chemistry) or a recognized diploma in Engg. or Tech.

Additional requirements for option (Y) above

i. Trained in fire-fighting as well as in safety / occupational health related subjects, with:
ii. Minimum Two years of practical experience in construction work environment or in the field of safety and

**Note:**

i. Option a above is by default, b is under special approval from Site HSE & Construction manager
ii. In both cases the candidate should possess requisite skills to deal with construction & fire safety related day-to-day issues.

## 5.3. HSE In-Charge

In case there is more than one HSE Officer with any subcontractor, one of them, who is senior most by experience & meets qualification as per option 1 as mentioned in clause 2.1 A above (in HSE discipline), may be designated as HSE In-charge who will be the nodal point of contact on HSE matters.

## 5.4. Supporting Staff To HSE Team

i. Supporting Staff shall include scaffolders, scaffolding inspectors, riggers, skilled and unskilled manpower
ii. Subcontractor shall provide adequate number of workers as and when required, in order to attend and comply to Safety observations raised by BHEL/ Customer.

## 5.5. Availability And Penalty For Non-Deployment

i. The subcontractor shall submit the certificates of qualification & experience of HSE manpower before deployment for BHEL to assess suitability as per requirement detailed in this document
ii. In case of rejection, subcontractor shall arrange additional candidates and submit resume to BHEL. Penalties will be applicable during the period of non-deployment in such cases as well.
iii. Subcontractor shall ensure physical availability of safety personnel at the place of specific work locations.
iv. The Subcontractor shall deploy the HSE Officers as per the site's requirement. Non-deployment shall lead to stoppage of the work and final decision shall rest with Site HSE & Construction manager.
v. The Subcontractor shall prepare an organization chart identifying the areas of operations, responsibilities and reporting structure of all safety personnel for each shift and submit the same to BHEL.
vi. The subcontractor shall deploy sufficient HSE Officers, supervisors, as per numbers & qualifications mandated in this Section since mobilization of first batch of manpower and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty at following rates:

| | |
|---|---|
| Non-deployment of HSE Officer – | Rs. 75,000 per man-month |
| Non-deployment of HSE Supervisor – | Rs. 50,000 per man-month |

vii. Penalty shall be collected for the period of non-availability of safety personnel after allowing a grace period of 15 days for finding a replacement. The same shall be deducted on pro-rata basis till the required manpower is deployed.

viii. In case of abnormal delay & frequent rejections of candidates proposed by the subcontractor, BHEL shall exercise the right to deploy the safety manpower & deduct the amount from subcontractor's running bill with applicable overheads. In such cases also, the provision of logistics, transportation, food and other logistical support to the HSE personnel shall be in the scope of subcontractor in addition to the salary. After deployment of manpower by BHEL, the penalty for non-deployment specified above shall not be applicable.

## 6. COMPETENCY OF OPERATORS/ DRIVERS OF CRANE, WINCH, LIFTING/ CONSTRUCTION EQUIPMENT ETC.

i. The Operators/ Drivers of crane, winch, construction/ lifting equipment etc. shall be experienced and have valid driving license for the class of vehicle / machinery as applicable (like Crane/ Forklift/ Rig, Construction equipment driving license etc.).

ii. Minimum HMV driving license is required for all heavy equipment/ heavy vehicle (trailer/ Hyva /dumper /TM) operators at site.

iii. The subcontractor shall certify competence of these persons in writing as and when they are posted at site.

iv. Crane, Winch, Construction & lifting equipment operator should have certificate on subject course or experience certificate in employer letterhead.

v. Where state is providing license for operating crane, tractor and other construction vehicles, same to be ensured.

**Note:** In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act,1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above, the same shall be followed.

7. In case of any stringent requirement of BHEL's customer over and above the specifications mentioned in current document, the same shall also be required to be complied at site by subcontractor.

## 8. REFERENCES

The Safety Rules for Construction & Erection as outlined hereunder, while setting out a broad parameter of safety norms, are not exhaustive. The subcontractor and his agencies are advised to refer to the following statutory provisions as amended from time to time for details and strict compliance therewith.

### 8.1. FOR GREENFIELD PROJECTS

a) Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996 (briefly referred to as BOCW Act),
b) Building and other construction workers (regulation of employment and conditions of service) Central Rules, 1998 (briefly referred to as BOCW Rules) as adopted by the various State Governments,

## 8.2. For Expansion, Modification, Alteration and, Or Construction Activity Within An Existing Plant Operating As Per Approved Site Plan Under The Factories Act

a) Factories Act, 1948,
b) Factories Rules, as adopted by the various State Governments
c) BOCW Act
d) BOCW Rules
e) In case a new act/ statutory guideline/ modification/ consolidation of acts is implemented the same shall be required to be adhered by the subcontractor.
f) The latest amendment of the above-mentioned acts/ rules shall be followed at site.

# 9. BHEL POWER SECTOR HSE MANAGEMENT SYSTEM

The Systems and procedures of BHEL Power Sector HSE Management System shall be implemented by the subcontractor, including:

- HSE Procedure for Register of OHS Hazards and Risks
- HSE Procedure for Register of Environmental Aspects and Impacts
- HSE Procedure for Register of Regulations
- HSE Procedure for Training and Awareness
- HSE Procedure for Emergency Preparedness and Response Plan
- HSE Procedure for Permit to Work
- HSE Inspection and Other Formats

**Note:**

i. BHEL reserves the right to revise/ update these systems and procedure as per requirement to address any changing HSE needs

ii. BHEL will provide hard / soft copies of applicable HSE Procedures, Work Permits, Operational Control Procedures, Inspection/ Other Formats etc. that are necessary for ensuring safe work to the successful bidder at Site. It is the responsibility of the subcontractor to ensure availability of these documents before commencing work at site.

iii. The subcontractor can get soft copies of these documents from respective Region SCT/ HSE for reference. The signed hard copies of the same shall not be required to be submitted along with tender document

iv. Subcontractor shall use the Digital (Web & App-Based) HSE management Software Systems provided by BHEL whenever provided. In case not provided, hard copy systems will continue to be used. All information technology resources (Computers, mobile phones, mobile data, internet access etc.) for the use of such systems shall be ensured by the subcontractor.

# 10. CLEARANCE OF MONTHLY RUNNING BILLS SUBJECT TO SAFETY COMPLIANCE

i. The monthly running Bills of the subcontractor shall be released subject to compliance to HSE requirements as per checklist in Annexure H
ii. BHEL site HSE Head and Package In-charge shall be authorized to issue the clearance
iii. Site Construction Manager of BHEL shall be the final authority on the matter.

# 11. HSE PERFORMANCE EVALUATION

i. Subcontractor shall be assessed on monthly basis for HSE Compliance by BHEL Safety In-charge at site.
ii. The HSE evaluation shall be based on HSE Performance Evaluation System of BHEL covering the contractual, statutory and regulatory requirements of HSE.
iii. BHEL shall reserve the right to use these performance scores for evaluating bidder's capacity for future tenders
iv. If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job, provided the execution performance is satisfactory.

# 12. HSE PENALTIES

i. Nonconformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the subcontractor for every instance of violation noticed.
ii. As per contractual provision HSE penalties shall be imposed on subcontractors for non-compliance on HSE requirement as per following format.
iii. Following are the applicable penalties for various Safety violations:

**Sub: MEMO for Penalty for non-compliances in Safety**

Following lapse (tick marked) was observed and penalty (in Rs.) is imposed as stated at the bottom of this memo. It is requested that such occurrences be please avoided in future.

| S. No | Nature of Non - Compliance | Penalty (in INR) | Remarks |
|---|---|---|---|
| **A. System Violations** | | | |
| 1 | Working without valid Work Permit/ HIRA/ Method Statement / JSA | 2000 | Per case |
| 2 | Controls as per Work Permit/ HIRA/MS/JSA not ensured | 2000 | Per case |
| 3 | Reported Safety Violations Not Closed within Stipulated Time | 1000-10000 | Per case |
| 4 | Absence of required Subcontractor Officials (Site Head, HS Head) in Safety Reviews/Meetings | 5000 | Per case |
| 5 | Not providing required PPEs (Safety Harness, Lifeline, Safety Net, Fall arrestor, Safety Helmet, Gloves, Shoes etc.) for the work by subcontractor | 2000 | Per case |
| **B. Competency/ Training/ Induction Violations** | | | |

| | | | |
|---|---|---|---|
| 1 | Incompetent personnel deployed for specialized jobs like height work, hot work, rigging, vehicle operation etc. (without valid license/ certificate etc.) | 3000 | Per case |
| 2 | Work without induction training & medical check | 2000 | Per case |
| 3 | Height Work without Vertigo Test and height work training | 2000 | Per case |
| **C. PPE Violations – Height Work** | | | |
| 1 | Not wearing/ hooking Double Lanyard Safety Harness while working at height (> 1.2 meters) or not anchoring to lifeline | 1000 | Per case |
| 2 | Not Providing Lifeline for height work | 3000 | |
| 3 | Unsafe platforms – without Top, Mid Rails and Toe-Guards for Height Work | 3000 | |
| 4 | Not providing secondary means of fall protection for height work (Safety Nets, Retractable Fall Arrestors etc.) | 3000 | Per case |
| **D. PPE Violations – General** | | | |
| 1 | Not wearing safety helmet | 1000 | Per case |
| 2 | Wearing of helmets without chin straps | 1000 | Per case |
| 3 | Not Wearing safety shoes | 500 | Per case |
| 4 | Not wearing gloves | 500 | Per case |
| 6 | Not using grinding goggles/ face shield during grinding/ cutting | 2000 | Per case |
| **E. Electrical Safety Violations** | | | |
| 1 | Broken/ exposed wires/ cables | 2000 | Per case per day |
| 2 | Electrical plug not used for connection/ hand machines | 1000 | Per case per day |
| 3 | Not using proper ELCBs for electrical equipment | 2000 | Per case per day |
| 4 | Improper earthing of welding & Other electrical machines (Lack of double earthing, improper/ untested earth pit etc.) | 2000 | Per case per day |
| 5 | Not using 24 V supply for lighting in confined spaces | 2000 | Per case |
| 6 | Cables haphazard/ blocking way/ not organized properly | 1000 | Per case per day |
| **F. Lifting & Rigging Violations** | | | |
| 1 | Using Sling/ Chain Pulley Block and other Small T&Ps without proper, traceable Tag and Test Certificate | 2000 | Per T&P per day |
| 2 | Using damaged slings or not slinging properly | 2000 | Per T&P per day |
| 3 | Use of lifting equipment without having valid Test certificate | 5000 | Per equipment per seven days |
| 4 | Lifting hooks used without latches | 2000 | Per hook per day |
| 5 | Not effectively barricading area below lifting activity | 5000 | Per case |
| 6 | Using untrained/ unqualified rigger | 5000 | Per case |
| **G. Housekeeping** | | | |
| 1 | Non-removal of scrap from platforms | 5000 | Per Event Per location per 7 days |
| 2 | Not conducting scheduled housekeeping drives | 5000 | Per drive |
| **H. Hot Work Safety Violations** | | | |
| 1 | Gas cutting without flash back arrestor at both ends | 5000 | Per machine per incidence |
| 2 | Gas cutting at height without fire blanket | 2000 | Per event |

| | | | |
|---|---|---|---|
| 3 | Not keeping gas cylinders vertically | 2000 | Per event |
| 4 | Lifting cylinders without cage or rolling of cylinders | 2000 | Per incidence |
| 5 | Leakage in gas cylinder | 2000 | Per incidence |
| **I. Vehicle Safety/ Operation** | | | |
| 1 | Not having valid driving license for the type of vehicle/ T&P | 2000 | Per driver per incidence |
| 2 | Two-wheeler entry in construction area | 2000 | Per vehicle |
| 3 | Using Hydra for material movement at site in unsafe manner | 2000 | Per case |
| 4 | Using Two Hydra in Tandem for material movement without proper precautions as per OCP | 2000 | Per case |
| 5 | Vehicles, Hydras, Cranes, Dumpers and Earth Movers not having automatic back horns linked to gear | 2000 | Per Equipment per day |
| 6 | Not providing proper hard barricades around excavations/ unpermitted areas | 5000 | Per location per day |
| 7 | Not using guide rope while transporting material using Hydra or Cranes | 2000 | Per event |
| 8 | Over speeding | 5000 | Per case |
| 9 | Using Conventional Hydra crane | 50000 | Per day /crane |
| **J. Accidents/ Incidents/ Near Misses** | | | |
| 1 | Non-reporting of Near Miss/ Incident | 20000 | Per case |
| 2 | Major Accident – Worker unable to resume work within 48 hrs | 100000 | Per incident |
| 3 | Fatal Accident | 500000 | Per incident |
| **K. Miscellaneous** | | | |
| 1. | Not providing the facility (drinking water, rest shed, labor colony etc. as per the specifications/ requirement) | 5000 | Per month per violation |
| 2. | Not nominating the required number of workers for training as per plan | 5000 | Per incidence |
| 3. | Lack of proper arrangement for disposal of sewage/ waste water/ effluents etc. | 10000 | Per incidence |

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.):

_____
_____
_____

Penalty Amount:

1. Rate as per above chart
2. No. of Persons/ machine/ event/ labor
3. No. of times the same error is repeated: Repetition factor
4. Total Penalty= 1. X 2. X 3. =

**Witnessed by:**

(Sub- Subcontractor representative) (BHEL representative)

Signature _____

_____

Name _____

_____

Distribution: 1 Copy: to Sub- subcontractor Site In-charge,
1 Copy to Site Construction Manager (BHEL)
1 Copy to Site Finance

**Note:**

i. In case the amount of penalty imposed by BHEL's Client on BHEL for Safety violation/ incident due to or in the area of the subcontractor is more than those indicated above, same shall be imposed back-to-back on the subcontractor. However, in case such an amount is less than the specified above, penalty amount indicated above shall be imposed on the subcontractor.

ii. For same violation only one penalty (higher of the two mentioned below) shall be applicable
   a. Penalty imposed by BHEL's Customer over BHEL.
   b. Penalty as indicated in current document.

iii. For repeated violation for the same equipment/ location, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.

iv. For repeated fatal incident in the same Unit incremental penalty shall be imposed: The subcontractor will pay 2 times the previously paid penalty in case there is repeated major/ fatal incident under the same subcontractor for the same package in the same unit.

v. Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above.

vi. If principal customer/statutory and regulatory bodies impose some penalty on HSE due to the non-compliance of the subcontractor the same shall be passed on to them.

vii. The penalty amount shall be recovered by BHEL Finance department from subcontractors from the RA/Final bill.

## 13. PUNITIVE ACTIONS FOR "CRITICAL SAFETY VIOLATIONS":

**"Critical Safety Violations" include:**

i. Not wearing required PPEs when provided and not following safe work procedure

ii. Taking unnecessary risks especially in height work, hot work, radiation work, lifting activity

iii. Coming to work under influence of sedatives like alcohol, drugs etc.

iv. Coming to work without ID Card/ Gate Pass (if provided)

v. Intimidating/ threatening at work

vi. Using cell phones during height work, hot work, lifting activity, driving.

In case any worker carries out any of the critical safety violations as above, BHEL reserves the right to enforce punitive action in following manner:

| | |
|---|---|
| **First Offence**: | 1 Punch on Gate Pass/ Induction Card/ ID Card etc. and 1-hour HSE Training. With one day off from duty |
| **Second Offence:** | 2 Punches and 2-hours HSE Training with one day off from duty |

| | |
|---|---|
| **Third Offence:** | 3 Punches and the worker will be dismissed. Gate pass to be confiscated |

In case any employee of subcontractor carries out any of the critical safety violations as above, subcontractor Site In-charge shall issue warning letter to concerned employee with copy to BHEL

**Note:**

i. For above violations, guilt of the worker/ employee has to be established through appropriate evidences and records maintained.

ii. If worker/ employee has not been given the required PPEs and safety equipment by the agency and/or not facilitated by the agency to follow safety rules, he/ she will not be considered liable but the agency will be penalized as per penalty provision in this document. In such cases, the subcontractor shall not pass the penalty over to the worker/ employee through wage deduction etc.

iii. These critical safety violations and their consequences shall be shared with all workers and employees during induction and other training programs/ meetings, toolbox talks etc.

iv. Gate Pass shall have provision of Tagging as indicated above

v. The appellate authority (only for final dismissal) in this case shall be the BHEL Site In-charge whose decision shall be final on the matter and binding on all parties.

## 14. LEGAL IMPLICATIONS

Any legal Costs incurred by BHEL, on account of accidents taking place in the activities of the subcontractor, shall be debited to the subcontractor on actual cost basis.

For any accident occurring at site to any worker/ employee of the subcontractor leading to legal implications to BHEL Employee/ Management shall be safeguarded by BHEL legal department. All legal expenses incurred by BHEL on this account shall be recovered from the subcontractor. The accident also includes fire, loss of property or life at site.

## 15. HSE REVIEW MEETING

i. Subcontractor Site In-charge and HSE In-charge shall attend the HSE Review Meeting as and when called by BHEL.

The indicative agenda points are given below:

a) Implementation of earlier MOM points
b) Compliance Status of HSE Observations
c) Incidents & Near Misses, their Root Causes and Actions Taken
d) HSE performance review
e) HSE inspection findings
f) HSE audit and CAPA
g) HSE training
h) Health check-up camp
i) HSE planning for the erection and commissioning and installation activities in the coming month

j) HSE reward and promotional activities

ii. MOM on the discussion along with HSE observations will be circulated to the subcontractor for action.

iii. The subcontractor shall close the observations to the satisfaction of BHEL within stipulated time frame

## 16. OTHER REQUIREMENTS

i. If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps and the cost shall be debited to the subcontractor with applicable overheads.

ii. If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the subcontractor suitably for the performance.

iii. In case of any damage to property due to lapses by the subcontractor, BHEL shall have the right to recover the cost of such damages from the subcontractor after holding an appropriate enquiry.

iv. The subcontractor shall take all measures at the sites of the work to protect all persons from incidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the subcontractor be paid to compromise any claim by any such person, should such claim proceeding be filed against BHEL, the subcontractor hereby agrees to indemnify BHEL against the same.

v. The subcontractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

vi. The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.

vii. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the subcontractor shall adhere to such instructions.

viii. BHEL may prohibit the use of any construction machinery, which according to the organization is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.

# 17. MEMORANDUM OF UNDERSTANDING:

After award of work, subcontractors are required to enter into a memorandum of understanding as given below:

## Memorandum of Understanding

BHEL, Power Sector Region is committed to Health, Safety and Environment Policy (HSE Policy).

M/s……..do hereby also commit to comply with the same HSE Policy while executing the Contract Number _____

M/s……..have gone through and understood all the HSE requirements of the contract including HSE manpower, tools & equipment, systems & procedures, and agree to fulfill the same as a minimum. Any additional resources and support required for ensuring fulfillment of HSE Objectives shall be provided by subcontractor at no extra cost.

M/s…….. agree that in case they fail to comply to the HSE requirements as stipulated in the contract, BHEL shall have the right to implement the same and the cost shall be recovered from the subcontractor with applicable overheads.

M/s…….. shall ensure that safe work practices as per the HSE plan. Spirit and content therein shall be imbibed in all workers and supervisors for compliance.

In addition to this, M/s……..shall comply to all applicable statutory and regulatory requirements which are in force in the place of project and any special requirement specified in the contract document of the principal customer.

M/s……..shall co-operate in HSE audits/inspections conducted by BHEL /customer/ third party and ensure to close any non-conformity observed/reported within prescribed time limit.

M/s…….. agree that the subcontractor shall seek HSE clearance as per BHEL format before each RA bill as mentioned in clause no. 9. The penalty amounts for not providing Safety manpower and various Safety violations have also been reviewed and agreed.

M/s…….. agree to share the HSE Costs (running costs) of common facilities created by BHEL on proportional to contract value basis as calculated at Site by BHEL.

Signed by authorized representative of M/s ----------

Name :

Place & Date:

# SECTION B

# OPERATIONAL REQUIREMENTS

# 1. PURPOSE:

1.1. The purpose of this HSE Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during installation and servicing of industrial projects and power plants.

1.2. This document shall be followed by BHEL's subcontractors at all installation and servicing sites. In case customer specific documents are to be implemented, this document will be followed in conjunction with customer specific documents in complementary manner.

1.3. Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy wherein the relevant statutory guidelines supersedes this document, the same shall be followed.

1.4. In case there's any specific HSE requirement from BHEL's Client, not explicitly indicated in this document the same shall be required to be fulfilled as per the decision of BHEL Site construction manager.

# 2. SCOPE:

The document is applicable to BHEL's Subcontractors at all installation / servicing activities of BHEL Power Sector as per the relevant contractual obligations

# 3. OBJECTIVES AND TARGETS:

i. To achieve "Zero Incident at Site"
ii. 100% compliance to all legal/statutory requirements related to EHS.
iii. 100% Health, Safety and Environmental Induction training attendance for all workers.
iv. 100% High Risk activities to be carried out only after approved Method Statement, HIRA / Aspect-Impact / JSA / OCP and Permit to Work are implemented.
v. 100% PPEs compliance in high and medium risk activities.
vi. 100% incident reporting, recording and reviewing for corrective actions.
vii. Regular Safety Reviews to assess HSE program compliance and closure of any recognized gaps to improve safety management and incident prevention
viii. Prevent injury and ill health of all workers at site ('Workers' refers to all personnel including managerial, supervisory, professional, technical, clerical and other workers including contract laborers)
ix. Prevent pollution to environment
x. Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
xi. Ensure protection of environment of the work site.
xii. Comply at all times with the relevant statutory and contractual HSE requirements.
xiii. Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
xiv. Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.

xv. Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.
xvi. Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
xvii. Establish effective communication on HSE matters with all relevant parties involved in the Project works.
xviii. Ensure that all work planning considers all persons that may be affected by the work.
xix. Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent person.
xx. Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
xxi. Ensure continual improvements in HSE performance.
xxii. Ensure conservation of resources and reduction of wastage.
xxiii. Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
xxiv. Ensure timely implementation of correction, corrective action and preventive action. The subcontractor shall also comply with HSE Targets stipulated by BHEL from time to time.

## 4. BHEL HEALTH, SAFETY & ENVIRONMENT POLICY:

In BHEL, Health, Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with, community and environment. BHEL believes in zero tolerance for unsafe work/non-conformance to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulations and BHEL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/ substitution/reduction/control.
- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, subcontractors and suppliers on HSE issues.
- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- Communicating this policy within BHEL and making it available to interested parties.

**Chairman & Managing Director/ BHEL**

# 5. ILLUSTRATIVE RESPONSIBILITIES OF SUBCONTRACTOR EMPLOYEES

## 5.1 HSE - A LINE RESPONSIBILITY

i. HSE is a “Line Responsibility”.
ii. The term "Line" includes management, Executives, Supervisors, Foremen, and Workers who are part of the workforce. Line is to be fully involved in HSE Planning & Implementation with the aid and advice of HSE organization.
iii. “Line”, having control of resources and manpower is responsible for overall implementation of HSE Systems and closure of HSE observations.

## 5.2 SITE IN -CHARGE:

i. Shall sign Memorandum of Understanding (MoU)
ii. Shall ensure availability of all necessary resources required for implementation of HSE at Site
iii. Shall engage qualified HSE Officer(s) and supervisors (s)
iv. Shall adhere to the rules and regulations mentioned in this code, practice very strictly in area of work in consultation with concerned engineer and the safety coordinator.
v. Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
vi. Shall not engage any employee below 18 years.
vii. Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job.
viii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person.
ix. Shall ensure closure of all HSE non-conformities reported by BHEL or observed during internal inspection by providing appropriate resources in a timely manner.
x. Shall ensure the implementation of provisions of applicable acts and rules pertaining to HSE.
xi. Shall ensure availability of updated (Hazard Identification and Risk Assessment) Register for the area of activity
xii. Shall ensure availability of Method Statements & Job Safety Analysis for all hazardous activities
xiii. Shall ensure necessary controls to minimize risk in all applicable hazardous activities including Height Work, Hot Work, Lifting & Rigging, Confined Space, Maintenance, excavation, Radiography, Loading/ Unloading, Drilling/ Blasting etc.
xiv. Shall ensure implementation of HSE requirements mentioned in this document and as specified in the BHEL HSE management System including training, inspection, awareness, reporting etc.
xv. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
xvi. Shall ensure a secondary means of fall protection (Safety Net, Retractable Fall Arrestor etc.) for preventing fall from height
xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.

xviii. Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
xix. Shall ensure that Horseplay is strictly forbidden.
xx. Shall ensure that adequate illumination is arranged during night work.
xxi. Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
xxii. Shall ensure display of adequate signage/posters on HSE.
xxiii. Shall ensure that mobile phone is not used by workers while working.
xxiv. Shall ensure conductance of HSE audit, mock drill, medical camps, induction training and training on HSE at site.
xxv. Shall ensure full co-operation during HSE audits.
xxvi. Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
xxvii. Shall ensure good housekeeping.
xxviii. Shall ensure adequate valid fire extinguishers are provided at the work site.
xxix. Shall ensure availability of sufficient number of toilets (preferably bio-toilets) /restrooms and adequate drinking water at work site and labor colony.
xxx. Shall ensure adequate emergency preparedness.
xxxi. Shall be member of site HSE committee and attend all meetings of the committee
xxxii. Power source for hand lamps shall be maximum of 24 v.
xxxiii. Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available
xxxiv. To record all incidents including near miss and report to BHEL and to ensure analysis & corrective actions for the same
xxxv. Shall conduct weekly Safety Walks in the work area and record the findings.
xxxvi. Construction of Canteen at Site, Office Infrastructure: Printer, PC, Fire Extinguishers etc.
xxxvii. Shall analysis HSE Performance regularly in work area and take steps to improve the same
xxxviii. Shall ensure stoppage of work in case of unacceptable Safety hazards

## 5.3 HSE OFFICER:

i. Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
ii. Facilitate inclusion of safety elements into Work Method Statement and creation of Job Safety Analysis (JSA)
iii. (HSE Head) To prepare deployment plan of HSE personnel for all shifts, so as to ensure constant supervision of all areas. The plan to be submitted to BHEL
iv. Highlight the requirements of safety through Tool-box / other meetings.
v. Help concerned HOS to prepare Job Specific instructions/ JSA for critical jobs.
vi. Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
vii. Advice & co-ordinate for implementation of HSE Systems & Procedures.
viii. To stop work in case of any critical safety violation until the violation is cleared
ix. Convene HSE meeting & minute the proceeding for circulation & follow-up action.

x. Plan procurement of PPE & Safety devices and inspect their healthiness.
xi. Report to BHEL on all matters pertaining to status of safety and promotional program at site level.
xii. Facilitate administration of First Aid
xiii. Facilitate screening of workmen and safety induction.
xiv. Conduct fire Drill and facilitate emergency preparedness
xv. Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
xvi. Apprise BHEL on safety related problems.
xvii. Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
xviii. Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
xix. To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
xx. Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
xxi. Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters.

## 5.4 HSE SUPERVISOR:

i. All requirements as per 5.1
ii. To monitor allotted area for Safety violations, take required action and inform the concerned Safety Supervisor / Officer
iii. To assist HSE Officer

## 5.5 PACKAGE IN-CHARGES, ENGINEERS & ALL EMPLOYEES:

i. To be aware of, get involved in and ensure implementation of all HSE related Systems and Procedures including but not limited to:
   a. BHEL HSE Management System including HSE Procedures and OCPs, HIRA, JSA etc.
   b. Work Permit System
   c. Emergency Preparedness Response Plans
   d. Contractual HSE requirements
   e. Legal Requirements
   f. Penalty System
   g. Training requirements
ii. To ensure that the persons engaged in respective area follow the safety rules like using appropriate PPEs.
iii. To develop Method Statements and ensure availability of Job Safety Analysis for all activities in scope
iv. To ensure that the reported HSE non-conformities in the work area are resolved immediately before resuming work
v. To record all incidents including near miss and report to BHEL.

vi. To adopt safe working practices at all times and act as role model for Safety
vii. To take immediate corrective action actions in case any non-conformity is observed on product / process / system with respect to Occupational Health, Safety and Environment.
viii. In case any particular activity / work has extremely high consequential risk or high environmental impact, same shall be brought to the notice of BHEL Package In-charge before starting the work.
ix. To interfere/ stop work as & when identified unsafe.
x. To maintain & promote improved level of house-keeping all the time at site.
xi. To support/co-operate with audit team members as & when safety audits are carried out.
xii. To involve in investigation, if any incident occurs in his work area.
xiii. To participate in safety promotional programs
xiv. To attend the safety committee meeting, if member/invitee
xv. To ensure that only fit T&Ps and qualified persons are engaged for all activities.
xvi. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
xviii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent authorities.

# 6. HSE PLANNING BY SUBCONTRACTOR:

## 6.1 HAZARD ANALYSIS & RISK ASSESSMENT (HIRA), METHOD STATEMENT (MS) & JOB SAFETY ANALYSIS (JSA):

i. Subcontractor shall identify all OHS Hazards and Risks applicable to all activities in scope and plan & implement the required control measures. HIRA Register shall be maintained.
ii. Subcontractor shall develop Method Statements & Job Safety Analysis documents for all hazardous activities in scope and ensure the required control measures. Job Safety Analysis is to be attached along with any Work Permit request

## 6.2 REGISTER OF REGULATIONS:

Subcontractor shall prepare a register of applicable rules and regulations in the scope and plan to ensure compliance.

HIRA Register, Method Statements, Job Safety Analysis and Register of Regulations are dynamic documents and shall be revised (as applicable):

i. At fixed frequency of 3 months
ii. Addition/ deletion/ modification of a process/ activity
iii. After an accident/ incident
iv. After any change in applicable rules/ regulations/ laws.

## 6.3 MONTHLY HSE PLAN COVERING THE FOLLOWING AS A MINIMUM SHALL BE PREPARED AND SUBMITTED TO BHEL FOR APPROVAL:

i. HSE Trainings covering all activities/ hazards/ workers

ii. HSE Inspection Plan covering all areas/ activities/ equipment/ hazards

iii. HSE Activities: Safety walks, Awards, housekeeping, reviews etc.

**Note:** Online/ App-based system shall be used for HSE Planning and Implementation/ Update whenever provided by BHEL otherwise Hard-copy based system shall continue

### 6.4 Monthly HSE Planning & Review of HSE Activities along with BHEL:

Monthly planning and review of HSE activities shall be carried out by subcontractor as per provided **format** jointly along with BHEL

## 7. Mobilization Of Machinery/Equipment/Tools By Subcontractor:

i. Subcontractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.

ii. As a measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and complies with legislative and owner requirement, inspection shall be arranged by in-house competent authority for acceptance as applicable. Inspection by Third Party competent person shall be arranged:
   a. Before first time use at site
   b. After carrying out any modification
   c. After repairs subsequent to involvement in any accident/ incident

iii. As a further measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and comply with legislative and owner requirement, inspection as per provided format shall be arranged by in-house expert / competent authority (preferable) for acceptance. The equipment considered for this purpose shall include all those in the T&P list in the tender document.

## 8. Mobilization of Manpower by Subcontractor:

i. As a measure to ensure that manpower being mobilized to the construction site is fit and competent for safe working, screening arrangement shall be made by the sub-subcontractor to ensure competency and fitness through following measures:

a) **Medical Checkup:** Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed as per provided **format**. For height workers, vertigo (height phobia) test to be carried out as qualification criteria as per Annexure K and recorded in provided **format**.

b) **Induction Training**: Induction training of all workers to be ensured as per **provided procedure and format**. Training evaluation to be carried out and training to be repeated if not passed

c) Only on successfully meeting above criteria, permanent gate passes to be issued

ii. The subcontractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner.

iii. The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.

iv. Ensure that the regulatory requirements of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.

v. Appropriate accommodation to be arranged for all workmen in hygienic condition.

vi. Cost of contractual, statutory and regulatory requirements like Training, medical checks, PPEs etc. shall not be transferred to the workers and such activities shall be considered as part of the job.

## 9. Provision of Personal Protective Equipment (PPEs):

i. Personnel Protective Equipment (PPEs), shall be provided by the subcontractor to all workers as per requirement of the job.

ii. The choice of PPEs to ensure multiple (at least more than 1) means of protection against any hazard. All applicable safety precautions for a job shall be ensured notwithstanding the duration or perceived importance of the task.

iii. The applicability of PPEs shall be as per the concept of Hierarchy of controls, i.e.:

iv. Elimination->Substitution->EngineeringControls->AdministrativeControls-PPEs

v. Relying solely on PPEs without ensuring necessary controls to be strictly avoided.

vi. The following matrix recommends usage of minimum PPEs against the respective job.

| Activity | Type of Protection | | | | | | Remarks, if any |
|---|---|---|---|---|---|---|---|
| | Hand | Eye | Ear | Body | Respiratory | Others | |
| Gas Welding & Cutting | LG | WG | - | LA | *SCBA/ OLBA | - | * for confined space |
| Electric Arc Welding | LG | HMWS | - | LA | *SCBA/ OLBA | - | * for confined space |
| Rigging | CG | SG | - | | | | -- |
| Working at Height | - | SG | - | DLFBH | - | *FAS | * for vertical columns |
| Grinding & Chipping | CG | FS / SG | - | LA | - | - | -- |
| Working in High Noise | - | - | EP / EM | - | - | - | -- |
| Handling of Cement Concrete | RG | SG | - | - | DM | - | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Blasting | CG | SG | EP* | - | - | - | * at noise area |
| Excavation | CG | SG | - | - | DM | - | *Gum boot in place of Safety shoe for foot |
| Chemical Handling | PVCG | CSG | - | PVCA | - | - | *Full body rubber suit with hood |
| Electrical and C&I | ERG* | SG | - | - | - | - | *For high voltages |
| Sand/shot blasting | CG | - | EP/ EM | CA | SAMH | - | |

**ABBREVIATIONS**: FS: Face Shield, CSG: Chemical splash goggles, HMWS: Helmet mounted welder's shield, GB: gum boot, DLFBH: Double lanyard full body harness, SG: Safety goggles, DM: Dust mask, SAMH L Supplied air mask/hood, EP/EM: Ear plug/Ear Muff, CG: Cotton hand gloves, LG: Leather hand gloves, LA: Leather apron, RG: Rubber gloves, PVCG: PVC Gloves, PVCA: PVC Apron, SCBA: Self-contained breathing apparatus, WG: Welding goggles, ERG: Electrical Rubber Gloves. OLBA: Online breathing apparatus

The list is not exhaustive. Additional PPEs to ensure Safe Work may need to be deployed as per the requirement of the task at no additional cost.

vii. The PPEs shall conform to the relevant standards as below (illustrative list) and bear ISI mark.

**RELEVANT IS-CODES FOR PERSONAL PROTECTION**

| PPEs | IS Codes |
|---|---|
| Industrial Safety Helmets. | IS: 2925 – 1984 |
| Rubber gloves for electrical purposes. | IS: 4770 – 1968 |
| Industrial Safety Gloves (Leather &Cotton Gloves). | IS: 6994 – 1973 (Part-I) |
| Leather safety boots and shoes. | IS: 1989 – 1986 (Part-I-II) |
| Industrial and Safety rubber knee boots. | IS: 5557 – 1969 |
| Code of practice for selections care and repair of Safety footwear. | IS: 6519 – 1971 |
| Leather Safety footwear having direct molding sole. | IS: 11226 – 1985 |
| Eye protectors. | IS: 5983 – 1978 |
| Ear protectors. | IS: 9167 – 1979 |
| Eye & Face protection during welding | IS: 1179-1967 |
| Industrial Safety Belts and Harness | IS: 3521 – 1983 |
| Guide for selection of industrial Safety equipment for body protection | IS:8519 -1977 |
| Respiratory Protective Devices | IS:9473-2002,14166-1994,14746-1999 |

viii. Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public

ix. All the personnel and visitors shall mandatorily use safety helmet (with company logo), safety shoe and reflective vests, in addition to any other PPEs as deemed appropriate for the area of work/ visit.

x. Following Color scheme for Helmets shall be followed:
   a. Workmen: Yellow
   b. Safety staff: Green or white with green band
   c. Electrician: Red
   d. Others including visitors: White
   e. For height workers, special marking on helmets besides indication on Gate Pass/ ID Card

xi. The subcontractor shall maintain register for issue and receipt of PPEs.

xii. All the PPEs shall be checked for quality before issue and the same shall be periodically re-checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be replaced.

xiii. The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front.

xiv. The body harnesses shall be serial numbered.

# 10. ARRANGEMENT OF INFRASTRUCTURE:

## 10.1 DRINKING WATER:

i. Drinking water shall be provided and maintained at suitable places at different elevations such that minimum quantity of 5 liters is available for each worker during the day.

ii. Drinking water tank shall be so installed so as to be available within 200 meters of each working area

iii. Container should be labeled as “Drinking Water” in languages understood by the workers

iv. Cleaning of the container shall be ensured at least once in a week. Mild cleaning detergents as used for cleaning vessels shall be applied and scrubbers (3M or equivalent) shall be used for removing scales and deposits on the inside surface. The tank shall be thoroughly cleaned with potable water only before it is refilled (also applicable to labor colony).

v. Suitability of water source for drinking to be tested as per IS10500 at least once in six months.

## 10.2 WASHING FACILITIES:

i. In every workplace, adequate and suitable facilities for washing shall be provided and maintained.

ii. Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.

iii. Water suitable for washing and not for drinking shall be clearly indicated as “Not for Drinking” in language understood by workers.

iv. Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

## 10.3 LATRINES AND URINALS:

i. Latrines and urinals shall be provided in every work place as indicated in Section A
ii. Urinals shall also be provided at different elevations.
iii. They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
iv. Separate facilities shall be provided for the use of male and female worker if any.

## 10.4 PROVISION OF REST SHEDS FOR WORKERS DURING REST PERIOD:

Proper Rest Shed (s) with shelter shall be provided for rest during break so as to accommodate all workers as indicated in Section A

## 10.5 MEDICAL FACILITIES:

### 10.5.1 GENERAL

i. Provision of Medical Center, Ambulance etc. shall be as per Section A of this document
ii. Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste – Management and Handling Rules, 1998)
iii. Every injury shall be treated, recorded and reported.
iv. All First Aid injuries shall be recorded as per provided Format
v. List of qualified first aiders and their contact numbers to be displayed at conspicuous places.

### 10.5.2 FIRST AIDER/ FIRST AID BOX

i. The first aider along with facilities should be available at a point nearest to the work location wherein majority of the workers are working.
ii. The subcontractor shall provide necessary first aid facilities as per schedule III of BOCW. At every work place first aid facilities shall be provided and maintained.
iii. The first aid box shall be kept by first aider who shall always be readily available during the working hours of the work place. His name and contact no to be displayed on the box.
iv. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time.
v. The first aid box shall be distinctly marked with a Green Cross on white background.
vi. Details of contents of first aid box is given in Annexure J
vii. A slip of contents shall be pasted on the First Aid Box with following details
viii. Monthly inspection of First Aid Box shall be carried out by the owner as per provided format
ix. The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

### 10.5.3 HEALTH CHECK UP

The persons engaged at the site shall undergo health check-up as per provided format before induction. In addition, the persons engaged in the following works shall undergo health check-up at least once in a year:

i. Height workers
ii. Drivers/crane operators/riggers
iii. Confined space workers
iv. Shot/sand blaster
v. Welding and NDE personnel

### 10.5.4 HEIGHT PHOBIA/ VERTIGO TEST:

i. The persons engaged in working at heights (above 2 meters) to be assessed for Vertigo and associated conditions and recorded as per provided format. Suggested Vertigo Test Procedure is given in Annexure K
ii. Such workers are to be allowed only on successful completion of test, otherwise shall be allocated ground-based jobs.
iii. IDs / Height passes shall be issued to such workers, besides special markings on helmets for easy identification.

### 10.5.5 PROVISION OF CANTEEN FACILITY:

i. Canteen facilities shall be provided for the workmen of the project inside the project site where worker strength is 250 or more.
ii. Proper cleaning and hygienic condition shall be maintained.
iii. Proper care should be taken to prevent biological contamination.
iv. Adequate drinking water should be available at canteen.
v. Fire extinguisher shall be provided inside canteen.
vi. Regular health check-up and medication to the canteen workers shall be ensured as per applicable regulations.
vii. Canteen waste to be disposed of in hygienic manner

## 10.6 PROVISION OF ACCOMMODATION/LABOR COLONY FOR WORKFORCE:

i. Proper accommodation for workforce to be provided in line with minimum requirements indicated in Section A
ii. Labor colony shall be inspected each week by HSE Officer and report submitted to BHEL as per provided format

## 10.7 PEST CONTROL:

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labor colony and stores.

## 10.8 SCRAPYARD:

i. In consultation with customer, scrapyard shall be developed to store metal scrap, wooden scrap, waste, hazardous waste.
ii. Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

## 10.9 ILLUMINATION:

i. The subcontractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations at dark places and during night hours at the work spot as well as at the pre-assembly area.
ii. Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
iii. Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
iv. Emergency lighting provision for night work shall be made to minimize danger in case of main supply failure.
v. Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II).

SUITABLE ILLUMINATION LEVELS FOR VARIOUS AREAS SHALL BE DECIDED BASED ON BROAD GUIDELINES INDICATED BELOW:

| S. No. | Location | Lux Level (lumens/sqm) |
|---|---|---|
| A. | **Construction Site** | |
| 1 | Outdoor areas like store yards, entrance and exit roads | 20 |
| 2 | Platforms | 50 |
| 3 | Entrances, corridors and stairs | 100 |
| 4 | General illumination of work area | 150 |
| 5 | Rough work like fabrication, assembly of major items | 150 |
| 6 | Medium work like assembly of small machined parts | 300 |
| 7 | Fine work like precision assembly, precision measurements etc. | 700 |
| 8 | Sheet metal works | 200 |
| 9 | Electrical and instrument labs | 450 |
| B. | **Office** | |
| 1 | Outdoor area like entrance and exit roads | 20 |
| 2 | Entrance halls | 150 |
| 3 | Corridors and lift cars | 70 |
| 4 | Lift landing | 150 |
| 5 | Stairs | 100 |
| 6 | Office rooms, conference rooms, library reading tables | 300 |
| 7 | Drawing table | 450 |
| 8 | Manual telephone exchange | 200 |

vi. Illuminations shall be inspected on weekly basis as per provided **format** using a calibrated lux meter.

# 11. HSE TRAINING & AWARENESS:

## 11.1 TRAINING PLAN:

i. All training programs to be carried out in a planned manner. Monthly/ Annual Training Calendar to be submitted to BHEL for approval and shall cover HSE Training requirements of all activities, workers, hazards applicable to the area(s) of work.
ii. Subcontractor shall nominate workers as per the schedule of specific training plan, failing which, penalty shall be imposed.
iii. Training records of all workers along with attendance, signatures, faculty details etc. shall be maintained in soft/ hard copy as per provided **formats**.
iv. Each labor should undergo at least 0.5% of total man-hours worked in HSE training.

## 11.2 HSE INDUCTION TRAINING

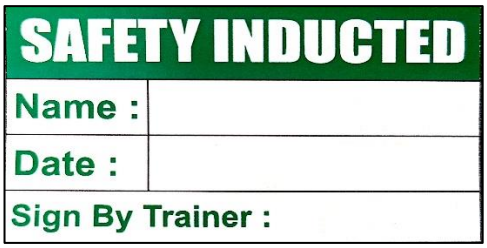
i. All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.
ii. The induction training shall be imparted through audio-visual medium (Classroom specialized training), and shall be minimum of 1 Complete Day.
iii. Evaluation to be carried out after training and training shall be repeated in case of failure.
iv. Safety Induction Card shall be printed by Subcontractor and provided to all trained workers. A Safety induction book shall also be printed and issued to each worker after induction training (Format for the same may be provided by BHEL).
v. Induction training subjects shall include but not limited to:

   a. Briefing of the Project details.
   b. Safety objectives and targets.
   c. Site HSE rules.
   d. Critical Safety Violations and consequences
   e. Site HSE hazards and aspects.
   f. First aid facility.
   g. Emergency Contact No.
   h. Incident & Near Miss reporting.
   i. Fire prevention and emergency response.
   j. Rules to be followed in the labor colony (if applicable)
   k. Accident case studies

vi. General:

   a. Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
   b. They must arrive fully dressed in safety wear & gear to attend the induction.
   c. Any one failing to conform to this safety wear& gear requirement shall not qualify to attend.

d. On completing attending subcontractor's in-house HSE induction, each employee shall sign an induction training form to declare that he had understood the content and shall abide to follow and comply with safe work practices.
e. They may only then be qualified to be issued with a personal I.D. card, for access to the work site subject to clearing the medical fitness test.




ABOVE STICKER SHALL BE PASTED ON HELMET OF WORKERS AFTER SAFETY INDUCTION TRAINING

## 11.3 JOB-SPECIFIC SKILL BASED HSE TRAINING

The contracting agency shall also impart job specific skill-based safety training to all its employees (Minimum one day) on various related safety topics using internal/external safety professionals/consultants as per the matrix given below. Record of such trainings and attendance particulars shall be maintained in a register for ready reference to statutory authorities/engineer-in charge as per provided format.

**TRAINING MATRIX**

| Name of topic | Executives | Supervisors | Skilled Workmen | Other Workers |
|---|---|---|---|---|
| Safety Induction | Y | Y | Y | Y |
| Accident_ Causes, factors, cost | Y | Y | Y | - |
| Industrial hazards & Accident Prevention | Y | Y | Y | - |
| Investigating, reporting, records | Y | Y | - | - |
| Personal Protective Equipment | - | Y | Y | Y |
| Construction Safety & Role of Supervisory personnel | - | Y | - | - |
| Permit to Work (PTW) | - | Y | Y | y |
| Statutory Provisions (BOCW Act/Rules, Factories Act 1948 etc.) | Y | Y | y | y |
| Material handling | - | y | Y | Y |
| Emergency Management | Y | Y | Y | - |
| Electrical Safety | - | Y | Y | - |
| Fire safety | Y | Y | Y | Y |
| First Aid & CPR (cardio pulmonary resuscitation) | - | Y | Y | Y (Selected) |
| Safety in Welding & Cutting | - | - | Y | - |
| Safety Audit | Y | Y | - | - |
| Safety in Lifting Tools & Tackles | - | Y | Y | y |

| | | | | |
|---|---|---|---|---|
| Safety in Working at height | - | Y | Y | Y |
| Safety in Confined space work | - | Y | Y | Y |
| Defensive Driving | - | Y* | Y* | Y* |

*for construction vehicle operators, helpers & crane operators

Y=YES

**Note:**

i. Subcontractor shall prepare a training plan/ matrix covering all hazards and implement the same after approval of BHEL.
ii. It is to be ensured that every worker undergoes Job-Specific training once every 3 months.
iii. Records of training programmes along with attendance shall be maintained by the subcontractor
iv. Each worker to be issued a Card indicating the types of trainings undergone.

## 11.4 HSE TOOL-BOX TALK:

i. HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work and shall be randomly attended by subcontractor engineers/ officials. The agenda shall consist of the following:

   a. Details of the job being intended for immediate execution.
   b. The relevant hazards and risks involved in executing the job and their control and mitigating measures.
   c. Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
   d. Recent non-compliances observed.
   e. Appreciation of good work done by any person.
   f. Any doubt clearing session at the end.

ii. Tool box talk to be conducted before start of work in every shift.
iii. During toolbox talk, visual check-up of workers regarding health, any signs of fatigue, intoxication etc. shall be conducted and any suspected workers to be acted upon.
iv. Record of Tool box talk shall be maintained as per provided **format**

## 11.5 TRAINING ON HEIGHT WORK:

i. Training on height work shall be imparted to all workers working at height by in-house/external faculty at least once every 3 months.
ii. For Height Workers Separate pass shall be provided by the subcontractor.
iii. The training shall be of minimum 2-hour duration, through audio-visual medium and followed by evaluation. In case of poor scoring, training shall be repeated.
iv. The training shall include following topics:

   a. Proper use of PPEs – safety harness, lanyard, fall arrester, retractable fall arrester, life line, safety nets etc.
   b. Provision of secondary means of fall protection

c. Safe climbing through monkey ladders.
d. Inspection of PPEs.
e. Medical fitness requirements.
f. Mock drill on rescue at height.
g. Dos & Don'ts during height work.
h. Accident case Studies

## 11.6 Re-Induction Training

The induction training shall be repeated for every worker after at least 1 year and shall be a pre-requisite for renewal of Gate Pass/ ID card.

## 11.7 Penalty Training

The personnel involved in Safety Violations/ Incidents shall mandatorily undertake penalty training pertaining to the violation/ incident. Penalty training shall be at least half-day duration.

## 11.8 HSE Promotion-Signage, Posters, Competition, Awards etc.:

i. HSE Displays shall be installed as indicated in Section A
ii. Contracting agencies shall arrange for display of safety hoardings depicting suitable safety cartoons/messages/ cautionary notices at appropriate places of project site to remind the workers to perform their duties safely.
iii. Apart from safety hoardings, each agency should maintain a safety bulletin board at all their work locations. Such safety bulletin boards should depict the activities being planned for the day, good practices, permit details etc.
iv. Safety suggestion boxes shall be kept at each subcontractor's office at site for obtaining safety suggestions from the workers. Best suggestions should be implemented and may be rewarded suitably to encourage the workers for safety.
v. Safety awareness campaigns, competitions, plays, movie shows, songs etc. to be organized for workers at Site and Labor colony from time to time to enhance Safety Awareness

## 11.9 HSE Rewards & Incentive Scheme

Subcontractor shall implement a reward & incentive scheme for workers & supervisors displaying adherence to safety principles. Such workers shall be felicitated in a monthly function, attended by Subcontractor top management and BHEL representatives. Suitable gift shall be given to such workers for encouragement.

## 11.10 HSE Awareness Program for Officials:

Subcontractor shall arrange monthly HSE awareness program on different topics including medical awareness for all engineers/ supervisors / officials working at site. This program can be part of progress/ safety review meetings.

# 12. HSE COMMUNICATION AND PARTICIPATION:

## 12.1 HSE INCIDENT REPORTING, INVESTIGATION & CORRECTIVE ACTION:

i. All incidents (near misses, property damage, first-aid cases, minor, major and fatal incidents) shall be reported to BHEL as they happen immediately through SMS and Hard/Soft copy as per provided format

ii. All incidents including near miss, minor, major and fatal incidents shall be recorded

iii. All incidents shall be investigated for Root Causes and corrective actions ensured to prevent recurrence shall be implemented.

iv. Work shall be put on hold in the area till corrective actions are verified by BHEL

v. The Root Cause Analyses and Corrective actions taken shall be recorded

## 12.2 HSE EVENT REPORTING:

i. Important HSE events like HSE training, Medical camp etc. organized at site shall be reported to BHEL site management in detail with photographs for publication in different in-house magazines

ii. Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported as mentioned above.

## 12.3 MONTHLY HSE REPORTING:

i. All routine and non-routine HSE activities shall be reported to BHEL on monthly basis by the subcontractor as per provided format. The reporting medium can be hard/soft as per BHEL requirement.

ii. The period of reporting shall be 25th of the preceding month to 24th of the present month and shall be submitted by the end of the calendar month.

iii. Report shall include good quality images of HSE Activities

## 12.4 DAILY HSE ACTIVITY REPORTING:

Daily HSE activities shall be reported by subcontractor to BHEL as per provided format

## 12.5 HSE SUGGESTIONS:

All workers and employees shall be encouraged to provide suggestions for improvement in Health, Safety & Environment performance at site. The suggestions shall be recorded in a “Suggestions Register” as per provided format. Suggestions found suitable for implementation shall be implemented and recognition / reward to be given to the submitter.

Suggestion Register to be placed at Site and Labor Colony and shall be reviewed on periodic basis

## 12.6 CLIENT COMMUNICATION:

All HSE related communication from BHEL, customer / external statutory and regulatory agencies to be handled on priority. Same to be recorded and issues to be resolved in expeditious manner

# 13. SAFETY DURING WORK EXECUTION:

Safety during work execution shall be ensured by following appropriate Safety Rules, providing adequate resources, deploying competent and trained manpower, regular training & inspection and non-conformity resolution. Main aspects are indicated as under:

## 13.1 OPERATIONAL CONTROL PROCEDURES:

In order to reduce the risk associated with hazardous activities, applicable OCPs (Operational control procedures) will be followed by subcontractor as per BHEL instructions, outcomes of Hazard Analysis & other requirements. This will be done as part of normal scope of work. Illustrative list of reference OCPs is given below.

**TABLE 13.1 ILLUSTRATIVE LIST OF REFERENCE OCPS**

| No. | Topic | No. | Topic | No. | Topic |
|---|---|---|---|---|---|
| **0** | General Safety | **22** | Steam blowing | **44** | Material preservation |
| **1** | Handling of chemicals | **23** | Working in confined area | **45** | Electro-resistance heating |
| **2** | Electrical safety | **24** | Operation of passenger lift, material hoists & cages | **46** | Blasting |
| **3** | Energy conservation | **25** | Vehicle/ Crane maintenance | **47** | Transformer charging |
| **4** | Welding and gas cutting operation | **26** | Radiography | **48** | Handling of battery system |
| **5** | Fire safety | **27** | Waste disposal | **49** | DG set |
| **6** | Use of hand tools | **28** | Handling & storage of mineral wool | **50** | Sanitary maintenance |
| **7** | First aid | **29** | Working at night | **51** | Piling rig operation |
| **8** | Food safety at canteen | **30** | Computer operation | **52** | Passivation |
| **9** | Use of cranes | **31** | Storage in open yard | **53** | EDTA Cleaning |
| **10** | Storage and handling of gas cylinders | **32** | Drilling, reaming and grinding(machining) | **54** | Chemical cleaning of Pre boiler system |
| **11** | Manual arc welding | **33** | Stress relieving | **55** | Boiler Light up |
| **12** | Use of helmets | **34** | Hydraulic test | **56** | Rolling and Synchronization |
| **13** | Good house keeping | **35** | Trial run of rotary equipment | **57** | Loading of Unit |

| | | | | | |
|---|---|---|---|---|---|
| **14** | Safe excavation | **36** | Batching | **58** | Air compressor |
| **15** | Working at height | **37** | Cable laying/tray work | **59** | Hydra Operation |
| **16** | Filling of hydrogen in cylinder | **38** | Spray insulation | **60** | Duct Pre-assembly |
| **17** | Illumination | **39** | Compressor operation | **61** | Resumption of construction activities after lockdown and prevention of coronavirus infection during site operations |
| **18** | Handling and erection of heavy metals | **40** | Gas distribution test | | |
| **19** | Acid cleaning | **41** | Cleaning of Hot well / Deaerator | | |
| **20** | Oil flushing | **42** | Electrical maintenance | **61A** | Prevention of Covid-19 infection in labour colony |
| **21** | Alkali boil out | **43** | O&M of control of AC plant & system | **62** | Truss/ Structure fit-up and alignment |

a. The reference OCPs shall be suitably modified by subcontractor as per specific requirements to control the hazards.

b. In case any other OCP is found to be applicable during the execution of work at site, then subcontractor will prepare and follow those as well.

## 13.2 Work Permit System:

i. The following activities shall be carried out by the subcontractor strictly after obtaining Permit to Work from BHEL
   a) Height working
   b) Hot working
   c) Confined space Work
   d) Excavation more than 2-meter depth
   e) Radiography
   f) Heavy / Complex / Critical Lifting Activity
   g) Night / Holiday Work
   h) Material Loading / Unloading
   i) Grating, Safety Net, Safety Facility Removal
   j) Live Electrical Maintenance etc. - Lockout / Tagout
   k) Beam / truss/ duct/ structure alignment

ii. The Work Permit Formats shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability

iii. The above list is not exhaustive. BHEL reserves right to introduce additional Permits or modify requirements for usage of existing Permits. The conditions for using the Permit are specified in the Format (General Requirements).

iv. Where customer is having separate Work Permit System the same shall be followed in conjunction / merged to ensure all activities and checks are covered in all systems.

v. Details of working Group to be attached along with work permit request.

vi. All the Permits along with JSA/HIRA must be initiated by Agency Execution Team
vii. Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work with Job Hazard Analysis.
viii. All Permit signatories (including subcontractor's package in-charge and HSE Officer) shall physically visit the work area and check that all the safety control measures necessary for the activity are in place. Only then the permit shall be issued.
ix. Signatory shall physically visit the area of work and ensure all required safeguards before signing the Permit
x. Signatory shall periodically visit the area to confirm the availability of required safeguards throughout the currency of the permit
xi. In case any Permit requirement is not available, work will be stopped till it is made available
xii. Permit holder shall implement and maintain all control measures during the period of permit. The permit will be closed after completion of the work.
xiii. Online Work Permit System shall be used whenever provided by BHEL, otherwise hard copy shall be used

## 13.3 Activity-Specific Precautions/ Controls

Detailed HSE precautions for various activities undertaken at Site by the subcontractors are specified in **Annexure I**. Same are to be ensured by the Sub-subcontractor while carrying out respective activities at Site

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## 14. ENVIRONMENTAL CONTROL & SOCIAL RESPONSIBILITY

i. Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Banned substances like asbestos and Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.

ii. Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per Material Safety Data Sheet (MSDS).

iii. In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. The subcontractor shall use appropriate MSDS for clean-up technique

iv. All subcontractors shall be responsible for the cleanliness of their own areas

v. Regular dust suppression using sprinklers shall be carried out in respective area

vi. The subcontractors shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform to Construction Manager of BHEL accordingly so that reasonable &practicable precautions can be taken to protect other persons who may be affected.

vii. It is imperative on the part of the subcontractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, enhancing good relation with local populace etc.

viii. The subcontractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.

## 15. HOUSEKEEPING

i. Keeping the work area and access roads clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the subcontractor. Such cleanings have to be done by subcontractor within quoted rate, on daily basis.

ii. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from subcontractor's bill. Such decisions of BHEL shall be binding on the subcontractor

iii. Dedicated Housekeeping gangs shall be deployed, who shall be provided all required PPEs and safety training

iv. Mass housekeeping shall be carried out for half a day in a week

v. Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis.

vi. All surplus earth and debris are removed/disposed off from the working areas to identified locations.

vii. Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.

viii. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations.

ix. Sufficient waste bins shall be provided at different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from high locations.

x. Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.

xi. Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.

xii. Labor camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.

xiii. Fabricated steel structures, pipes & piping materials shall be stacked properly.

xiv. No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power line.

xv. Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.

## 16. WASTE MANAGEMENT

i. Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.

ii. Details of E-Waste, Hazardous Waste, biomedical waste etc. and their disposal plan, shall be submitted to BHEL every 6 months as per provided **formats**.

### 16.1 Bins At Work Place

i. Sufficient rubbish bins shall be provided close to workplaces.
ii. Bins should be painted yellow and numbered.
iii. Sufficient nos. of drip trays shall be provided to collect oil and grease.
iv. Sufficient qty. of broomsticks with handle shall be provided.
v. Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

### 16.2 Storage And Collection

i. Different types of rubbish/waste should be collected and stored separately.
ii. Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
iii. Rubbish should not be left or allowed to accumulate on construction and other work places.
iv. Do not burn construction rubbish near working site.

### 16.3 Segregation

i. Earmark the scrap area for different types of waste.
ii. Store wastes away from building.
iii. Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
iv. Clinical and first aid waste stored and incinerated separately.

### 16.4 Disposal

i. Sufficient containers and scrap disposal area should be allocated.
ii. All scrap bin and containers should be conveniently located.
iii. Provide self-closing containers for flammable/spontaneously combustible material.
iv. Keep drainage channels free from choking.
v. Make schedule for collection and disposal of waste.

### 16.5 Warning And Signs

i. Appropriate sign to be displayed at scrap storage area
ii. No toxic, corrosive or flammable substance to be discarded into public sewage system.
iii. Waste disposal shall be in accordance with best practice.
iv. Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

## 17. Traffic Management System

### 17.1 Safe Workplace Transport System

i. Traffic routes in a work place shall be suitable for the persons or vehicles using them. This shall be sufficient in number and of sufficient size. This shall reflect the suitability of traffic routes for vehicles and pedestrians.

ii. Where vehicles and pedestrians use the same traffic routes there shall be sufficient space between them. Where necessary all traffic routes must be suitably indicated. Pedestrians or vehicles must be able to use traffic routes without endangering those at work. There must be sufficient separation of traffic routes from doors, gates and pedestrian traffic routes.

iii. For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.

iv. Temporary obstacles shall be brought to the attention of drivers by warning signs or hazard cones.

v. Speed limits shall be clearly displayed for each kind of vehicle.

vi. Speed ramps preceded by a warning signs or marker are necessary.

vii. The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.

viii. Safest route shall be provided between places where vehicles have to call or deliver.

ix. Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse

x. Safe areas shall be provided for loading and unloading.

xi. Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.

xii. Ensure road crossings are minimum and clearly signed.

xiii. Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.

xiv. Set sensible speed limits which are clearly sign posted.

xv. Where necessary ramps should be used to retard speed. This shall be preceded by a warning sign or mark on the road.

xvi. Forklift trucks shall not pass over road hump unless of a type capable of doing so.

xvii. Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.

xviii. Road traffic signs shall be provided on prominent locations for prevention of incidents and hazards and for quick guidance and warning to employees and public. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.

## 17.2 Traffic Route For Pedestrians

i. Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.

ii. Separate routes shall be provided for pedestrians to keep them away from vehicles. Provide suitable barriers/guard at entrances/exit and the corners or buildings.

iii. Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.

iv. Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
v. Provide high visibility clothing for people permitted in delivery area.

## 17.3 WORK VEHICLE

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are suitably trained. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

i. A high level of stability.
ii. A safe means of access/egress.
iii. Suitable and effective service and parking brakes.
iv. Windscreens with wipers and external mirrors giving optimum all round visibility.
v. Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
vi. Provision of seat belts.
vii. Guards on dangerous parts.
viii. Driver protection - to prevent injury from overturning and from falling objects/materials.
ix. Driver protection from adverse weather.
x. No vehicle shall be parked below HT/LT power lines.
xi. Valid Pollution Under Control certification for all vehicles
xii. Wheel stopper shall be use during the parking of vehicle
xiii. Helper to be deployed in each vehicle as per site requirement.

## 17.4 DAILY CHECK BY DRIVER

1. There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used.

| | | |
|---|---|---|
| Brakes | Mirrors | Warning signals |
| Tires | Windscreen waters | Specific safety systems i.e. controls & interlocks |
| Steering | Wipers | |

2. Management should ensure that drivers carry out these checks.

## 17.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES

i. All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
ii. Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
iii. All overhangs shall be made clearly visible and restricted to acceptable limits
iv. Load shall be checked before moving off and after traveling a suitable distance.
v. On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.

vi. Warning signs shall be displayed during transportation of material.
vii. All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement.
viii. Wheel stopper shall be use during the parking of vehicle
ix. Helper to be deployed in each vehicle as per site requirement.

### 17.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.

## 18. EMERGENCY PREPAREDNESS AND RESPONSE

i. Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by BHEL
ii. Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its subcontractors
iii. All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures.
iv. Assembly point shall be earmarked and access to the same from different location shall be shown
v. Fire exit shall be identified and pathway shall be clear for emergency escape.
vi. Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
vii. Adequate number of first aid boxes shall be strategically placed at different work places to cater emergency need. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
viii. First aid center shall be developed at site with trained medical personnel and ambulance
ix. Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
x. Tie up with fire brigade shall be done in case customer is not having fire station.
xi. Tie up with hospital shall be done in case customer is not having hospital.
xii. Disaster Management group shall be formed at site
xiii. Mock drill shall be arranged at regular intervals. Monthly report of the above to be given to BHEL HSE Officer as per prescribed BHEL formats
xiv. Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

# 19. HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSE requirements. The subcontractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test as applicable, to enable inspection agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

Online/ App-based HSE Inspection system shall be used for inspection whenever provided by BHEL otherwise Hard-copy based system shall continue

| | OK | NOT OK |
|---|---|---|
| Contractor Name: | | |
| Equipment Identification No : | | |
| Inspection Date : | | |
| Next Inspection Date : | | |
| Inspected By : | | |

**Every Inspected Equipment shall display above sticker**

## 19.1 INSPECTION PLAN

Subcontractor shall prepare an inspection plan covering all areas/ activities/ equipment/ hazards and implement the same after getting approval of BHEL. Responsibility to ensure coverage of all areas/ activities rests with the subcontractor.

All Inspections shall be witnessed by BHEL – only then they shall be considered as valid

## 19.2 INSPECTION REPORTS

Monthly inspection reports as per plan shall be submitted to BHEL HSE Head

## 19.3 NON-CONFORMANCES

Any non-conformances identified during inspection observed shall be addressed on priority.

The responsibility of resolution shall rest with the Subcontractor Site In-charge

In case immediate closure of non-conformities is not possible:

a. work to be halted in the area
b. non-conformance to be generated and submitted to responsible person and BHEL
c. non-conformance to be resolved through responsible agency / person

Only after closure of non-conformances, work to be allowed to resume

## 19.4 DAILY HSE CHECKS

Both the Site Supervisors and HSE Officer of Subcontractor are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites

are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:

i. Personal Safety wears & gear compliance.
ii. Complying with site safety rules and permit-to-work (PTW).
iii. Positions and postures of workers.
iv. Use of tools and equipment etc. by the workers.

The inspection should be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day's work ends.

## 19.5 Indicative List of Inspections And Periodicities

Indicative list & periodicity of Inspections is given as under. It is the responsibility of the subcontractor to develop an inspection plan covering all areas & activities in the scope.

| SL. No. | Format Name | Frequency of check (if applicable) |
|---|---|---|
| 01 | Inspection of First Aid Box | Weekly |
| 02 | Inspection of PPE | Weekly |
| 03 | Inspection of T&Ps | Monthly |
| 04 | Inspection of Cranes | Monthly |
| 05 | Inspection of Winches | Monthly |
| 06 | Inspection on Height Working | Weekly |
| 07 | Inspection on Welding & Gas Cutting | Monthly |
| 08 | Inspection on Electrical Installation | Monthly |
| 09 | Inspection on Elevator | Weekly |
| 10 | Inspection of Excavation | Weekly |
| 11 | Inspection of Labor Colony | Monthly |
| 12 | Inspection of Illumination Levels | Weekly |

The checklists shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability before start of work

### 19.5.1 Inspection Of PPE

i. PPEs shall be inspected by HSE officer at random once in a week as per provided **format** for its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
ii. The applicable PPEs for carrying out particular activities are listed below.

### 19.5.2 Inspection Of Tools & Plants (T&Ps)

i. A master list of T&Ps shall be maintained by each subcontractor in provided **format**.
ii. All T&Ps being used at site shall be inspected by HSE officer once in a month as per provided **format** for its healthiness and maintenance.
iii. The T&Ps which require third party inspection shall be checked for its validity during inspection. The third-party test certificate should be accompanied with a copy of the concerned competent person's valid qualification record.

iv. BHEL shall be given advance intimation of Third-Party Inspection. BHEL shall associate with Inspection as per discretion.
v. The validity of T&P shall be monitored as per provided **format**

### 19.5.3 Inspection Of Cranes And Winches

i. Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
ii. Cranes and Winches shall be inspected by HSE officer once in a month as per provided **format** for healthiness, maintenance and validity of third-party inspection.
iii. The date of third-party inspection and next due date shall be painted on cranes and winches.
iv. The operators/drivers shall be authorized by sub-subcontractor based on their competency and experience and shall carry the I-card.
v. The operator should be above 18 years of age and should be in possession of driving license of HMV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

### 19.5.4 Inspection Of Height Working

i. Any activity carried out at more than 2 m height is classified as height work.
ii. Inspection of height working shall be conducted daily by Supervisors before start of work to ensure safe working condition including provision of
   a. Fall arrestor
   b. Lifelines – connected to rigid & independent structure
   c. Safety nets deployed below all height work activities
   d. Fencing and barricading
   e. Warning signage
   f. Covering of opening
   g. Proper scaffolding with access and egress.
   h. Illumination
iii. For full duration of height work, constant supervision to be maintained by dedicated HSE personnel
iv. Inspection on height working shall be conducted once in a week by HSE officer as per provided **format**.
v. Medical fitness of height worker shall be ensured.
vi. Height working shall not be allowed during adverse weather.

### 19.5.5 Inspection Of Welding And Gas Cutting Operation

i. Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
ii. Gas cylinders shall be kept upright.
iii. Use of Flash back arrestor shall be ensured at both ends.

iv. Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per provided **format**.
v. Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
vi. Availability of fire extinguisher at vicinity shall be ensured.

### 19.5.6 Inspection Of Electrical Installation / Appliances

i. Ensure proper earthing in electrical installation
ii. Use ELCB at electrical booth
iii. Electrical installation shall be properly covered at top where required
iv. Use appropriate PPEs while working
v. Use portable electrical light < 24 V in confined space and potentially wet area.
vi. Inspection shall be carried out as per provided **format**.

### 19.5.7 Inspection Of Elevator

i. Elevators shall be inspected by concerned supervisors once in a week as per provided **format**
ii. All elevators shall be inspected by competent person and validity shall be ensured.
iii. The date of third-party inspection and next due date shall be painted on elevator.

### 19.5.8 Inspection Of Excavation

Excavation activities shall be inspected as per provided **format**

### 19.5.9 Internal/ External HSE Audits/Inspections

i. All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed of by site in a time bound manner and reported back the implementation status.
ii. Corrective action and Preventive action on HSE issues raised by certification body issued by BHEL shall be implemented by site and reported to Site management.

## 20. Terms and Definitions:

1. **Incident**
   Work- related or natural event(s) in which an injury, or ill health (regardless of severity), damage to property or fatality occurred, or could have occurred.

2. **Near Miss:**
   An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as “Near-Miss”.

3. **Man-Hours Worked:**
   The total number of man hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labors. Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the

period covered by the number of hours worked per day. The total number of workdays for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

4. **First Aid Cases:**
   First aids are not essentially all reportable cases, where the injured person is given medical treatment and discharged immediately for reporting on duty, without counting any lost time.

5. **Lost Time Injury:**
   Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

6. **Medical Cases:**
   Medical cases come under non-reportable cases, where owing to illness or other reason the employee was absent from work and seeks Medical treatment.

7. **Type of Incidents & Their Reporting:**
   The three categories of Incident are as follows:

8. **Non-Reportable Cases:**
   An incident, where the injured person is given medical help and discharged for work without counting any lost time.

9. **Reportable Cases:**
   In this case the injured person is disable for 48 hours or more and is not able to perform his duty.

10. **Injury Cases:**
    These are covered under the heading of non-reportable cases. In these cases, the incident caused injury to the person, but he still continues his duty.

11. **Total Reportable Frequency Rate**
    Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

    Number of Reportable LTI x 1,000,000/ Total Man Hours Worked

12. **Severity Rate:**
    Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:
    Days lost due to LTI x 1,000,000/ Total Man Hours Worked

13. **Incidence Rate:**
    Incidence Rate is the Number of LTI per one thousand manpower deployed. Mathematically, the formula reads as:
    Number of LTIx1000/Average number of manpower deployed

**14. HIRA:**

Hazard Identification and Risk Assessment (HIRA) is a process of identifying Hazards in work area and then assessing them properly

**15. Method Statement:**

A method statement is prepared by the Execution/ Engineering Department detailing the steps, equipment, competencies and safety precautions required for carrying out any activity

**16. Job Safety Analysis:**

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.

**17. Safety Walk:**

It's conducted periodically by an official - it's a walk through a portion or whole of a site as a HSE officer who notes down HSE observations, speak to concerned workmen and supervisor on observation, get the same corrected with personal follow up- this sends out a strong message on Management's commitment to safety.

**18. Heavy & Complex Lifting:**

A heavy and complex lifting activity includes:

1. Lifting above 20 Tons
2. Tandem Lifting using multiple cranes
   Total load exceeding 75% of capacity of crane. Depending up the condition of cranes, hydra cranes, winch machines & other lifting accessories
3. Lift of unusual difficulty or geometry or rigging
4. Lift over operating units
5. Any other lift as decided by site HSE / Erection

**19. Safety Committee:**

As per the BOCW, Safety Committee shall be constituted if there are more than five hundred or more construction workers are employed at any site. As per the Factories Act, 1948 it is for 250 workers. It shall be represented by equal number of representatives of employer and construction workers.

**20. Night Work:**

Work conducted after sunset when only a fraction of total manpower is available

# ANNEXURES

# ANNEXURE A

Medical Centre & Ambulance

# A. Medical Centre

1. Paramedical staff
    a. When < 500 workers, 1 Trained Male Nurse (round the clock deployment)
    b. When >=500 workers*:
        i. Registered Medical Practitioner (Qualified MBBS) to be deployed for at least 8 hours in a day, 5 days per week
        ii. 2 Trained Male Nurses (round the clock deployment)
2. All articles as per Schedule IV of BOCW Central Rules, 1998 to be made available in the Medical Centre (given under for convenience)
3. Basic Facilities/ Requirements to be provided as per location eg. Refrigerator, Air Conditioner, Anti Venom Serums etc.
4. Tie-ups with speciality hospitals to be ensured for referring serious patients

* In case the number of workers is envisaged to exceed 500, a medical practitioner is to be engaged.

**SCHEDULE IV (BOCW CENTRAL RULES, 1998) ARTICLES FOR AMBULANCE ROOM**
**[SEE RULE 226 (C)]**

i. A glazed sink with hot and cold water always available.
ii. A table with a smooth top at least 180 cm x 105 cm.
iii. Means for sterilising instruments.
iv. A couch.
v. Two stretchers.
vi. Two buckets or containers with close fitting lids.
vii. Two rubber hot water bags
viii. A kettle and spirit stove or other suitable means of boiling water.
ix. Twelve plain wooden splints 900 cm x 100 cm x 6 cm.
x. Twelve plain wooden splints 350 cm x 75 cm x 6 cm.
xi. Six plain wooden splints 250 cm x 50 cm x 12 cm.
xii. Six woollen blankets.
xiii. Three pairs of artery forceps.
xiv. One bottle of spiritus annemia aremations (120 ml).
xv. Smelling salt (60 gm).
xvi. Two medium size sponges.
xvii. Six hand towels.
xviii. Four kidney trays.
xix. Four cakes of toilet, preferably antiseptic soap.
xx. Two glass tumblers and tow wine glasses.
xxi. Two clinical thermometers.
xxii. Two tea spoons.
xxiii. Two graduated (120 ml) measuring glasses.
xxiv. Two minimum measuring glasses.
xxv. One wash bottle (1000 cc) for washing eyes.
xxvi. one bottle (one litre) carbolic lotion 1 to 20.
xxvii. Three chairs.
xxviii. One screen.
xxix. One electric hand torch.
xxx. Four first-aid boxes or cupboards stocked to the standards prescribed in
xxxi. An adequate supply of tetanus toxide.
xxxii. Injections—morphia, pethidine, atrophine, adrenaline, coramine, novocaine (6 each).
xxxiii. Cramine liquid (60 ml).
xxxiv. Tablets—antihistaminic antispasmodic (25 each).
xxxv. Syringes with needles—2 cc, 5 cc, 10 cc and 500 cc.

xxxvi. Three surgical scissors.
xxxvii. Two needle holders, big and small.
xxxviii. Suturing needles and materials.
xxxix. Three dissecting forceps
xl. Three dressing forceps
xli. Three scalpels.
xlii. One stethoscope and a B. P. apparatus.
xliii. Rubber bandage—pressure bandage.
xliv. Oxygen cylinder with necessary attachments.
xlv. Atropine eye ointments.
xlvi. I. V. Fluids and sets 10 nos.
xlvii. Suitable, foot operated, covered, refuse containers.
xlviii. Adequate number of sterilised, paired, latex hand gloves.

## B. Ambulance

1. When number of workers is <500:
   If the distance to a major hospital capable of handling critical injuries expected at Site is <= 50 KM from Site, then 1 BLS (Basic Life Support)/ Type B Ambulance otherwise ALS* (Advanced Life Support)/ Type D Ambulance
2. If no. of workers increases to >2000 workers one additional BLS Ambulance to be deployed
3. Minimum Articles as per Schedule V of BOCW Central Rules to be ensured in each Ambulance. (given under for convenience)

*Final call to be taken at Site in consultation with all the contractors

**SCHEDULE V (BOCW CENTRAL RULES, 1998)**
**CONTENTS OF AMBULANCE VAN OR CARRIAGE**
**[SEE RULE 227]**

The Ambulance Van shall have equipment prescribed as under:

a) General—a portable stretcher with folding and adjusting devices with the Head of the stretcher capable of being tilted upward. Fixed suction unit with equipment. Fixed oxygen supply with equipment. Pillow with case, sheets, blankets, towels, emergency bag, bed pan, urinal glass.
b) Safety Equipment-Flaros with life of three thousand minutes, floor lights, flash lights, fire extinguishers (dry power type), insulated guntlets.
c) Emergency Care Equipment—
   i. **Resuscitation**—Portable suction unit, portable oxygen unit, bag valve mask, hand operated artificial ventilation unit, airways, mouth gag tracheostomy adapters, short spine board, I.V. FLUIDS with administration unit, B. P. manometer cuff stethoscope.
   ii. **Immobilisation**—Long and short padded boards, wire ladder splints, triangular bandage—long and short spine boards.
   iii. **Dressing**-Gauze pads—100 m x 100 mm universal dressing 250 x 1000 mm, roll of aluminium foils—soft roller bandages 150 mm x 5 mm yards adhesive tape in 75 mm roll safety pins, bandage sheets, burn sheets.
   iv. **Poisoning**—Syrup of Ipecac, activated charcoal pre packeted dose, snake bit kit, drinking water.
   v. **Emergency Medicines**—As per requirement (under the advice of construction Medical Officer).

# ANNEXURE A.1

Sample calculation for deduction of operational cost of facilities

**Annexure A.1**

## Cost Calculation Methodology of Operation of Facilities (Data is indicative only)

**(Period of 48 months is considered - shall be on actual basis)**

### A. Project Info:

| | |
|---|---|
| Total time of Project | 48 months |
| Project cost | 1000 Crore |
| No. of packages | 10 (A1-A10) |

### B. Item-wise Calculation:

| Item | Nos. | Rate | Unit | Amount |
|---|---|---|---|---|
| | | | | |
| Ambulance with Driver | 2 | | Monthly/Unit | 170000 |
| Nurse/First aider | 2 X 2 shifts | 15000 | Per month | 30000 |
| Training center one time cost | 1 | 100000 | Once | 100000 |
| Medical center one time cost | 1 | 200000 | Once | 200000 |
| Medicines at medical center | 1 | 10000 | Monthly | 10000 |
| Dust supression water tank | 2 | 2000 | Monthly | 4000 |
| Doctor | 1 | 70000 | Monthly | 70000 |
| Cleaning staff | 1 | 12000 | Monthly | 12000 |
| | | | Recurring monthly expenditure | 296000 |
| | | | Total one-time expenditure | 300000 |

### C. Package-wise Deduction Plan for a period of 48 months

| **Period (In Months)** | 6 | 36 | 6 |
|---|---|---|---|
| | For 1-6 months | For 7-42 months | For 43-48 months |
| **Cost to be incurred from contractors** | 7% | 81% | 12% |
| | 1.17% per month | 2.25% per month | 2.00% per month |

## D. Calculation For One-Time Running Cost

| Packages/ Contracts | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract Values (in Thousands) | 100000 | 250000 | 2000000 | 200000 | 500000 | 1500000 | 1000000 | 1000000 | 250000 | 200000 | 7000000 | | |
| Share of common facilities one time running cost (in Thousands) | 4 | 11 | 86 | 9 | 21 | 64 | 43 | 43 | 11 | 9 | Individual Pkg value X Total one time running cost / All Pkg award values | | |
| Timeline of work | 1-6 | 1-8 | 2-48 | 6-36 | 7-15 | 10-48 | 6-48 | 7-40 | 40-48 | 41-48 | | | |
| Month Count of work | 6 | 8 | 47 | 31 | 9 | 39 | 43 | 34 | 9 | 8 | | | |
| Deduction per month (in Thousands) | 1 | 1 | 2 | 0 | 2 | 2 | 1 | 1 | 1 | 1 | Total of One time Running cost (in thousands) | % deduction share of one time running cost per month | Nos. of active packages in month |
| Month No. | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | 2 | 1% | 2 |
| 2 | 1 | 1 | 2 | | | | | | | | 4 | 1% | 3 |
| 3 | 1 | 1 | 2 | | | | | | | | 4 | 1% | 3 |
| 4 | 1 | 1 | 2 | | | | | | | | 4 | 1% | 3 |
| 5 | 1 | 1 | 2 | | | | | | | | 4 | 1% | 3 |
| 6 | 1 | 1 | 2 | 0 | | | 1 | | | | 5 | 2% | 5 |
| 7 | | 1 | 2 | 0 | 2 | | 1 | 1 | | | 8 | 3% | 6 |
| 8 | | 1 | 2 | 0 | 2 | | 1 | 1 | | | 8 | 3% | 6 |
| 9 | | | 2 | 0 | 2 | | 1 | 1 | | | 7 | 2% | 5 |
| 10 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 11 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 12 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 13 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 14 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 15 | | | 2 | 0 | 2 | 2 | 1 | 1 | | | 8 | 3% | 6 |
| 16 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 17 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 18 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 19 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 20 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 21 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 22 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 23 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 24 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 25 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 26 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 27 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 28 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 29 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 30 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 31 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 32 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 33 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 34 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 35 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 36 | | | 2 | 0 | | 2 | 1 | 1 | | | 6 | 2% | 5 |
| 37 | | | 2 | | | 2 | 1 | 1 | | | 6 | 2% | 4 |
| 38 | | | 2 | | | 2 | 1 | 1 | | | 6 | 2% | 4 |
| 39 | | | 2 | | | 2 | 1 | 1 | | | 6 | 2% | 4 |
| 40 | | | 2 | | | 2 | 1 | 1 | 1 | | 7 | 2% | 5 |
| 41 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 42 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 43 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 44 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 45 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 46 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 47 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| 48 | | | 2 | | | 2 | 1 | | 1 | 1 | 7 | 2% | 5 |
| Total | 4 | 11 | 86 | 9 | 21 | 64 | 43 | 43 | 11 | 9 | 300 | 100% | |

## D. Calculation For Recurring Running Cost

| Packages/ Contracts | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract Values (in Thousands) | 100000 | 250000 | 2000000 | 200000 | 500000 | 1500000 | 1000000 | 1000000 | 250000 | 200000 | 7000000 | |
| Timeline of work | 1-6 | 1-8 | 2-48 | 6-36 | 7-15 | 10-48 | 6-48 | 7-40 | 40-48 | 41-48 | Total of Recurring cost (in thousands) | Nos. of active packages in month |
| | 6 | 8 | 47 | 31 | 9 | 39 | 43 | 34 | 9 | 8 | | |
| Month No. | | | | | | | | | | | | |
| 1 | 85 | 211 | | | | | | | | | 296 | 2 |
| 2 | 13 | 31 | 252 | | | | | | | | 296 | 3 |
| 3 | 13 | 31 | 252 | | | | | | | | 296 | 3 |
| 4 | 13 | 31 | 252 | | | | | | | | 296 | 3 |
| 5 | 13 | 31 | 252 | | | | | | | | 296 | 3 |
| 6 | 8 | 21 | 167 | 17 | | | 83 | | | | 296 | 5 |
| 7 | | 15 | 120 | 12 | 30 | | 60 | 60 | | | 296 | 6 |
| 8 | | 15 | 120 | 12 | 30 | | 60 | 60 | | | 296 | 6 |
| 9 | | | 126 | 13 | 31 | | 63 | 63 | | | 296 | 5 |
| 10 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 11 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 12 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 13 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 14 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 15 | | | 95 | 10 | 24 | 72 | 48 | 48 | | | 296 | 6 |
| 16 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 17 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 18 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 19 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 20 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 21 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 22 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 23 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 24 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 25 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 26 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 27 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 28 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 29 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 30 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 31 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 32 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 33 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 34 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 35 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 36 | | | 104 | 10 | | 78 | 52 | 52 | | | 296 | 5 |
| 37 | | | 108 | | | 81 | 54 | 54 | | | 296 | 4 |
| 38 | | | 108 | | | 81 | 54 | 54 | | | 296 | 4 |
| 39 | | | 108 | | | 81 | 54 | 54 | | | 296 | 4 |
| 40 | | | 103 | | | 77 | 51 | 51 | 13 | | 296 | 5 |
| 41 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 42 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 43 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 44 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 45 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 46 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 47 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| 48 | | | 120 | | | 90 | 60 | | 15 | 12 | 296 | 5 |
| Total | 143 | 388 | 5676 | 329 | 235 | 3102 | 2334 | 1772 | 132 | 96 | 14208 | |

# ANNEXURE B

HSE Displays

## A. Types of Displays

### 1. Based on Content

| SN | Type |
|---|---|
| **1.** | **HSE Hazards & Precautions**<br>Height Work, Housekeeping, Fire Safety, PPEs, Hot Work, Lifting & Rigging Activity, Site-specific Hazards – eg. for Refineries, Nuclear plants etc.; COVID Precautions; Environment Protection etc. |
| **2.** | **Other Displays, Signage etc.**<br>HSE Policy, ISO Certificate, Safety Statistics, Assembly Area Location/ Route, Emergency Contact Numbers, Site Safety Rules & Regulations, Speed Limit, Work in Progress, Lock-Out Tag-Out (LOTO) Boards etc. |

### 2. Based on Mounting

| [Type 1] | [Type 2] | [Type 3] |
|---|---|---|
| Flex Sign Boards of Wooden Frame – directly mounted on Structures (walls, stairs, railings etc.) | Flex Sign Boards with Wooden Frame – mounted on metallic/ wooden legs – preferably double-sided | Coloured weather-proof Paintings on Walls (after due concurrence of BHEL/ Customer – Type 1 in case of no concurrence/ space) |

## B. General Requirements:

a. Displays should be weather-proof as per installation location, i.e. rain-proof, wind-proof and sun-proof.
b. Installation location and size to ensure visibility for the intended viewers (workers and moving personnel)
c. Displays to have at least 50% graphical elements preferably (as applicable). Language should be understandable by majority of the workers
d. Displays to be relevant to the hazards in the area
e. Proper installation to ensure boards don't obstruct activities and should not be prone to fall so as to pose danger
f. In case of multiple elevations (eg. Boiler, Power-house etc.), each elevation to have displays for applicable hazards including Height-Work, Housekeeping
g. For temporary work locations, posters/ boards may be erected and shifted after task is over
h. Minimum size of displays should be A1 unless otherwise specified
i. In case of damage, displays shall be reviewed and repaired/ replaced
j. In areas where night work is envisaged, fluorescent displays shall be installed and these should comprise of at least 20-30% of total displays
k. Total Number of displays to be not less than 1 per 10 workers and are to be dynamically updated based on number of workers

## C. Area-wise Displays

**Below is list of Area-wise displays that are to be installed at Sites (Numbers, locations may be adjusted for specific requirements)**

| SN | Area | Suggested Subjects | Minimum Size | Minimum Quantity | Locations |
|---|---|---|---|---|---|
| **1** | **Walls/ Foundations/ Cement Structures etc. belonging to the package area** | Safety Hazards Prevention and other HSE Awareness content | **[Type 3]** | As per BHEL assessment from time to time | |
| **2** | **Site Interior Roads belonging to the package area** | At least every 20 meters:<br>1. Speed Limit Indication, Safe Driving board<br>2. Boards for hazard awareness | 1.As needed **[Type 2]**<br>**2.** A1 or equivalent each [**Type 2]** | As indicated | Sides of Roads; Height to ensure good visibility |
| **3** | **Specific Package Areas** | **A. Common**<br>At entry to respective Package/ Work Area, each contractor to put up daily updated board with following for each shift:<br>1. Scope of work and start date<br>2. Emergency Contact Numbers<br>3. Emergency Assembly Location, Escape Plan<br>4. Locations and supervisors of various gangs in the area,<br>5. Current Work permit Details<br>6. Safety Supervisor Location assignments - Names, Mobile Nos., Assigned Locations<br>7. Details (Name, Contact No. etc.) of Package In-charge - Contractor & BHEL<br>8. Details (Name, Contact No. etc.) of Safety In-charge - Contractor & BHEL<br>9. LTI Free Man-days & details of last LTI also to be indicated<br><br>In addition, Area-Specific Displays as indicated in Table 1 | **A0**<br>**[Type 2]** | 1 per Package Area | Entry/ Ground Level |

**Table 1**

**(Area/ Package-wise HSE Display Plan – As applicable)**

| **Prepared By (Subcontractor)** | | | | |
|---|---|---|---|---|
| **S. No.** | **Area** | **Suggested Minimum No. of Displays & Types** | **Type** | **Numbers Installed** |
| 1 | Boiler | 3 per working elevation | **[Type 1]** | |
| 2 | Powerhouse | 5 per elevation | **[Type 1]** | |
| 3 | ESP | 5 Per Pass | **[Type 1]** | |
| 4 | Buildings | 5 per elevation | **[Type 1]** | |
| 5 | Cooling Tower (NDCT/ IDCT/ ACC) | 20 per Structure | **[Type 1]** | |
| 6 | Chimney | 20 per Structure | **[Type 1]** | |
| 7 | Fabrication Yard | 10 per Yard | **[Type 2]** | |
| 8 | Batching Plant | 5 per Plant | **[Type 1]** | |
| 9 | Material Storage Yard – Open | 20 per Yard | **[Type 2]** | |
| 10 | Material Storage Shed – Semi-Closed/ Closed | 10 per Shed | **[Type 1]** | |
| 11 | Electrical Booths | 2 per booth<br>+ Line diagram, Emergency contact details | **[Type 1]** | |
| 12 | Medical & First Aid Centre | 2 per Centre | **[Type 1]** | |
| 13 | Rest Shed | 2 per Shed | **[Type 1]** | |
| 14 | Canteen | 2 per Canteen | **[Type 1]** | |
| 15 | Drinking Water Area | 1 Per Outlet | **[Type 1]** | |
| 16 | Washing Water Area | 1 Per Outlet | **[Type 1]** | |
| 17 | Training Centre | 10 per room | **[Type 1/2]** | |
| 18 | Assembly Area | 5 | **[Type 1/2]** | |
| 19 | Stairs | 1 per landing elevation | **[Type 1]** | |
| 20 | Cylinder Storage Area | 5 +<br>Signage: Type of Gas, Empty, Filled etc. | **[Type 1/2]** | |
| 21 | Labor Colony | Electrical Safety with Distribution Plan/ Line Diagram - 1<br>COVID Precautions Posters – 5<br>Safety Awareness Posters – 10<br>Hygiene awareness posters - 2 | **[Type 1]** | |
| 22 | Others | As per requirement | **[Type 1/2]** | |

**Date:**

**Sign (Contractor)** **Sign (BHEL)**

# ANNEXURE C

HSE Tools/ Equipment/ Devices

Following equipment conforming to relevant IS/ISO/BS Codes/ Standards in indicated quantities shall be ensured by subcontractor. This list is tentative, not exhaustive. Quantity and date/ period of deployment shall be as per site requirement.

## A. HSE Tools/ Equipment/ Devices

| SN | Item |
|---|---|
| 1 | Lifelines |
| 2 | Retractable Fall Arrestors |
| 3 | Safety Nets (10m X 5m) fire proof double mesh |
| 4 | Sky Climbers |
| 5 | Fire Blanket |
| 6 | Honey Bee Removal Suit & Kit |
| 7 | Scaffolding Pipes |
| 8 | Flashback Arrestors |
| 9 | Barricading Tape |
| 10 | Binoculars |
| 11 | Walkie-Talkies |
| 12 | LOTO kit |
| 13 | 24-Volt light |
| 14 | Sand Buckets |
| 15 | Hard barricading Pipes |
| 16 | Standby Fire kits |
| 17 | Hand-held Megaphone |
| 18 | Small Public Address System |
| 19 | Foldable Stretcher |
| 20 | Height Rescue Kit (Non-Motorized) |
| | (Others:) |

## B. Test & Measurement Devices

| SN | Device |
|---|---|
| 1 | ELCB Tester |
| 2 | Multi meter (Light cables) |
| 3 | Earth Resistance Meter |
| 4 | Lux Meter |
| 5 | Sound Meter |
| 6 | Anemometer |
| 7 | Breath Analyzer (Alcohol) |
| 8 | Multi-gas dozi-meter/ detector |
| 9 | Gas leakage detector / alarm |
| 10 | Gas monitor (confined space) |
| 11 | Radiation meter & Badges |
| 12 | Blood Pressure Monitor |
| 13 | Fire detectors |
| 14 | Hand held signaling light |
| | (Others:) |

# ANNEXURE D

Rest Sheds

## 1. Determining the Number, Sizes and Locations of Rest Shelters

i. **Numbers:**

The number of rest shelters shall be determined based on maximum number of workers at any one time (across all shifts). Formula is:

Wmax = Maximum number of workers at any time in the Site

Space per worker = 1.1 sq meter

Total space required, Tspace = Wmax X 1.1

Based on total space requirement calculated above, the number of rest sheds can be decided according to availability of locations and concentration of workers – so as to ensure the required space.

ii. **Locations:**

The rest sheds should be so located so as to minimize the distance to be travelled by the workers from their locations of work considering all the practical constraints

iii. **Other:**

The Rest shelter should be fenced so that it cannot be used as parking area.

## 2. Design & Construction of Rest Sheds

### a. Permanent/ Long duration Rest Sheds

i. For locations where, permanent rest sheds can be constructed without possibility of removal for relatively long period of time, a semi-closed shed can be constructed covered with tin roof and supported with well-grouted beams. The floor of the shed to be preferably cemented/ solidified.

ii. Adequate structural requirements suitable to the local weather (wind/ rain etc.) to be ensured.

iii. The design of the rest shed to be approved by Civil Engineering Department of BHEL Site before commencing work

### b. Temporary/ Movable/ Portable Rest Sheds

i. For locations where, permanent rest sheds cannot be constructed either due to non-availability of permanent location or other reasons, temporary rest shed shall be constructed.

ii. Temporary rest sheds shall comprise of Tent arrangement carried out by professional agencies

## 3. Amenities in Rest Sheds

### a. Essential Amenities

Following amenities shall be essentially ensured in a rest shed:

i. Hygienic environment with regular cleaning and housekeeping (with records)
ii. Adequate illumination
iii. Adequate ventilation/ heating as per weather conditions
iv. Clean Drinking water source
v. Hand Washing area
vi. Toilets & Urinals
vii. Benches/ mats for sitting/ lying
viii. Any other essential requirement deemed necessary by the Site
ix. Dust bins of sufficient quantity/ size that are vacated each day/ as per requirement

### b. Additional/ Optional Amenities

Following amenities are optional but are recommended to enhance the level of satisfaction of work force:

i. Hot/ Cold drinks (Tea, Coffee, Glucose etc.) as per requirement
ii. Snacks
iii. Fans/ Coolers/ Heating arrangements as per requirement and weather conditions
iv. A nice, welcoming interior design, music etc.
v. Water cooler

## 4. Health & Safety Requirements of Rest Sheds

Use of asbestos in construction is banned and shall not be used.
In addition, following essential Safety features shall be ensured in Rest sheds:

i. Availability of Fire extinguishers (preferably CO2 type)
ii. Display of Safety Posters
iii. Pest/ reptile protection
iv. Mosquito prevention measures

## 5. Note:

Any suitable closed spaces/ newly constructed buildings etc. available at project may also be used for the purpose of rest shed with due concurrence of BHEL

# ANNEXURE E

Labor Colony

1. These Guidelines suggest minimum requirements. However, additional requirements based on feasibility and circumstances, while adhering to directions of GOI/District Administration/Local Authority guidelines to be considered
2. Norms for social distancing, training/ awareness, face masks, disinfection, sanitization, gate entry, quarantine, medical, action in case of suspect cases of COVID and other communicable diseases etc. to be followed as per Govt. and BHEL guidelines issued from time to time
3. Labor colony to be developed as close to the Site as possible to avoid lengthy commute
4. A "Suggestion Register" shall be made available at the labor colony for residents. The feedback shall be reviewed on weekly basis and acted upon by concerned Contractor. Same shall be reviewed periodically by authorized BHEL Site Official.
5. **Canteens, Latrines & Urinals, Washing Facilities, Creches, Residential Accommodation and other infrastructure/ facilities:**
   Numbers/ Quantities and Features of these facilities shall be in line with the following as applicable:

   a. BOCW Act & State Rules
   b. The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act & State Rules
   c. Factories Act & State Rules
   d. Other Relevant Acts & Rules

6. **Cleanliness & Hygiene/ Housekeeping:**
   a. Regular cleaning of the labor colony to be ensured.
   b. Daily cleaning of Sanitary facilities.
   c. Proper drainage system to prevent water-logging
   d. Regular fogging to prevent spread of mosquitoes
   e. Prevention of foul smell through necessary interventions
   f. Dust suppression as per requirement
   g. Cutting of Grass at regular intervals and other necessary measures to prevent pests & reptiles
   h. Stray animals to be banned from labor colony.
   i. Outside every common facility, eg. Toilet, washroom, food hall/ canteen etc., provision of washbasin with flowing water and soap (preferably liquid soap) to be ensured
7. **Power Supply Layout:**
   Electrical supply Layout of Labor Colony shall have the provision of Safety devices like MCBs, ELCBs etc. and to be clearly displayed
8. **Washing & Drinking Water Availability**
   a. Adequate water to be provided in line with: "Estimation of Water Requirements for Drinking and Domestic Use (Source: National Building Code 2016, BIS)"
   b. Drinking water tank to be cleaned every week and sticker for the same pasted on the tank
   c. Drinking water source should be tested as per IS 10500
9. **Waste Disposal:** Separate bins for dry, wet and biomedical waste to be installed. These bins to be evacuated regularly
10. **Training & Awareness/ Displays**
    a. **HSE Awareness Displays**: Posters/ banners/ boards to be displayed in labor colony. Subjects of displays shall be precautions for applicable hazards at work site.
    b. **Emergency Contact Numbers** including that of Doctor, Hospital, Labor Colony Supervisor, HSE Officials to be displayed prominently

11. **Doctor Visits:**
    Regular and need-based visits by Doctors to be ensured through tie-ups etc.
12. **Inspection & Review:** Regular inspection of labor accommodation to be carried out by the Contractor as per prescribed format. Last inspection date, inspector and next due date to be prominently indicated near main gate
13. Provision of a Fair Price shop in the premises to be ensured as per requirement
14. Adequate arrangements to be ensured in case of children/ families

# ANNEXURE F

Toilets

Toilets (Latrines and urinals shall be ensured at Site and Labor Colony in accordance with the Inter-State Migrant Workmen Act, 1979 as given below:

| LATRINES | URINALS |
|---|---|
| 1. Latrines shall be provided in every establishment on the following scale, namely: -<br>a. Where females are employed, there shall be at least one latrine for every 25 females;<br>b. Where males are employed, there shall be at least one latrine for every 25 males:<br><br>Provided that where the number of males or females exceeds 190, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 30 thereafter<br>2. Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings. | 1. There shall be at least one urinal for male workers up to fifty and one for female up to fifty employed at a time:<br>Provided that where the number of male or female workmen, as the case may be, exceeds 500 it shall be sufficient if there is one urinal for every fifty females up to the first 500 and one for every 100 or part thereof thereafter.<br>2. The urinals shall be designed and located so as to ensure privacy. |

Important:

1. Where workers of both sexes are employed there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers 'For Men Only', or For Women Ónly', as the case may be.
2. The notice shall also bear the figure of a man or of a woman, as the case may be.
3. The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment.
4. The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
5. Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the public health authorities.
6. Water shall be provided by the means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.
7. At Site, on ground, Modular Bio-toilets as per industry standard specifications and regular professional cleaning shall be ensured. The toilets should be sufficient in number and easily accessible to workers from every work area
8. At Site, in various elevations, suitable urinals with proper drainage to be ensured at each elevation in line with IS 2064 (1993). Same to be cleaned regularly

# ANNEXURE G

Fire Extinguishers

| SN | Type of Fire Risk (Class of Fire) | Extinguishing Medium & Relevant INDIAN STANDARD | Scale of Equipment (Minimum recommended) |
|---|---|---|---|
| **1.** | **CLASS 'A'** Fires involving ordinary combustible materials like wood, paper, textiles, rubber etc. (Ordinary hazard or low fire load) | WATER Soda acid type, water type (gas pressure) and water type (constant air pressure) IS: 934 -1976; IS: 940 -1976; IS: 6234 -1971 | For every 600 square meter floor area or part, one 9-litre capacity. Minimum 4 numbers per floor or room; should not be required to travel more than 15 meter to reach any extinguisher. |
| **2.** | **CLASS 'A'** (Extra hazard &high fire load) | -do | -do – (Also, consult local fire authority). |
| **3.** | **CLASS 'A'** (Special hazards) | -do | -do – Extra provision For every 100 square meter floor area or part, one 4.5 Kg. CO2; minimum 2 numbers per room; should not be required to travel more than 10 meter to reach any extinguisher. |
| **4.** | **CLASS 'B'** (Fires in flammable liquids like oils, solvents, petroleum, products, varnishes, paints, etc. where blanketing effect is essential) (Storage and handling in small quantities) | FOAM / CARBON DIOXIDE / DRY CHEMICAL POWDER IS: 933 -1976; IS: 2878 1976; IS: 2171 1976; IS: 4308 -1982 | For every 50 square meter floor area or part, 2 numbers 9 -liters foam or 5 kg dry powder; should not be required to travel more than 10 m in the area of storage to reach any extinguisher. |
| **5.** | **CLASS 'B'** (Bulk storage other than in tank form)) | -do - | -do- (but minimum 3 numbers per room) |
| **6.** | **CLASS 'C'** (Fires involving gaseous substances under pressure where it is necessary to dilute the burning gas at a very fast rate with an inert gas or powder) (storage and handling of gas cylinders) | CARBON DIOXIDE / DRY CHEM. POWDER. The best way to extinguish such fire is by stopping the flow of fuel gas to the fire. Container is kept cool with water spray. IS: 2878 1976; IS: 2171 -1976; IS: 4308 -1982 | For every 100 square meter floor area or part; 2 numbers, 10 kg powder extinguisher or 6 kg C02; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher. |
| **7.** | **CLASS'D'** Fires involving metals like magnesium, aluminum, zinc, potassium etc. where the burning metal is reactive to water and which require special extinguishing media or technique | SPECIAL DAY POWDER IS: 2171 -1976 IS: 4861 -1968 | For every 50 square meter floor area or part, 2 nos. 5 kg special dry powder; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher. |
| **8.** | **MIXED OCCUPANCY** (electrical); Generators; Transformers; etc. | CARBON DIOXIDE DRY POWDER, IS: 2878 1976; IS: 2171 -1976 | For every 100 square meter floor area or part one 10 kg C02. Minimum 2 numbers for every location should not be required to travel more than 10 meter to reach an extinguisher. |
| **Note**: Due to peculiarities of the power plant construction sites, there would be locations in the construction areas of Boiler, Turbine, Generator, Transformer, etc. where different types of fire risk (classes of fire) may co-exist. Special care shall be taken while selecting and installing portable fire extinguishers for such locations so that all types of fire risk that may co-exist, are adequately covered. Similar special care shall be taken for storage areas. | | | |

a. All Electrical welding booths shall be equipped with appropriate Fire Extinguisher

b. Appropriate Fire Extinguishers shall be made within easy reach of all welding operations
c. Fire extinguishers shall be regularly tested and last checked date to be indicated on each. Master list shall be prepared with location and details
d. Providing appropriate fire-fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
e. Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times.
f. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
g. All other fire safety measures as laid down in the “codes for fire safety at construction site” issued by safety coordinator of BHEL shall be followed.
h. Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
i. Emergency contacts nos. must be displayed at prominent locations
j. Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

# ANNEXURE H

HSE Compliance Certificate

Bill Ref no:_____Date:_____

NAME OF THE AGENCY: _____ Work-Area/Package:_____

| Sl. No. | Description | Remarks |
|---|---|---|
| 1 | **HOUSE KEEPING**: | |
| 1.1 | All working areas at site (specific to the agency) are free from garbage's, scraps & any other undesired non-plant materials. There is no encroachment in safe passage of man, material & T&P to carry out activities safely | |
| 1.2 | All the plant materials under the custody of the agency are stacked & stored properly. | |
| 2 | **GENERAL ILLUMINATION**: | |
| 2.1 | ALL the working areas at site & office of the agency including passages are having proper & sufficient illumination. | |
| 3 | **STATUTORY & REGULATORY REQUIREMENT**: | |
| 3.1 | Sufficient water for drinking & other purposes and sanitation in work area and labour colony are available. | |
| 3.2 | Periodical Medical check-up of workers & staff done regularly & report submitted to BHEL | |
| 3.3 | Regular EYE testing is done for Crane operators/Welders and data's are available with agency | |
| 3.4 | All the T&P, Cranes etc used by the agency are having proper T.Cs & Fitness certificate available from competent authority. | |
| 4 | **SAFETY COMPLIANCE:** | |
| 4.1 | Number of Tool box meetings between Safety officers, erection staff & workers of the agency held in this month with location mentioned | |
| 4.2 | All precautions & Safety measures including PPE compliances are taken before working at HEIGHT | |
| 4.3 | Permit for working at Height is taken & complied accordingly | |
| 4.4 | ELCB is used in Construction Power Supply source by the agency & Proper Distribution board and electrical cabling has been used by the agency and regularly checked by electrician & safety officer of the agency | |
| 4.5 | Unsafe areas barricaded properly &unsafe opening closed properly | |
| 4.6 | Proper Platforms & Hand-rails used In areas earmarked earlier | |
| 4.7 | Proper safety signage's, Slogans & Emergency contact phone numbers including FIRE contact nos. are made available by the agency in locations mentioned | |
| 5 | Whether any penalty imposed by BHEL towards non-compliance of above points. | |

| **VENDOR'S SIGNATURE** | |
|---|---|
| Erection Engineer | |
| HSE Officer | |
| Site-in-Charge | |

| **BHEL'S SIGNATURE** | |
|---|---|
| Erection Engineer | |
| HSE Officer | |
| Package-in-Charge | |

# ANNEXURE I

Activity-Specific Safety Precautions/ Controls

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## General

The philosophy of hierarchy of controls as below shall be followed

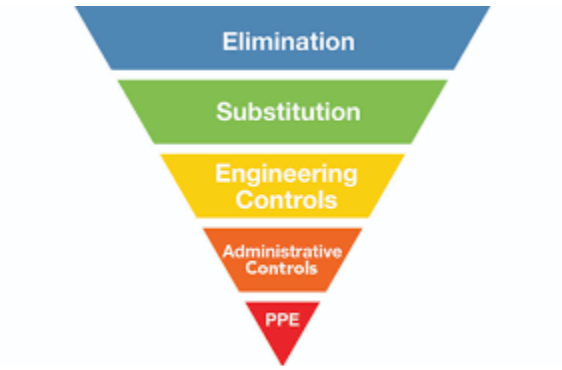



Fig. 1.1

It shall be ensured that there are multiple protections against any accident/ incident. For example, for height work there shall be safe platforms and walkways, Safety Nets and Lifelines for hooking double lanyard Safety harness by workers.

Monitoring and modifying worker behavior shall be part of ensuring safety. All personnel should be competent and trained for the job

Brief Safety guidelines for various hazardous activities are indicated below, besides the mandatory requirements based on Hazard Identification studies, HSE Procedures, Operational Control Procedures, Work Permits, applicable Indian Standard Codes and other provisions detailed in this document. Constant supervision at all times to be maintained by Execution & Safety Team to ensure implementation of these provisions.

## 1. WORK AT HEIGHT:

a. All work at height above 2 meter above ground level without complete platforms, handrails and other related fall protection shall require a work permit in the prescribed form. This shall require approval by the competent authority. The HSE officer of sub-contractors shall follow the checklist religiously by physically verifying the condition of the work area before recommending for approval.

b. Prior to the start of work at elevation, the HSE Officer involved with the work must meet the work supervisor to review the scope of work, and must review all the possible fall hazards and effective safety responses. The evaluation / analysis must be documented and kept on file and on site by the HSE Officer.

c. Whenever a fall hazard or other exposure exists for working at heights more than 2.0m/6ft, the nature and scope of work will be evaluated for conditions and environmental factors before selecting the appropriate fall protection system (active, passive or a combination of measures, as appropriate).

d. All Engineering and Administrative Controls including barricading, safe platform, Safety Nets etc. shall be made available at work location. Under no circumstances, there shall be total reliance on PPEs only

e. **Safety Nets**

   i. Contractor shall maintain sufficient stock of Safety Nets for deployment

   ii. Safety Nets as per IS: 11057:1984 should be used extensively for prevention / arrest men and materials falling from height.

   iii. The safety nets shall be fire resistant, duly tested and shall be of ISI marked.

iv. Safety Nets shall be deployed below all platforms where height work is envisaged. Duration of work, delay shall be no excuses for non-installation of Safety Net

f. Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
g. Monkey Ladder shall be fitted with cages. Rope ladder should be discouraged.
h. In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
i. In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
j. For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure along with separate fall arrestor.
k. The procedures for the safety response to identified fall hazards developed and rescue plans must be reviewed with all individuals exposed to the hazards.
l. The HSE Officer must establish an inspection process of fall protection systems. Some equipment requires documented inspections by its manufacture on a regular schedule. Such equipment must have evidence of the inspection and re-certification process on it. This information must be reviewed before the equipment is actually used. Individuals must visually inspect the fall protection equipment before each use. Failure to complete this inspection process could result in serious injury or death.
m. Immediately remove from service any fall protection equipment that is identified as defective, damaged, or has been subjected to an impact. Damaged fall protective equipment must be destroyed to prevent re-use and not be discarded into trash containers, as the worn or damaged equipment could be unintentionally re-used.
n. Aerial lifting devices, excluding scissor lifts require the use of full body harnesses and lanyards in any elevated position.
o. Where Height related works are applicable then rescue team (consist of 5- 10 person) shall be identified and trained for potential rescue.

## 1.1 Personnel fall protection system must include:

**a. Safety Harness**

All height workers must use Full Body Safety harness with double lanyards with shock absorber (only). The primary lanyard is never unhooked until the secondary lanyard is secure. The design of the working platform should be such that under no circumstances, worker should have both lanyards unhooked while at height.

**b. Lanyard**

i. The type of work and the environment conditions determine lanyard and lifeline selection. If welding, chemical cleaning that may damage lanyards, connectors or lifelines, sandblasting, etc., either protect the components or use more appropriate type of system.
ii. Lanyards and lifelines must incorporate, or be used with, an appropriate deceleration (shock absorbing) device. Deceleration devices include rope grabs, rip-stitch lanyards, specially woven lanyards, tearing, or deforming lanyards, automatic self-retracting lifelines and lanyards which dissipate or limit the energy imposed on the employee during fall arrest.
iii. Once in use, the system's effectiveness is to be monitored. In some cases, a program for cleaning and maintaining the system may be necessary. Lanyard and lifelines must use locking snap hooks only and under

no circumstances must two lanyard snap hooks be connected.

**c. Lifeline**

All lifelines in general are to be made of min 12mm dia. steel rope (plastic coated) and tied to columns with 3 clamps at each end. Wherever columns are not available to tie the lifelines, the vertical posts as per the design below are to be provided after carrying out drop load test initially. A load of 240kg to be dropped off the mid-point of lifeline in this test.

**d. Lifeline Post**

**DIAGRAM : LIFELINE POST**

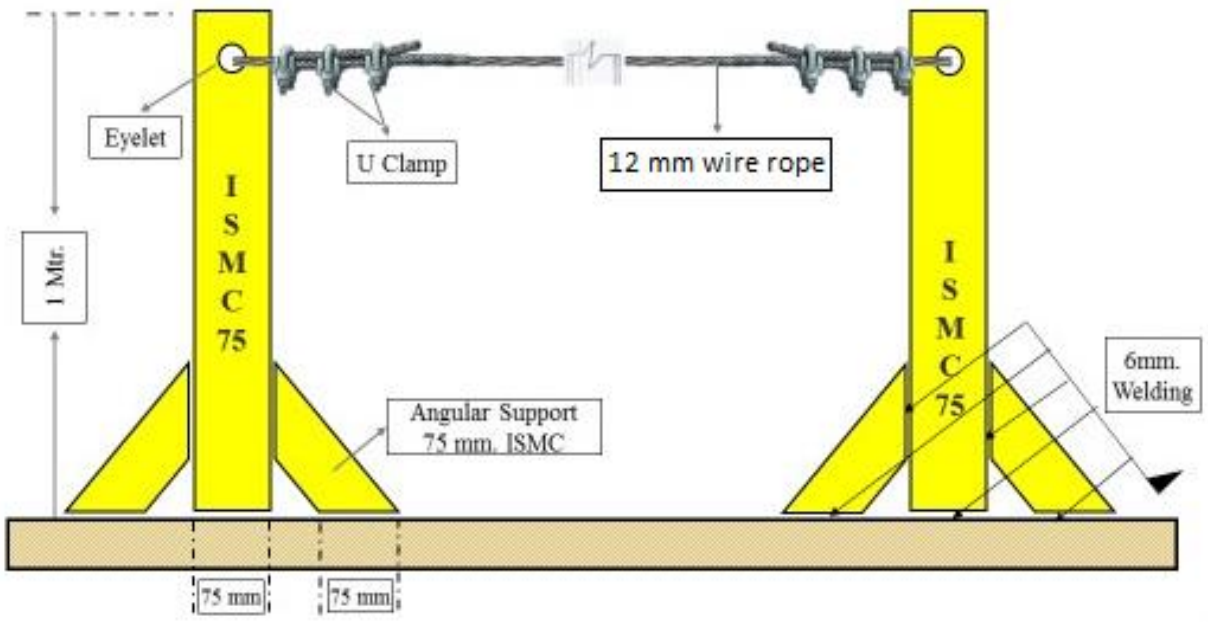



**Fig. 2.1 Lifeline Post**

i. The support at vertical post shall be fixed at end-to-end (welded/ bolted). The maximum length of one end to another end shall be 6 meters

ii. If the length of a lifeline is more than 6 meters, then intermediate vertical post(s) are to be used. Such intermediate post(s) will act as supports and the lifeline rope should simply pass through the eyelets (holes) of such supports without being anchored

iii. The lifeline need not be wrapped / clamped to any intermediate post

iv. Such intermediate posts must be used at an interval of every 6 meters

v. The post(s) in which the original lifeline is to be installed should be capable of sustaining a tensile stress of 2268 Kgs.

vi. In a horizontal lifeline installation, maximum allowable sagging is 500-600 mm

vii. For a single spun lifeline, no more than 3(Three Nos.) persons are allowed to work; for more than two workers, another lifeline should be installed

viii. Horizontal lifeline should be so installed that it does not impede safe movement of workers

ix. All the installation work must be carried out by competent person with adequate knowledge

## 1.2 Working Platform

a. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or

floor level, they shall be closely boarded and shall have adequate width, which shall not be less than 750 mm and be suitably fenced.

**b. <u>Precautions against the fall of Materials, Persons and Collapse of Structures:</u>**

i. Every opening in the floor or a building or in a working platform shall be suitably barricaded to prevent the fall of persons by providing suitable fencing or railing whose minimum height shall be 90 cm.

ii. Adequate precautions should be taken such as the provision of fencing, or barriers to protect any person who might be injured by the fall of materials, or tools or equipment being raised or lowered. Hard barricading shall be made at such places made of scaffolding pipe & clamps covered with reflective net. Cradle may be used for lifting materials - however this shall be made of MS angles and flats only and duly certified by the HSE officer. Operators may also use designed containers for lifting small tools.

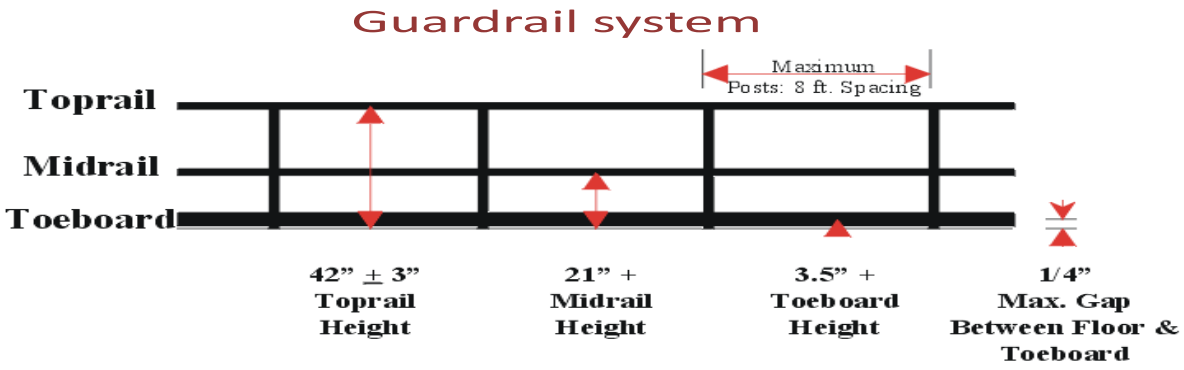
iii. Guardrails (including scaffolding) erected over/adjacent working areas must have the guardrails screened (opening < 0.5), to prevent material from falling outside the platform/decking.

iv. Guardrails must be able to withstand a 200-pound force exerted in any one direction.

v. Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.

vi. All openings through which workers are liable to fall should be kept effectively covered or fenced and indicated in the most appropriate manner.

vii. Guardrails and toe-board/barricades and sound platform conforming to IS: 4912-1978 and other Indian laws and regulations as depicted below should be provided.




**<u>Fig. 2.2 Guard Rail System</u>**

viii. Guardrails shall be provided to protect workers from falling from elevated work places. The rails are generally made of MS pipes of suitable dia. Rebar shall not be used for any handrails, ladder or cover purpose. Wherever the guard-rails and toe-boards cannot be provided:

a. adequate safety nets or safety sheets shall be erected and maintained; or
b. adequate safety harnesses shall be provided and used and / or
c. adequate fall arrestor shall be provided and used.

As mentioned under PPE clause, all these PPEs shall be defect free and regularly inspected for any defect. The full body safety harness shall have double lanyard only with max 1.8m length.

ix. The monkey ladders shall have sufficient fall arrestors. Adequate lifelines of 8mm steel wire rope shall be provided across the work area.

x. The HSE officer shall recommend appropriate PPEs after analyzing hazards and risks involved.

## 1.3 Scaffolding

All scaffolds shall be conformant to the relevant standards including IS 3696 and IS 4014 as applicable. A sketch of the scaffolds proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use. Only cup lock type scaffoldings will be allowed in site. Where cup lock type scaffolding arrangement is not feasible by the virtue of the location, in that case only pipe and clamp type scaffolding will be allowed.

a. The scaffolding work must be carried out by a competent person, who shall train the scaffold users on safety aspects
b. All scaffolds shall be erected / dismantled by scaffolding crew under direct supervision of competent scaffolding supervisors.
c. All scaffolds shall be capable of supporting 4 times maximum intended load and erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement. Bamboo scaffolding is not permitted for use on site.
d. Each employee on the scaffold shall use an approved safety harness attached to an independent lifeline. The lifeline is to be securely attached to substantial members of the structure (not the scaffold itself) or to securely rigged lines, which shall safely suspend a worker in event of a fall.
e. Guard rails and toe boards shall be installed on all open sides and ends of platforms more than (2) meters above ground or floor
f. Scaffold planks must be at least 5 cm x 25 cm (2” x 10”) full thickness lumber scaffold grade or better.
g. Scaffold planks shall not span distances greater than 2.5 meters (8 feet).
h. Scaffold planks shall extend over end supports not less than 6 inches nor more than 12 inches and be secured to the scaffold. Scaffolding and accessories with defective parts shall be immediately repaired or replaced.
i. All scaffolding must be a minimum of two planks wide. No one may work from a single plank.
j. Scaffold planks must be inspected before use. Planks that have been damaged must be removed from the site.
k. Access ladders must be provided for each scaffold. Climbing the end frames is prohibited unless the design incorporates an approved ladder.
l. Adequate mudsills or other rigid footing capable of withstanding the maximum intended load must be provided.
m. Scaffolds more the 6 meters (20 feet) in height must be tied to the building or structure at intervals which do not exceed 4 meters (13 feet) vertically and 6 meters (20 feet) horizontally.
n. Do not overload scaffolds. Material should be brought up as needed. Scaffolding must not be loaded in excess of its rated capacity.
o. Barrels, boxes, kegs, blocks or similar unstable object must never be used as work platforms or to support scaffold.
p. Where persons must work under or pass under a scaffold then a 18 gauge wire mesh screen must be installed between the toe board and guard rail.
q. Employees exposed to overhead hazards while working on a scaffold will be protected by 5 cm (2”) thick planks.
r. Wooden/bamboo ladders shall not be allowed at any cost. Ladder’s rungs shall be fitted /welded

properly. Before every use the rungs should be checked for safe use.

s. Wooden scaffolds shall not be used in areas where fire / fire products are expected

t. Ropes made of jute / Plastic and other fire prone material shall not be used to tie up scaffolding components together

u. The platform should have permanent hand rail and mid rail with Toe board without fail.

v. All platforms are to be tightly planked for the full width of the scaffold, except as may be necessary for entrance openings. Platforms shall be secured in place.

w. On suspension scaffolds designed for a working load of 500 pounds, no more than two workers are permitted to work on the scaffold simultaneously. On suspension scaffolds with a working load of 750 pounds, no more than three workers are permitted on the scaffold simultaneously.

**x. Requirements for different types of Scaffolds:**

**A. Suspended Scaffold**

i. Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.

ii. Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

**B. Rolling Scaffolds**

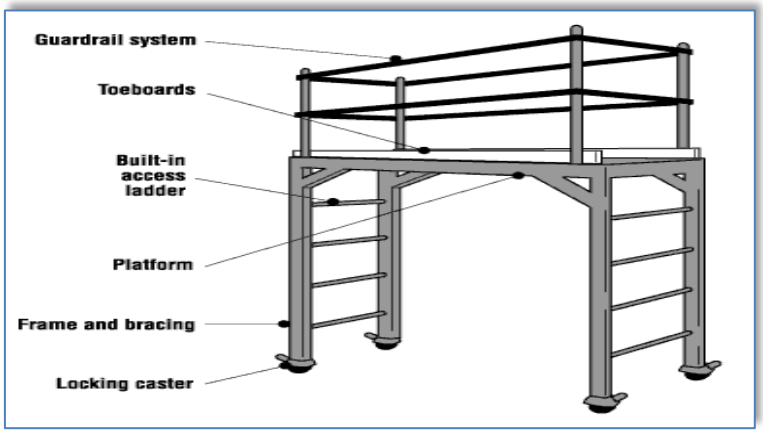
i. The height of rolling scaffolds shall not exceed three times the minimum base dimension.

ii. The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).

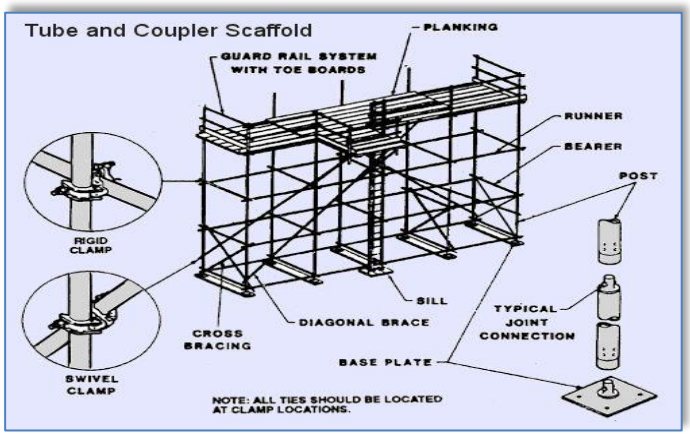
iii. Adequate help must be provided when moving a rolling scaffold.

iv. Secure or remove all loose materials, equipment and tools before moving a rolling scaffold.

v. No one is permitted to ride a rolling scaffold when it is being moved. Castor brakes must be locked-on when the scaffold is not being moved.




Rolling Scaffold




Tube & Coupler Scaffold

**Fig. 2.3 Types of Scaffolds**

## 1.4 Ladder Safety

A sketch of the ladders proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use

**a. Safe Use of Ladders:**

i. Fall protection is required when working on a ladder above 2 meters and when climbing above nearby guardrails.

ii. Ladders must be inspected prior to use and by a competent person quarterly, with documentation.
iii. Use portable ladders for height up to 4 M only
iv. Provide fixed ladders for height above 4 M
v. Place the ladder at an angle of 75 degrees (approx.) from the horizontal (1:4)
vi. Extend ladder at least 1 M above the top landing
vii. Secure top and bottom of the ladder firmly to prevent displacement- anti skid lining at the bottom
viii. Ensure that the width of the ladder is not less than 300 mm and distance between rungs is not more than 300 mm
ix. Provide landings of minimum size 600 x 600 mm at intervals not more than 6 M for fixed ladders. Check the ladders daily for any defects
x. Ensure that the areas around base and top of the ladder are clear. Getting on and off the ladder is more hazardous than using it. Use a mudsill if the ladder is to rest on soft, lose or rough soil
xi. Do not use ladders of conducting material near power lines, and only use ladders near power line or other energize system with exposed parts if they are confirmed locked-out and de-energized.
xii. Stand no higher than the fourth rung from the top for carrying out any job standing on a ladder.
xiii. Never reach out from a ladder to perform work where your belt buckle protrudes past the ladder rung.
xiv. Always face the ladder while climbing up or down
xv. Maintain three-point contact while climbing up or down a ladder i.e. two hands and one foot or two feet and one hand on the ladder at all the times.
xvi. Avoid climbing up or down a ladder while carrying anything in hands. Lift tools, equipment and materials with a rope.
xvii. Work from portable and extension ladders near guardrail where fall expose exists over the guardrail regardless of height, and above 2.0 mtr. heights from the working/walking surface will require the use of personal fall arrest equipment

## 2. EXCAVATION & CIVIL WORKS

All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

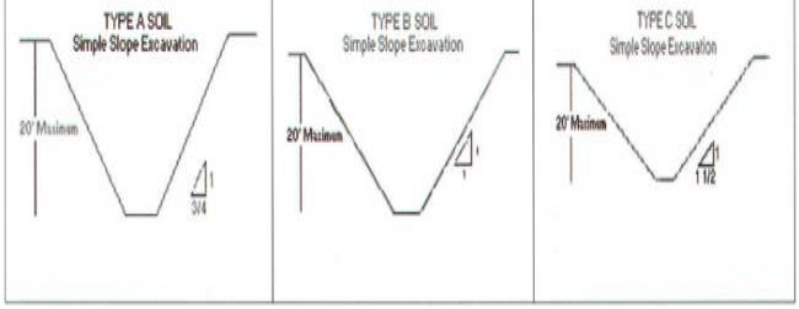
### 2.1 Excavation

The following safety measures are to be ensured before and during excavation:

a. All Excavation activities more than with depth of 1.22 meter or more shall require and Excavation Work Permit
b. Check for underground utilities like electrical / telephone cables, sewage, water lines and proper care has to be exercised to protect and prevent damage to it.
c. Electrical cables and service lines to be identified using cable detector/locator device before carrying out the excavation work
d. Proper and adequate slope is maintained while excavating
e. Adequate shoring or sheeting is done wherever require to prevent soil sliding
f. Safe access through ladder or steps for exit & entry to excavation
g. No material /excavated soil is kept within one meter from the edge
h. Safe way is planned and provided for movement of HEM /transport equipment near excavation
i. Safety helmet and shoes/gum boots are provided and worn by the workmen at excavation works

j. Dewatering arrangement is made where water seepage is prevailed.
k. Stop blocks are provided to avoid vehicles reversing into the excavated trenches
l. Danger signs /Caution boards are displayed at work spot
m. Hard Barricading is provided at excavated pits. It should be made of scaffolding pipe and clamp with reflective nets.
n. All Excavated area of depth 3mtr or more is to be hard barricaded with pipe.

| Soil Type | Height/Depth ratio | Slope Angle |
|---|---|---|
| Stable Rock | Vertical | 90 deg. |
| Type A | ¾ : 1 | 53 deg. |
| Type B | 1 : 1 | 45 deg. |
| Type C | 1½ : 1 | 34 deg. |




**Determining Soil Type**

| Type | Description | Examples |
|---|---|---|
| A | Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot or greater. | Clay, silty clay, sandy clay, clay loam and in some cases: silty clay loam and sandy clay loam. |
| B | Cohesive soils with unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf. | Angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases silty clay loam and sandy clay loam. |
| C | Cohesive soils with unconfined compressive strength greater than 0.5 tsf or less. | Granular soils such as gravel, sand and loamy sand; submerged soil or soil from which water is freely seeping; submerged rock that is not stable. |

**Fig. 3.1 Excavation Reference**

## 2.2 Piling

Ensure the following precautionary measures before starting piling works:

a. Inspection of piling equipment by responsible person for its condition before initiating piling operation.
b. Checklist and OCP for piling to be prepared using manufacturer's instructions and used
c. Testing and its certification wire rope, slings, D-shackles, chain pulley blocks using in the process of piling work by competent person
d. Adequate support and secured foundation of the piling equipment to avoid toppling
e. Hoses should be lashed and adequately secured
f. Proper work platform is to be provided on piling frame
g. Safe work procedures and close supervision to prevent unsafe acts of operators/any unsafe conditions that may arise
h. Only experienced and trained operators are engaged for the piling operation
i. Provision of Personal Protective Equipment (PPE) like safety shoes/gumshoes/safety helmet/safety belt etc. and its use by their workmen.
j. Special care and precautions If work is near electrical live cables/ electrical equipment
k. Cordoning of work area to prevent un authorized entry
l. Guarding of revolving parts
m. Specific measures to prevent over turning of pile driver/missing of hammer/ hammer movement out of range

## 2.3 Batching Plant Operation

Following Safety considerations for batching plant are to be ensured:

1. Modern type batching plant should be used in which all the moving parts are protected and emergency

and safety features are incorporated.

2. Installation of external Electric moto-vibrators in the feeding hopper of all batching plants to reduce human intervention.
3. Installation of safety devices like pull-chord on both the sides of conveyor for stopping the conveyor in emergency
4. Workers carrying cement / sand to be given appropriate PPEs like respiratory masks & gloves.
5. Conveyor belt/rotating parts must be guarded properly.
6. Safety awareness shall be inculcated in workmen about the risk involved in rotating parts.
7. The agency shall ensure to erect the batching plant as per drawing including installation of all safety devices as provided by manufacturer and witnessed by BHEL Engineer in charge before starting of machine in future.
8. Safety audit to also focus on Batching plant.
9. The site shall impose penalty on the agency who has violated the safety norms as per contract.

### 2.4 Mobile Plant

Mobile plant includes tractors, trailers, dumpers, excavators, bulldozers, road rollers etc. for earthmoving purpose and concrete mixers, concrete transit mixtures, concrete pumps etc for concreting purpose. Due to the very nature of their function and movement in difficult terrains, congested areas, working in tandem with manual work and other operations the danger is inherent.

Automatic reverse camera with reverse horn connected with reverse gear is compulsory for all moving machineries.

**Following Safety measures to be ensured for Mobile Plant:**

a. Where movement around site is involved, routes should be planned, obstruction free and well maintained
b. Observe specified speed limits
c. Operating personnel should be aware of associated risks and its preventive measures
d. Only experienced, trained and authorized persons with valid license (wherever applicable) should operate the mobile equipment/vehicles
e. Provide and use Warning lights and reverse horn for cautioning the people around
f. Operation should be on level and stable ground with adequate working clearance.
g. Loading of out riggers/stabilizers should be well within safe ground bearing capacity
h. No person should be on equipment or vehicle during loading and unloading of material
i. Operators should be protected by warning barriers or switching off power when working in close proximity of overhead power lines
j. The equipment /vehicles should be well maintained and provided with effective brake system and other safety devices (wherever require)
k. Rotating parts of equipment should be adequately guarded
l. Provide necessary personal protective appliances and ensure its use by the operating personnel Ensure effective measures at source to control harmful emissions, dust, fumes contaminating atmosphere and cause health hazards to the operators and people in the vicinity.
m. No overloading/over stressing of vehicles/plant is allowed
n. Hoses, pipes, receivers, gauges and valves involved in carrying out hydraulic fluid/ compressed air should be checked for leaks and tested prior to operation.

o. Adequate safe clearance for swing and movement is to be judged during operation of Concrete mixer
p. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
q. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket
r. Operator leaving work spot should ensure that the equipment/vehicle is kept in neutral position and place on firm and level ground.
s. The hand brake should be kept in position and block road wheels as additional safety measure
t. Blades/buckets should be kept low while moving
u. The dozer blades should not be used as brakes except in emergency
v. The ground should be examined for its bearing capacity and general safety especially when operating road roller at the edges of slopes, embankments.
w. The roller should not be moved downhill with the engine out of gear
x. If operating near excavations the following precautionary measures are to be ensured
y. Barricading, edge protection to prevent fall of persons/vehicles over running while reversing etc.
z. Suitable support system and adequate allowance to avoid the danger of side collapsing
aa. Experienced signaler /attendant should be always accompanied with operator/driver for proper direction /signal and also to caution others in the working Zone during operation of mobile plant

**2.5 Concrete Vibrators**

a. Revolving parts/belt drives should be adequately guarded and Vibrating unit shall be completely enclosed and have suitable overload relays and effectively earthed
b. Ensure sufficient length of cable to the Vibrator.
c. Ensure electric starters and other accessories are firmly fixed adequately supported
d. Ensure locking of needle load while inserting needle in to the vibrator,
e. Ensure periodical lubrication and maintenance

**2.6 Concrete Mixers**

a. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
b. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket

**3. WELDING & GAS CUTTING SAFETY (HOT WORK)**

a. All Hot Work shall require a Hot Work Permit
b. Inbuilt Voltage Reduction Device (VRD) equipped arc welding machine will only be allowed for work.
c. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced.
d. All safety precautions shall be taken for welding and cutting operations as per IS-818.
e. When possible, items to be welded, cut, heated, etc. shall be moved to a safe location free of combustible or flammable material. If this is not possible, then all combustibles/ flammables that can be removed from the area shall be removed within a 35-foot circumference and a positive means of confining arcs and sparks generated by the process shall be ensured and additional person(s) shall be stationed as fire-watch for the area(s) still exposed, along with obtaining the Hot Work Permit as applicable.
f. Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times suitable for the type of Fire.

g. Drums, tanks, and similar containers that have contained flammable or toxic material shall not be welded, cut, or heated until they have been made safe by water filling, thorough cleansing or similar accepted practices. The container shall also be ventilated during the welding, cutting, or heating process.
h. Proper ventilation is required for any welding or torch operations performed in a confined space.
i. Any welding or gas cutting operations performed on metals of toxic compounds or coating such as zinc, stainless steel, lead, cadmium, chromium, and beryllium shall be properly ventilated and/or proper respiratory protection shall be worn by any person that could be exposed to fumes, vapors, and gasses created by the welding and gas cutting processes.
j. Wherever it is practical, all arc welding operations shall be shielded to prevent direct light rays or sparks from contacting persons in the vicinity or from reaching areas normally used to travel through or into the vicinity. Where this is not practical, persons who shall be in the area are to use proper eye and skin protection. Other persons who are not participating in the welding or gas cutting operations are not to be allowed into the hazard zone.
k. Welders and other employees who are exposed to arc welding radiation shall wear suitable clothing and protective apparel to prevent burns and other types of ultraviolet radiation damage to the skin.
l. Arc welding machines shall be shut down when being moved or when they are not in continuous use. Electrode holders left unattended shall have electrodes removed and shall not be left where they might contact employees or conducting objects.
m. Arc welding power supply cable shall be of proper rating and material, e.g. copper.
n. Welders shall guard against allowing materials adjacent to or behind them to reflect radiation back toward them or towards others in the area. Reflected radiation can cause skin burns and eye flash burns.
o. Valve caps shall be in place when cylinders are not in use. Valve caps shall never be used for lifting the cylinder vertically.
p. Torches shall only be lit by approved strikers; never with matches, cigarette lighters, or hot-work.
**q. Splatter / Slag Collector:**

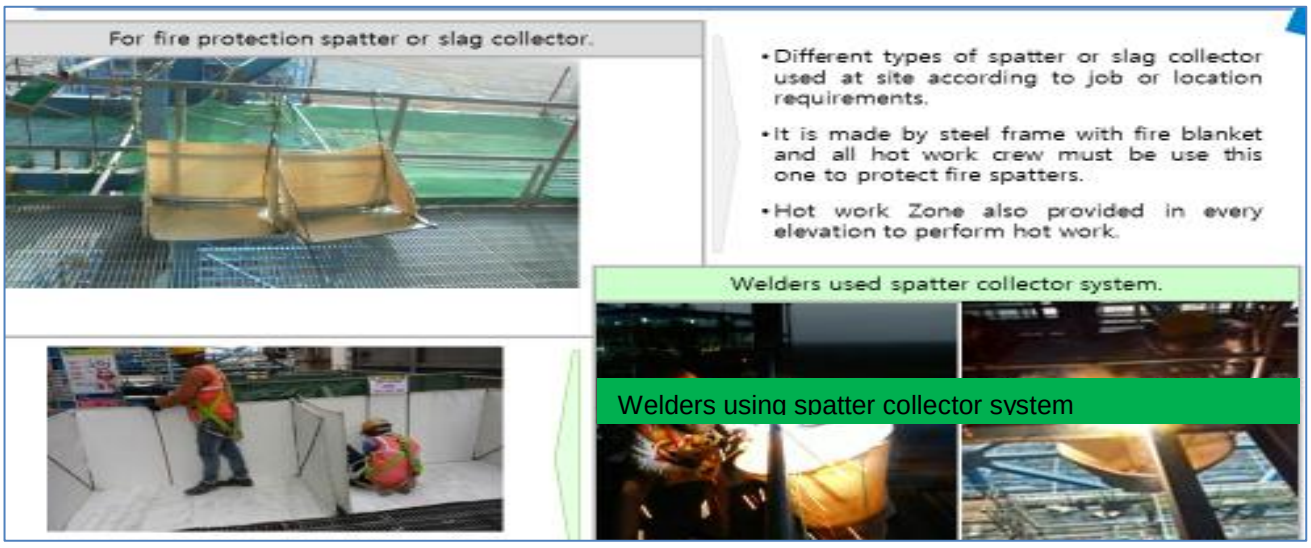



**Fig. 4.1 Splatter / Slag Collector**

While carrying out job at height, the sparks or molten slag shall be prevented from falling down by putting a fire-resistant (non-asbestos) sheet or patter/ slag collector or even MS Sheet. The passage of falling sparks

or molten slag shall be barricaded till ground floor and any cable/ tubes/ any other objects interfering in the passages hall either be removed or covered with Fire-resistant sheet or MS Sheet.

**r. COMPRESSED GAS**

i. All cylinder valves shall be closed when any work is finished and when any Cylinders are empty or being moved. Valve protection caps shall be placed and secured properly before gas cylinders are transported, moved or stored.

ii. Compressed gas cylinders shall be secured in an upright position with chain or appropriate means during storage & use. However, a trolley shall be used for transportation.

iii. Compressed gas cylinders shall always be secured from tipping or falling, whether in use, in storage or in transit. The cylinders shall always be secured upright, except during times when actually being hoisted or carried.

iv. When cylinders are transported by powered vehicle they shall be secured in a vertical position.

v. Regulators shall be removed when cylinders are not in use or are in transit, unless the cylinder is firmly secured on a special carrier designed for this purpose.

vi. Gas cylinders are not allowed to be used in man-basket when occupied.

vii. Cylinders containing oxygen or fuel gasses shall not be taken into confined spaces.

viii. Oxygen cylinders shall be stored a minimum of 6 meters from fuel gas cylinders or shall have an approved firewall between them.

ix. All cylinders shall be kept at a safe distance from welding or cutting operations or shielded from arc/ sparks / slag.

x. All cylinders shall be placed where they cannot become part of the electrical circuit.

xi. Oxygen and acetylene shall not be stored together. Oxygen must be separated from acetylene (or ANY fuel gas) or combustible material by at least 20ft or a barrier with a 30-minute fire resistance rating.

xii. All Cylinders should be stored upright in a designated area with labels for the type of gas. All applicable precautions to be ensured during storage

xiii. Oxygen and fuel gas regulators, hoses and associated equipment shall not be altered and shall be in proper working order while in use.

xiv. Compressed air can be extremely dangerous if allowed to penetrate the skin. As such, the use of compressed air to clean off yourself or other workers shall be strictly prohibited.

xv. All gas cylinders shall be stored in upright position. Suitable trolley shall be used for cylinder movement, the design of which shall be submitted to BHEL Engineer for approval.

xvi. No of cylinders shall not exceed the specified quantity as per OCP

xvii. Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.

xviii. All cylinder should be kept only in cylinder trolley.

xix. Cylinder shall be transported in upright vertical position by suitable mean.

**4. LIFTING & RIGGING SAFETY**

a. All Heavy / Complex Lifting operations as defined in Clause 6.12 shall require a Lifting Work Permit. A written rigging procedure and plan must be prepared for all individual heavy/ complex lifting operations.

b. All the cranes and lifting tools & tackles shall be inspected on daily / weekly basis as well as monthly by expert as per applicable formats.
c. In addition, inspection / certification as mandated by law shall be carried out wherein these shall be tested and certificates of fitness shall be obtained from 3rd party State Govt. approved competent agency before deploying at site and later periodically. BHEL shall be given advance intimation of any such inspections
d. The last date of Third-Party Inspection and the next Due date shall be conspicuously displayed on all cranes. A copy of certificate shall be pasted on operator's cabin of all the lifting equipment.
e. Specifically designed heavy steel plates lifting clamps shall be used for lifting heavy metal sheets. Manmade lifting clamp chapa shall not be used for lifting/shifting of plates.
f. Following requirements shall be mandatorily followed, wherever applicable:
    i. The manufacturer's instruction for maintenance shall also be followed. All safety measures shall be followed.
    ii. All tools tackles, lifting appliances; material-handling equipment etc. used by the subcontractor shall be of safe design and construction.
    iii. The operators, slingers and signalers shall be qualified as per IS 13367 (part-1):2003 "Safe use of cranes- code of practices".
    iv. There shall be a person responsible for co-ordination among cranes where multiple cranes are used, and lifting over load chart of the crane to be avoided.
    v. Mobile phone should be banned for crane operator and lifting operation. Only walkie talkie shall be allowed in rigging/Lifting purpose.
g. Lifts/Movements between 5 Tons and 20 Tons:
    i. Shall include a rigging plan, detailing schematic representation of the handling/lifting operations that must be included on the Method Statement.
    ii. When performing similar lifts of identical items, only one rigging plan need be prepared, provided each of the lifts can be performed in accordance with the rigging plan.
h. Lifts/Movements Less Than 5 Tons:
    i. An equipment rigging plan is not required for lifts less than 5 tons, safety measures are covered in the JSA. This could change as per BHEL requirement

**i. Personnel Lifts (Man-Basket / Jhoola):**

The design of personnel man basket shall be submitted to BHEL Engineer for approval before use. Relevant permit (Height work & others as applicable) shall be completed prior to lifting any people, along with a rigging plan.

i. A separate Lifeline / fall arrestor anchored to a fixed structure outside of Jhoola shall be provided for the workers inside the basket. All occupants of the basket shall have Safety Harnesses equipped with rope grabs, which are to be hooked to the vertical lifeline.
ii. Man-basket shall be used where access through ladders or scaffolding is not feasible.
iii. Man-baskets shall be designed and engineered by a manufacturer (job made man-baskets are not allowed, unless designed and tested by a certified engineer), and built robust with MS Angles and flats or plates or channels only.
iv. Guard rails top and mid, must be in place and screened-in to avoid material from falling out of

basket. The factor of safety shall be 200%.

v. It shall have a door with double latches and shall open inside. Anchor points shall be identified within the man-basket.

vi. The man-basket shall be thoroughly inspected and load tested and a trial run performed without personnel before being put to job.

vii. It shall be treated as a lifting tool (T&P Item) and shall undergo same certification cycle and inspection as other lifting equipment.

viii. An additional sling of required lifting capacity shall be fixed the man-basket main lifting point and attached to the crane above the ball or block.

ix. While lifting man-basket, the crane shall maintain a uniform speed of lift without any swing.

x. Once man-basket reaches the destination, the lift brakes shall be locked as long as the basket
   a. remains at that point. The same care shall be taken in its descent.

xi. As for hanging man-basket, the same shall be hung off a rigid structure with help U-shaped handle welded to man-basket. This shall be tested once in a year by a competent person.

xii. Use of Rebar steel for making and monkey-ladder must be avoided.

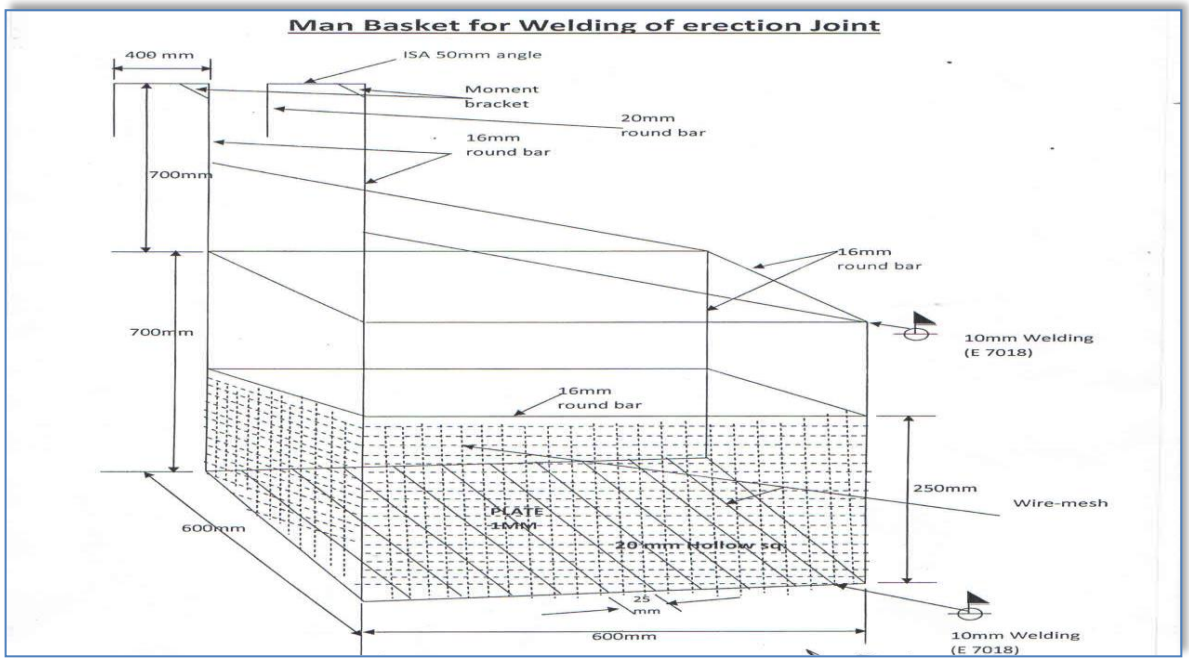



**Fig. 5.1 Man Basket for Welding Erection Joint**

## 4.1 Cranes & Hoisting Equipment:

This section provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.

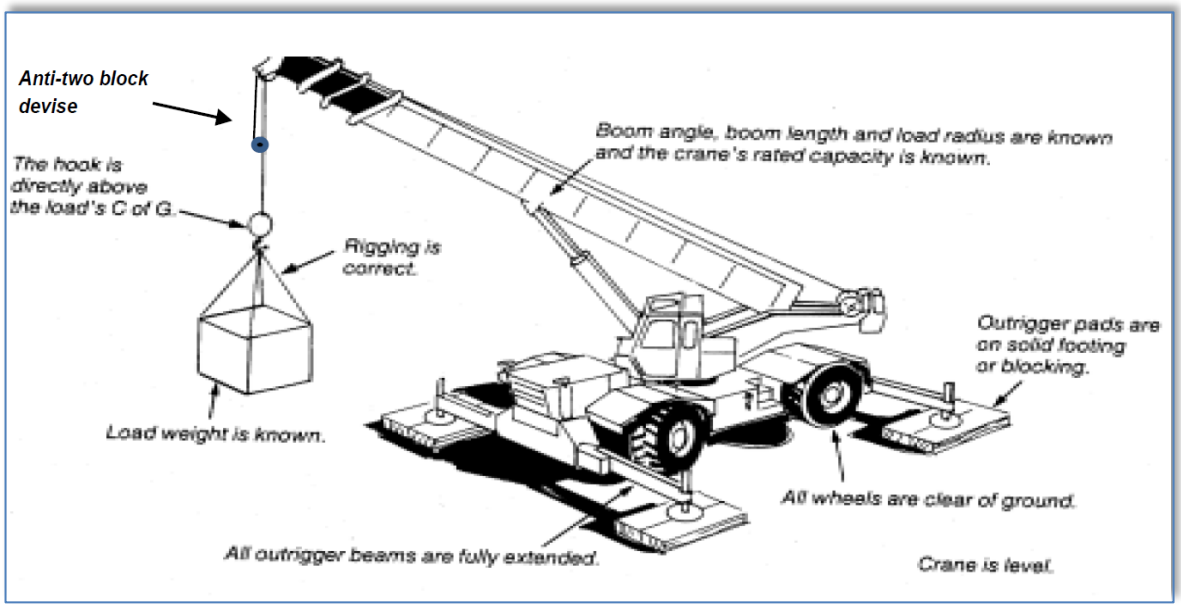



**Fig. 5.2 Proper Crane Setup**

a. On every crane or piece of hoisting equipment notices of all rated load capacities, recommended operating speeds, and any hazard warnings or special instructions shall be conspicuously posted. All instructions and warning shall be visible from the equipment operator ‘s station.
b. Cranes shall have an Anti-Two-block safety device installed
c. All mobile cranes shall have overload and backup alarms, load angle indicators and limit switches
d. All areas within swing radius of cranes that are potentially accessible by pedestrian, vehicular, or equipment movement shall be barricaded to prevent anyone or any vehicle or equipment from being struck by the crane or hoisting equipment, or its load(s).
e. No part of the lifting equipment or its load shall be within the distance as specified in the Indian Electricity Act from an energized power line
f. Cranes shall have annual certified third-party inspection and be inspected before use by the operator. Any defects shall be corrected before use. Logs of crane inspection shall be kept with the crane.
g. Make certain that the rigging personnel, material, and equipment have the necessary capabilities for the job and are in safe condition.
h. Communicate with person(s) directly responsible for accomplishing the work and / or work area to establish requirements/responsibilities and make certain that all preparatory work is complete.
i. Mats/Pads must be used on all lifting equipment, equipped with out riggers.
j. Pick and carry must have the load secured to the rig in front.
k. Only BHEL Approved Plate Lifting Spreader Beam configuration shall be used (Sample in Fig. 11.3.5.3)
l. Crane operators must follow the following:
    i. Pass an annual Operator’s Physical examination
    ii. Carry a valid training certification card at all time while operating issued by the Govt. or other recognized institute.

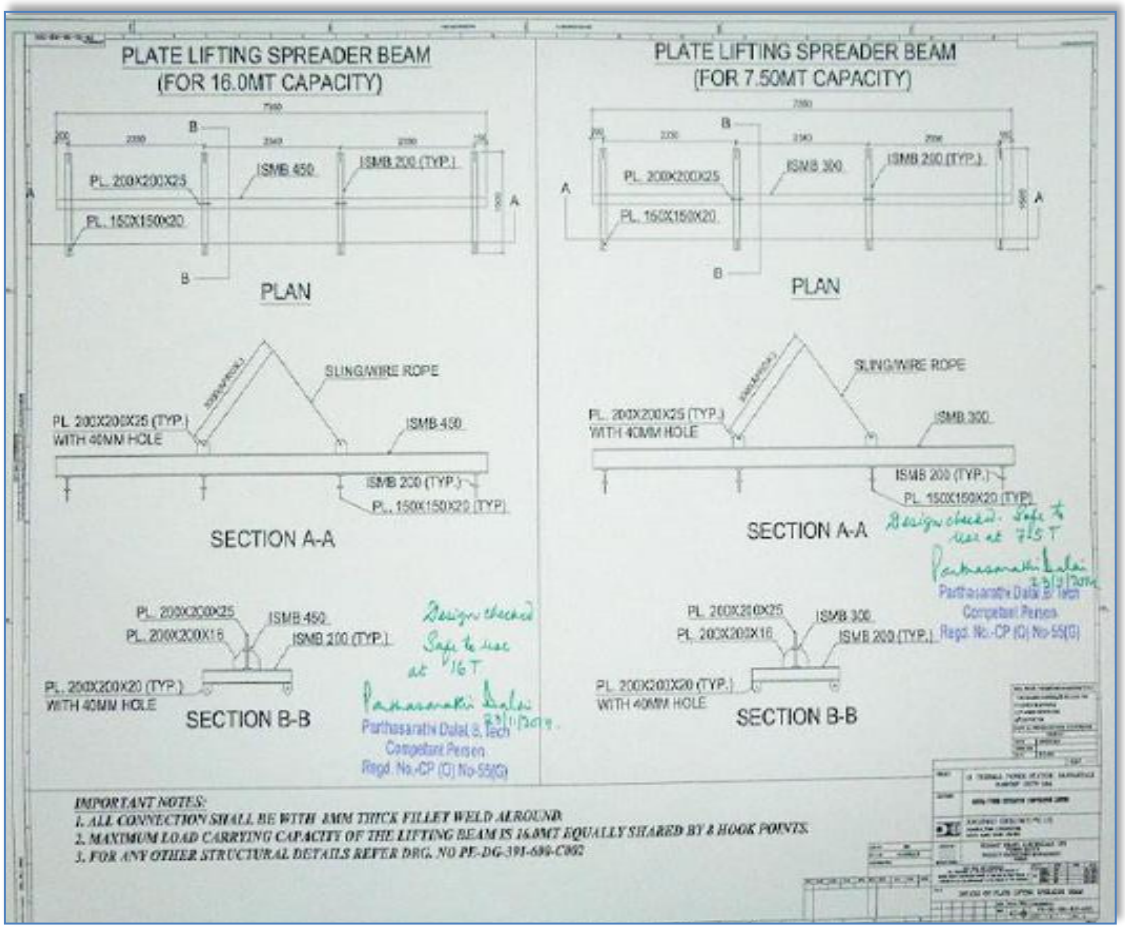



**Fig. 5.3 Typical Plate Lifting Spreader Beam Configuration for 7.5 MT and 15 MT Loads**

**m. Safe Rigging Practices**

i. Review the planned operation and requirements with the operator and rigging crew.
ii. Ensure a pre-lift meeting is conducted with crane operator, tagline operator, signal personnel, and Safety Manager.
iii. Designate a qualified person from the rigging crew to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desire clearance by visual means.
iv. Clear the lift area of all unnecessary personnel.
v. Hydras shall only be allowed for loading & unloading works & shall not be allowed to move with load

**n. Rules for Safe Rigging**

i. Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
ii. Never allow wire rope to lie on the ground for any length of time or on rusty steel or near solvents, chemicals or corrosive substances.
iii. Slings must not be pulled from between or under loads with load resting on the sling.
iv. Keep all rope away from flame cutting or welding operations.
v. Never use rope as sling material.
vi. Never wrap a wire rope completely around a hook.

vii. Do not bend wire rope near any attached fitting.

viii. The sling must be selected to suite the most heavily loaded leg rather than the total weight when using multi-legged sling to lift loads in which one end is heavier than the other.

ix. When using 3 and 4-legged sling configurations, any two legs must be capable of supporting the entire load.

x. Where possible, wire rope choker hitches must include a shackle with the eye around the shackle pin to prevent breaking wires of the choke. The choker hitch must be “snugged down” prior to lifting, not after tension is applied.

xi. Unless authorized by the hook manufacturer when more than two rope eyes are placed over a hook, install a shackle, pin resting in the hook, and place the rope eyes in the bowl of the shackle.

xii. Properly rig all loads to prevent dislodgment of any part.

xiii. Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.

xiv. Loads must be safely landed and properly blocked before being unhooked and unslung. Tag lines must not be used in situations that jeopardize the safety of the lift.

xv. Lifting beams must be plainly marked with their weight and designed working load and must only be used in the manner for which they were designed.

xvi. The hoist rope or chain must never be wrapped around the load. The load must be attached to the hook by slings or other rigging devices that are adequate for the load being lifted.

xvii. Multiple part lines must not be twisted around each other.

xviii. The hook must be brought over the center of gravity of load before the lift is started.

xix. If there has been a slack rope condition, determine that the rope is properly seated on the drum and in the sheaves prior to lifting.

xx. Keep hands away from pinch points as the slack is being taken up.

xxi. Leather gloves are recommended when handling wire rope.

xxii. Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.

xxiii. Never ride on a load that is suspended.

xxiv. Avoid allowing the load to be carried over the heads of any personnel.

xxv. Never work under a suspended load until the load has been adequately supported from the floor and all conditions have been approved by the supervisor in charge of the operation.

xxvi. Never leave a load suspended unless emergency evacuation is required.

xxvii. Never make temporary repairs to sling.

xxviii. The capacity of a sling is determined by its angle, construction, type of hitch and size.

xxix. Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.

xxx. Never point load a hook unless it is especially designed and rated for such use.

xxxi. Make certain that the load is broken free before lifting and that all legs are taking the load.

xxxii. When using two or more slings on a load make certain all slings are made from the same materials.

xxxiii. Lower the loads on to adequate blocking to prevent damage to the slings.

xxxiv. Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.

xxxv. The weight of the hook, load block and any material handling devices must be included when determining crane capacity.

xxxvi. Calculated weights cannot exceed load chart without written approval.

xxxvii. Personnel must be completely clear of loads being picked up or set down by crane. Tag lines will be used to control the loads. Loads must not be touched by hand while placing/ moving.

**o. Slings**

The following are rules for safe use of synthetic slings:

i. Synthetic slings must be marked to show the rated capacity for each type of hitch and type of web material.

ii. Nylon web slings must not be used where fumes, vapors, sprays or mists or liquids of acids or phenolic are present. Web slings with aluminum fittings must apply in this category.

**iii. Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:**

a. Acid or caustic burns
b. Melting or charring of any part of the sling surface
c. Snags, punctures, tears or cuts
d. Broken stitches
e. Distortion of fittings
f. Synthetic web slings of polyester or nylon must not be used at or come in contact with temperatures in excess of 82°C
g. Polypropylene web slings must not be used at or come in contact with temperatures in excess of 93°C
h. Insulated hooks must be tested yearly to ensure insulation integrity to at least manufacturer's specifications.

**p. Wire Rope Slings must be removed from service and destroyed if any of the following conditions are present:**

i. In (10) randomly distributed wires broken in one (1) rope lay, or five (5) broken wires in one (1) strand in one (1) rope lay.
ii. Wear or scraping of one-third the original diameter of outside wires.
iii. Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure such as:
iv. Evidence of heat damage.
v. End attachments that are cracked, deformed worn.
vi. Corrosion of the rope or end attachments.

**q. Metal mesh slings must be immediately removed from service if any of the following conditions are present:**

i. A broken weld or broken brazed joint along the sling edge.
ii. Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
iii. Lack of flexibility due to distortion or corrosion.

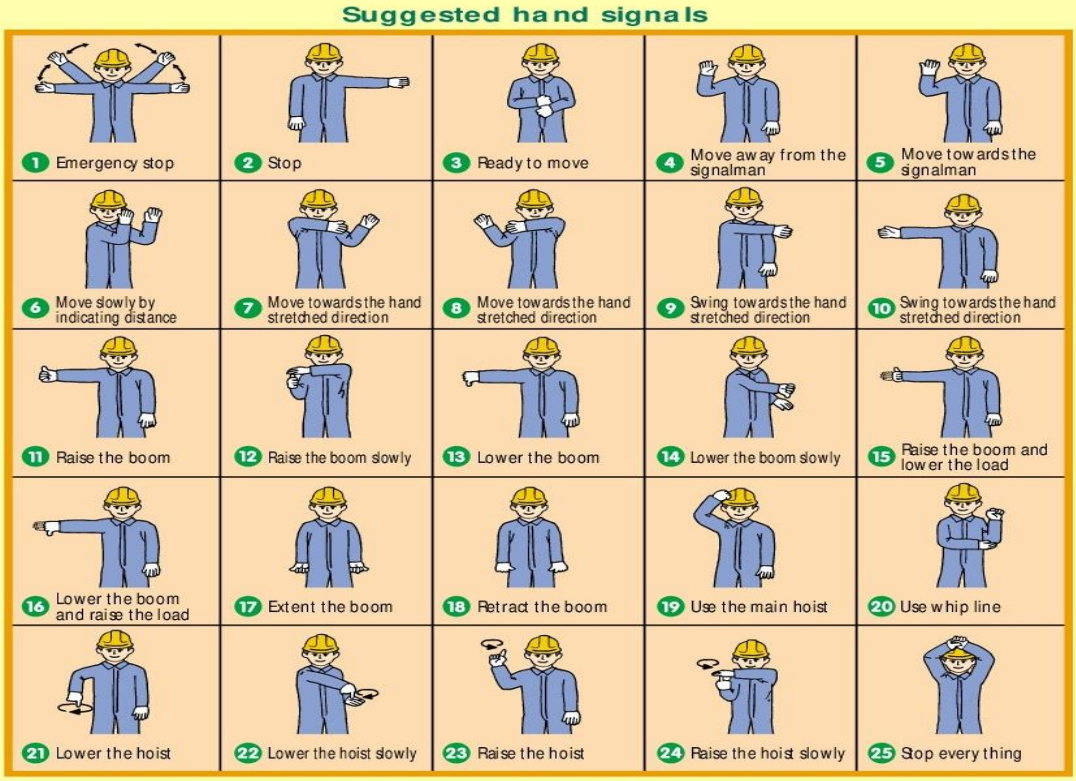
**r. Requirements of Plate Clamps:**

i. The rated load of the plate clamp must be marked on the main structure.

ii. Care must be taken to make certain the load is correctly distributed for the plate clamp being used.
iii. Do not allow load or plate clamp to come into contact with any obstruction.
iv. The plate clamp must not be used for side pulls or sliding the load.
v. When lifting stainless steel or special alloys, ensure plate clamp is designed for use on the specific metal.

**s. Signaling Practices:**

- The "slinger" is responsible for attaching and detaching the load to and from the crane. He shall:
  – have received appropriate training on general safe lifting operations;
  – be capable of selectings lifting gears suitable for the loads;
  – liaise with the operator and direct the movement of the crane safely.
- The "signaller" is responsible for relaying the signal from the slinger to the crane operator. He shall:
  – have received appropriate training on general safe lifting operations;
  – be able to direct the movement of the crane and loads.




**Note: During the lifting operation, either the slinger or signaller shall communicate with the operator. Other communication methods (e.g., wireless walkie-talkies, telephones, etc.) may also be used.**

**Fig. 5.4 Recommended Signaling Practices**

## 5. DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured, besides using the Work Permit:

a. All roads and open areas adjacent to the work site shall either be closed, suitably protected or restricted for movement
b. No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.

c. All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

**6. T&PS GENERAL**

a. All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test /calibration certificates bearing endorsement from competent authority of BHEL.
b. Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
c. Tagging and punching in all lifting tool is compulsory with SWL, sr. no. and due date.
d. All T&Ps shall be inspected by authorized Third Party agency as per applicable frequency. BHEL shall be kept informed of any such scheduled inspection
e. All T&Ps shall be internally inspected in each quarter and colour coded.

**7. CHEMICAL HANDLING**

a. Displaying safe handling procedures & MSDS for all chemicals such as lube oil, acid, alkali, sealing compounds etc. at work place.
b. Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.
c. The used containers of chemicals shall be segregated and disposed of suitably
d. In case the used containers need to be re-used, all traces of the chemical to be removed by thorough cleaning with detergents etc. under trained supervision

**8. ELECTRICAL SAFETY**

a. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
b. No PDB or any other distribution board shall be more than 03 (three) years of purchase. Only modern PDB with industrial sockets as shown in layout below to be allowed to use at site.
c. Power supply to all equipment at site to be routed through MCBs of appropriate rating. A 'Power Supply Distribution Plan' shall be prepared and submitted to BHEL Engineer for approval
d. All power supplies through cables shall be underground or overhead with height > 3mtrs.
e. All power distribution boxes shall be locked and the key controlled by site management of concerned subcontractor.
f. All individual equipment & tools at site shall be powered through Earth Leakage Circuit Breakers of 30 mA sensitivity.
g. These MCBs and ELCBs shall be regularly tested as per Clause 14
h. All fuses and fuse wires shall be of standard size and rating.
i. All electrical appliances used in the work shall be in good working condition and shall be properly double earthed other that armour earthling.

j. All extension boards shall have separate switches for all sockets / connections.

k. All portable electric tools used by the subcontractor shall have safe plugging system (industrial top & socket) to source of power and be appropriately earthed.

l. Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts especially in confined spaces like inside water boxes, turbine casings, condensers etc.

m. Electrical appliance shall have proper earthing and for appliances equal to & more than 415V shall have two separate earthing (as per IS-3043-1987)

**n. Portable Electric Lights**

i. Portable electric lights used in wet or potentially wet locations must be either low voltage type (24 volts or less) or protected by a GFI (ground fault interrupter).

ii. They must be visually checked before each use and periodically while in use to assure their original integrity is maintained.

iii. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately.

iv. Repairs to extension cords shall only be performed by qualified/ licensed electricians.

v. Must not be allowed to lie in wet or potentially wet areas.

**o. Underground Cables:**

i. Every electric line or cable of unknown origin that is discovered or exposed during a digging, drilling, probing, or similar operation is to be considered as energized and life threatening.

ii. The senior company employee on the site will ensure that all necessary safety precautions are taken in order to isolate the line from all workers and the public.

iii. Such precautions may include halting the operation if appropriate.

iv. The senior company employee on the site is to then contact the proper authorities to have the line identified and either confirmed to be abandoned and/or made safe for continuing the work.

v. Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.

p. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL

q. The subcontractor shall use only properly insulated and armoured cables and conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.

r. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the risk & cost of the subcontractor.

s. No maintenance work shall be carried out on live equipment

t. Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public

u. The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.

v. Wiring and Branch Circuits Must be protected by a proper amperage over-current device such as a HRC fuse or circuit breaker. Such installations must be located so as to prevent physical damage to the wire conductors & panels.

w. The sub-contractor shall supply modern power distribution board of different combination (1-phase & 3-phase). All the distribution of power should be through modern PDB. Equipment drawing is mentioned below.

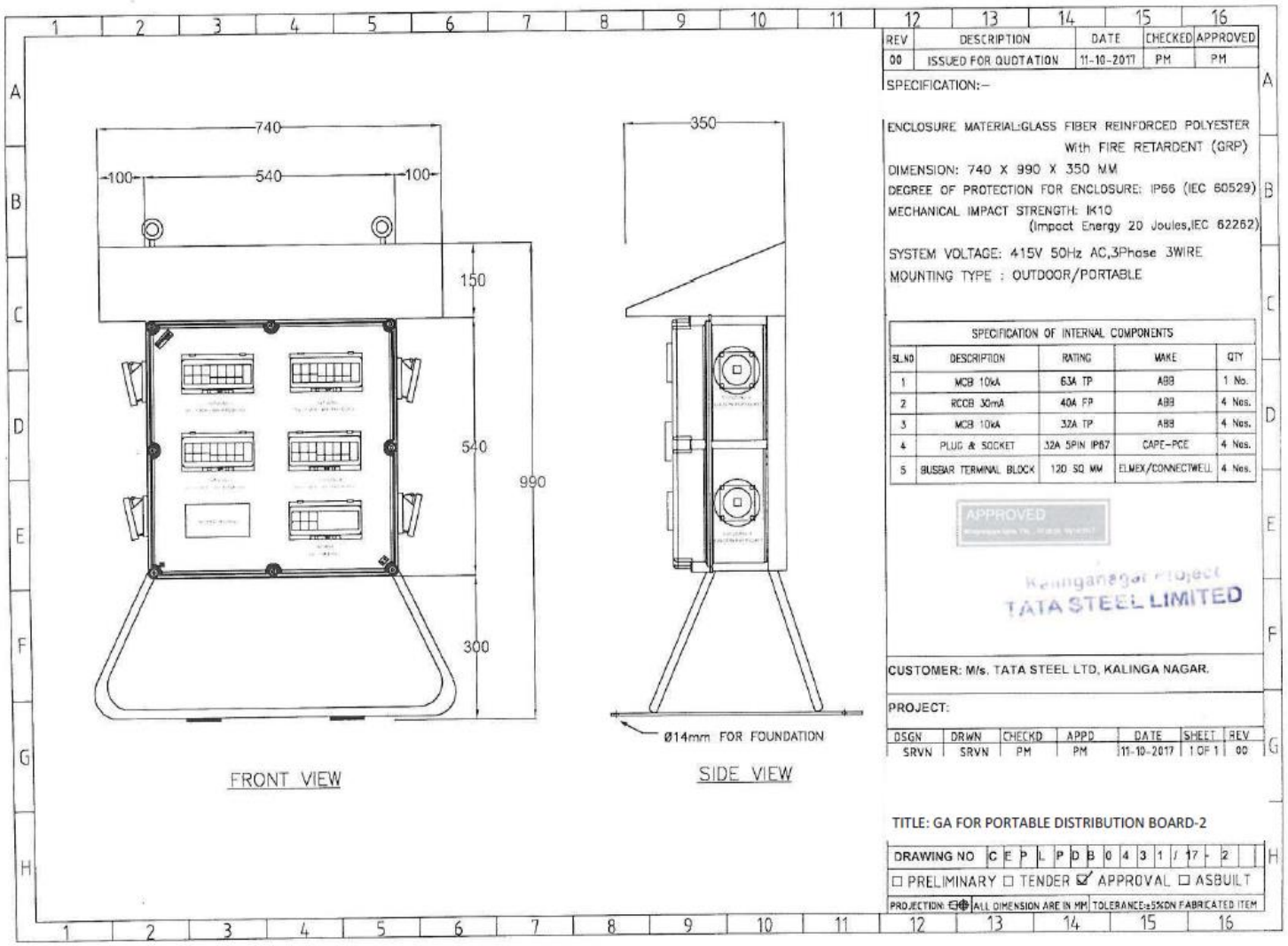



**Fig. 9.1 Layout of a modern Power Distribution Board**

**x. General Electrical Safety**

i. In general, equipment or machinery being moved or transported must maintain minimum clearances of 25 ft. to all power lines.

ii. TAG IN/ TAG OUT must be in force in Switch Room and all Distribution Boxes for live power line. The authorized person's name and contact no shall be displayed

iii. Ensure "double insulated" three - core cables and three pin connectors are used and are properly ground "all insulated" types, all electrical tools and appliances must be manufactured for industrial use.

iv. All connections shall be electrically and mechanically sound and properly insulated. Taped joints are not permitted. Connections to socket outlets must be made with proper plugs (industrial top and socket).

v. Splices in electrical cords are not permitted. Repairs must be made at the socket connection and retain the same mechanical and dielectric condition of the original connection.

vi. Damaged or defective electric tools, equipment and extension cords, etc. must not be used and shall be tagged out of service, removed from the work area and taken back to stores.

vii. Only licensed electricians are authorized to repair and work on electrical equipment. Tampering with electric tools or equipment by others could result in termination.

viii. Temporary electric cabling should be elevated 2.2 meters above the floor/ground or covered for protection. It must be kept clear of walkways and other locations where it may be exposed to damage or create a tripping hazard.

ix. Energized wiring in junction boxes, circuit breaker panels and similar places must be covered and locked at all times.

x. Areas with live high voltage wires or terminals must be barricaded against entry and warning signs posted Danger – High Voltage and Authorized Personnel Only.

xi. Personnel should never work on energized equipment, de-energizing (lockout/tag out) the equipment is always the first requirement.

xii. The lockout and tag out procedure will be used when testing or working on, or around, energized installation.

xiii. Working around energized equipment should never be done alone. A second electrician must always be available for assistance.

xiv. If lockout/tag out of the work is infeasible (must be demonstrated), work on energized electrical circuits must be approved by the Site In-charge. All safety precautions necessary must be taken, PPE use must be evaluated per the exposure and used, i.e high/low voltage gloves, insulated shoes, overcoats/aprons, face shields, and other protective equipment like insulated tools, blankets, mats, etc. must be used.

xv. The welding machines earth leads shall be properly fixed without loose contacts. The earth cable only has to be used. No steel members shall be used as earth leads.

xvi. Electrical crews must be qualified for the equipment and tools they work on, including being trained in Cardio-Pulmonary Resuscitation (CPR) methods and First Aid for rendering help in the event of electric shock.

**y. Qualified Persons for Electrical Works**

(One who is trained and wiremen licensed to Govt. of Respective State and familiar with the construction, operation and safety hazards of the equipment upon which they are permitted to work.)

i. Qualified persons are intended to be only those who are well acquainted/experienced with and thoroughly conversant in the electric equipment and electrical hazards involved with work being performed.

ii. Only qualified persons may be permitted to work on or near exposed energized parts. Such persons are required to have been trained in three specific areas:

iii. Qualified persons must be capable of working safely on energized circuits;

iv. Must be familiar with the proper use of special precautionary techniques and procedures bases on equipment and exposure; and

v. Must be familiar with required personal protective equipment, insulating and shielding materials, and insulated tools.

vi. Qualified persons are expected to be able to evaluate unknown situations and adjust their activities in such a way that only safe work practices are used. Such behavior is the responsibility of the qualified person.

vii. It is possible and likely for an individual to be 'qualified' with regard to certain equipment in the work place, and unqualified on other equipment they must know their limitation and stop work if not qualified on what equipment they were to work on.

viii. An employee who is undergoing on-the-job training, who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties. The process must be documented as proof.

**z. Mandatory PPEs of electrical work on LV & HV**

i. HV arc flash suit with protective hood (for protection of face and head) as specified for hazard risk category-4 in NFPA-70E or similar IS specification for working on HT switch gear (for all voltage >690 V) to the concerned licensed electrician or competent person.

ii. LV arc flash jacket/FR as specified for hazard risk category-4 in NFPA-70E or similar IS specification having ATPV rating of 8.5 to 9 cal/cm2 for working on LV (>260V and <=690V) to the concerned licensed electrician or competent person.

iii. The LV arc flash jacket as shown above shall be worn continuously while working on LV (>260V and <=690V). The color specification of LV arc flash jacket should be blue.

iv. Electrical hand gloves should have following specification: Flame resistance, arc flash and cut protection of voltage rating (>260V and <=690V).

v. Electrical safety over shoe of relevant IS make for foot protection of licensed electrician or competent person while working in HV & LV line or equipment.

## 9. USE OF HAND TOOLS AND POWER-OPERATED TOOLS

### a. General Provisions

i. All hands and power tools and similar equipment, shall be maintained in safe condition.

ii. When power operated tools are designed to accommodate guards, they shall be equipped

iii. with such guards, when in use;

iv. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;

v. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazards;

vi. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive on-off control.

vii. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

**b. Hand Tools**

i. The subcontractor shall not issue or permit the use of unsafe hand tools;

ii. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;

iii. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;

iv. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

**c. Power Operated Tools**

i. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;

ii. The use of electric cords for hoisting or lowering loads shall not be permitted;

iii. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming incidentally disconnected;

iv. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being incidentally expelled;

v. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm2 pressure at the tool a safety device on the muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;

vi. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm2 and that too with effective chip guarding. The 2 kg/cm2 pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;

vii. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;

viii. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;

ix. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's recommended procedure;

x. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;

xi. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;

xii. Loaded tools shall not be left unattended;

xiii. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;

xiv. Driving into materials that can be easily penetrated shall be avoided unless backed by a
xv. substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;
xvi. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;
xvii. Only non-sparking tools shall be used in an explosive or flammable atmosphere;
xviii. All tools shall be used with the correct shield, guard or attachment as recommended by the manufacturer.

**d. Abrasive Wheels and Tools**

i. All grinding wheel must be ISO certified only.
ii. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;
iii. Grinding machines shall be equipped with suitable safety guards;
iv. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than 900, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 1200. In either case, the exposure shall begin not more than 8.650 above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;
v. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;
vi. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;
vii. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of incidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 1800;
viii. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;
ix. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of incidental breakage, shall be used;
x. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from cracks or defects;
xi. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;
xii. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

**e. Wood Working Tools**

i. All fixed power-driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off-position;
ii. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is re-tensioned for a different speed,

the marking shall be corrected to show the new speed;

iii. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;

iv. All portable power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

**10. START UP, COMMISSIONING AND TESTING:**

There are various activities involved prior to commissioning- the major ones are -Hydraulic Test, Steam Blowing, Transformers Charging, Boiler Light Up, Rolling and Synchronisation and Full loading of unit.

a. These activities shall be personally supervised by the site executive along with the commissioning engineer.
b. Appropriate Work Permits shall be taken as applicable
c. The readiness of upstream and downstream system shall be ensured before taking up.
d. These shall be handled strictly by the authorized persons only and the team shall be suitably briefed about the activity including hazards & risks involved and control plan by the concerned executive-in-charge before start.
e. Entry of persons to the area of activity shall be suitably restricted and the emergency functions like Ambulance, first aid center and Fire station shall be intimated about the plan well in advance.
f. Tag-in/ Tag-out shall be in place while charging transformer and whenever necessary.
g. Electricians with valid wiremen license only shall be permitted to work on power lines.
h. The area and the passage shall be adequately illuminated.

**11. FIRE SAFETY**

a. The Fire Prevention, Protection and Preparedness Program is an integral part of the overall HSE Program. Effort and consideration must be given to safety, life and potential for delays in construction schedules and plant startup, as well as protection of property on a given project. The purpose of which is to prevent
    i. Inception of fire
    ii. Loss of life or personal injury
    iii. Loss of Property
    iv. Interruption of operations
b. Site-in-charge / Safety Officer will make periodical review of the site Fire Protection, Prevention Preparedness Programme, Site conditions and available fire protection equipment. It is very imperative that the Sub-contractors along with BHEL to establish good contact with Local fire station for availability of Fire tender in case of emergencies, in additional to their own fire equipment.
c. Fire Protection, Prevention and Preparedness Inspections - The Contractor /Sub-Contractor will be required to make frequent fire prevention inspections of his work site and operating facilities.
   Deficiencies will be corrected at once.
d. Area where Hot work activities are carried out (Gas cutting / Welding/ any other spark producing work)

above a working spot, a GI / fire-resistant non-asbestos sheet or suitable material shall be placed to prevent the fall of hot sparks. A bucket of water shall be kept nearby while doing hot work

e. Hot work shall be preferably carried out in a designated area with a standing Hot Work Permit, to be renewed monthly. The designated area shall have fire extinguishers.

f. Any hot work outside designated area shall require a Hot Work permit and fire watch. No flammable material shall be stored within 35 feet from any fire load.

**12. PAINTING:**

a. Requirements provide a detailed procedure to be implemented by all concerned employees and sub-contractors involved in painting activities.

b. Significant Environmental Hazards:
   i. Chemical hazard due to inhalation of lead fumes (lead containing paint)
   ii. Chemical hazard due to inhalation of VOC's from paining operations
   iii. VOC's from painting and coating operation
   iv. Disposal of paints and coats drums

c. Control Procedure for Paining:
   i. Chemical products used in painting and coating operation shall have proper MSDS sheet in place. Whenever any doubt arises with respect to handling and safety point of view it should be accessed to all concerned.
   ii. Toxic substances and hazards relate the toxic chemicals shall be identified.
   iii. Proper PPE shall be used including plastic gloves appropriate overall etc.,
   iv. Arrangement for cleaning of spillage shall be ensured

d. Only trained workers shall be allowed and proper training should be imparted to the works.

e. Exposure limits of the toxic substances shall be checked before starting the work and nobody shall be allowed to carry the work beyond the permissible limit.

f. Ventilation or exhaust facility shall be provided at place where painting and coating operations are carried out.

g. Overalls shall be supplied by the contractors/subcontractors to the workmen and adequate facilities shall be provided to enable the painters to wash at the cessation of work.

h. Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored.

i. A caution board in national /regional language "**smoking strictly prohibited**" shall be displayed in the vicinity.

j. Suitable fire extinguishers/sand buckets shall be kept available at places where flammable paints are stored, handled or used.

k. In case of indoor painting or painting in confined spaces, exhaust ventilating shall be provided. If adequate ventilation is not provided a proper respirator shall be provided and used by persons who are trained and fit tested.

l. The VOC's from painting and coating operations shall not exceed the permissible level of CPCB/ SPCB norms. The paints and coats must be selected as per the guidelines.

m. Workers shall thoroughly wash their hands and feet before leaving the work.

## 13. "HAZARDOUS ENERGY" CONTROL PROCEDURE/ LOCKOUT/TAGOUT (LOTO)

Hazardous Energy Control Procedures, known as "Lockout/Tagout (LOTO)" refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.

Contractors must develop and submit a written LOTO program This requires that a designated qualified individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock and tag the energy- isolating device(s) to prevent the release of hazardous energy and test the machine or equipment to verify that the energy has been isolated effectively.

**a. Minimum Requirements:**

The following are minimum requirements that must be included in the Contractor's LOTO program:

i. Inspection of equipment by a trained individual who is thoroughly familiar with the equipment operation and associated hazards.
ii. Identification and labeling of lockout devices. Purchase of locks, tags, and blocks Development of a standard written operating procedure, permitted through a controlling authority that is followed by all workers.

**b. General Requirements**

The following steps must be taken to protect workers that install or service equipment and systems:

Follow the hazardous energy procedures and statutory regulations. Follow the manufacturer's service/repair instructions. Identify and label all sources of hazardous energy. Before beginning work, accomplish the following:

i. De-energize all sources of hazardous energy:
ii. Disconnect or shut down engines or motors.
iii. De-energize electrical circuits.
iv. Block fluid (gas or liquid) flow in hydraulic or pneumatic systems.
v. Block or secure machine parts against motion.
vi. Block or dissipate stored energy.
vii. Discharge capacitors.
viii. Release or block springs that are under compression or tension.
ix. Vent fluids from pressure vessels, tanks, or accumulators—but never vent toxic, flammable, or explosive substances directly into the atmosphere

c. Lockout and tag out all forms of hazardous energy including electrical breaker panels, control valves, etc. Make sure that only one key exists for each of your assigned locks and that access to the key is controlled. Verify by test and/or observation that all energy sources are de- energized.

d. After completion of the work, accomplish the following:

i. Inspect repair work before removing the lock and activating the equipment.
ii. Make sure that only the worker that installed the lock removes his/her assigned lock.
iii. Make sure that all workers are clear of danger points before re-energizing the system.

**e. LOTO Procedure**

**PURPOSE AND SUMMARY**

This procedure provides the requirements and responsibilities of Hazardous Energy Control and the process for Lockout / Tag out (LOTO) of energy isolating devices (valves, circuit breakers, disconnect, etc.). Its use

shall ensure that machinery, equipment, or systems are isolated from all potentially hazardous energy to prevent unexpected energization, startup, or release of stored energy which may cause personnel injury or property damage.

This procedure applies to all BHEL personnel and subcontractors working on the WBPDCL (1X660MW) STAGE-III projects where equipment must be taken out of service for the performance of work activities such as installation, maintenance, repair, construction, or equipment removal. The procedure may also be used to isolate equipment of which the energization or operation may present danger to personnel or property.

Lockout / tag out are not required for electrical equipment that can be unplugged from the source and the person performing the work has control of the plug.

This procedure shall be applied to prevent injury or damage caused by the unexpected release of active or stored energy. Hazardous energy sources could be in the form of the following:

- Electrical
- Hydraulic
- Chemical
- Thermal
- Mechanical
- Pneumatic

Preplanning of work activities includes the identification of all potential hazardous energy sources so that they may be properly controlled and isolated, locked, and tagged out.

Prior to initiating work activities on or around locked out / tagged out equipment, the equipment must be tested and tried by or in the presence of the person(s) performing the work activities.

**RESPONSIBILITIES**

- The Engineers in Charge is responsible for implementing and enforcing this procedure and approving lockouts /tag outs that impact the operation of the project.
- The Engineer in Charges responsible for authorizing Lockout /Tag out Requests.
- The Lockout / Tag out Coordinator is responsible for maintaining the Lockout / Tag out Log. Each shift should have a designated Lockout / Tag out Coordinator.
- The Isolator is responsible for determining the proper isolation devices and device positions required to isolate all potential energy sources so that the work stated on the Lockout /Tag out Request Permit may be safely performed. The Isolator must be familiar with the equipment and energy type(s) that require isolation. For this reason, in some cases the Isolator may be more than one person (i.e. Engineer, System Operator and/or Electrician). The Isolator shall position the specified device points, and apply locks and tags, and sign the tags and the LOTO Permit isolation point blocks.
- The Safety Manager is responsible for conducting an annual audit that is documented to ensure all procedures and requirements are current and being followed as written.

**DEFINITIONS**

**Affected Employee: -**

An employee whose job requires him/her to operate or use machinery or equipment on which servicing or maintenance is being performed under a lock out/tag out procedure or whose job requires him/her to work in an area in which servicing or maintenance is being performed under a lockout/tag out procedure

**Authorized Employee: -**

An employee who implements a lockout/tag out procedure on machinery, equipment, or systems in order that servicing or maintenance may be performed. Often an authorized employee and an affected employee may be the same person.

**Danger "Do Not Operate" Tag**

A tag used to identify energy isolation devices and specify the required position of the device. The tag should be affixed to the isolation device such that it is in plain view of anyone attempting to operate the device. The tags shall be sequentially numbered and shall specify the lockout/ tag out request number. The tag shall also state the purpose, and the expected duration of the lockout /tag out

**Isolation Device**

A device that is designed and intended to prevent the passage of energy. These devices, usually located at the energy source, are typically valves, circuit breakers, etc. Isolation devices should have a means of being locked in position

**Lockout Device**

A device that uses a positive physical means such as a lock, either key or combination type to maintain an energy isolation device in the safe position and prevent the in advertent energization of machinery, equipment, or systems. Device locks should serve no other purpose other than hazardous energy control isolation

**Lockout Tag out Request Permit**

A pre-numbered form used to request that machinery, equipment or systems be taken out of service. A Lockout/Tagout Request Permit may be initiated by any one requiring energy isolation for work activities or for taking faulty equipment out of service

**Lockout / Tag out Request Log**

A record of all Lockout /Tag out Request Permits shall be maintained by the Lockout /Tag out Coordinator.

**PROCEDURE**

**1. REQUESTING A LOCKOUT / TAGOUT PERMIT**

When machinery, equipment, or systems are partially or completely taken out of service for work activities or equipment protection, a lockout / tag out shall be requested. The requestor shall be familiar with scope of work required and shall provide a brief description of the work on the Lockout / Tag out Request Permit. The requestor shall also provide the proposed start time and estimated duration of lockout / tag out. If familiar with the machinery, equipment, or system to be taken out of service, the requestor may identify the devices that are required to be isolated. The LOTO Request Permit shall be forwarded to the Authorized Lockout / Tag out Coordinator for reviewed and signature, along with Permit to Work number to be entered on the LOTO Request Permit.

a. The Lockout / Tag out Coordinator shall record the necessary information on the Lockout / Tag out Request Log and forward the request to the Engineer in Charge for approval.
b. The Safety Manager or Engineer in Charge shall review the Lockout / Tagout Request Permit for impact on project operations. Project operations could be impacted by the equipment being taken out of service or by the required isolation to take the equipment out of service. If project operations are impacted by the Lockout / Tagout, the request shall be forwarded to the Engineer in Charge for approval.
c. The Engineer in Charge shall provide the lockout / tag out isolation points necessary to perform the task stated on the request. The device identification, device location, device position, and locking mechanism

shall be entered into the appropriate blocks on the Lockout / Tag out Request Permit.

d. The Engineer in Charge indicates approval of the Lockout / Tagout Request Permit by signing in the appropriate space on the request. If the Lockout /Tag out Request Permit is rejected, the Engineer in Charge shall return it to the requestor, via the Lockout / Tagout Coordinator with a written explanation of the rejection.
e. Once approved, the Lockout / Tag out Request Permit shall be forwarded to the Lockout / Tag out Coordinator to assign tags and locks.
f. The log shall show current status of all Lockout / Tag out Request Permits from submittal to approval, through lifting of locks and tags to final closeout. The log shall be maintained by the Lockout / Tag out Coordinator in their office.

**2. PLACEMENT OF LOCKS AND TAGS**

a. The tags shall be filled out to match the information on the LOTO Request Permit. Appropriate locks for the types of isolation devices specified shall be collected and placed with the tags and the Lockout / Tag out Request Permit.
b. The isolator(s) shall take the device locks, tags, and the Lockout / Tagout Request Permit to position the specified isolation devices, sign and hang the tags, and place the locks. If the isolator does not agree with or understand the Lockout / Tagout Request Permit, or has a problem performing the isolation, the problem should be brought to the attention of the Safety Representative or Area Supervisor immediately and the lockout / tag out should be postponed until the situation is resolved.
c. Once the Isolator has placed all “locks” on isolation points, they will “test ”and “try” the machinery, equipment, or system to ensure all hazardous energy has been completely removed and the isolation is one totally accomplished, and has initialed and signed the Lockout /Tag out Request Permit indicating all isolation points have been confirmed. Examples of “lock”, “test” and “try”:
    - by checking that all locks on the LOTO Request Permit have been applied and are in the specified position open/closed, on/off, etc.; metering test of electrical circuits, opening of drain valves, checking pressure gauges or indicators; and try by pushing start buttons and on/off switches, etc.
    - Testing shall be performed by person(s) knowledgeable of the energy source(s) being isolated (e.g., an electrician should meter electrical circuits).
d. A copy of the completed Lockout /Tag out Request Permit shall remain with the Work Package and used as part of the daily Pre-Job Briefings

**3. WORKING UNDER A LOCKOUT / TAGOUT REQUEST**

a. Prior to starting the work activity, the person(s) performing the work shall review the Lockout / Tag out Request Permit and place the necessary tags and personal locks on the identified isolation devices. Personal locks may be placed only on devices that have already been locked and tagged in accordance with the Lockout / Tag out Request Permit.

- All personal locks shall be accompanied by a tag that is signed and dated by the worker(s) and specifies the work activity being performed.
- Personal locks should be of a different color than device locks for ready identification.

b. Verification of the effectiveness of the isolation by the Isolator shall be performed for Worker’s working under the lockout / tag out, by demonstrating the checks on “lock”, “test” and “try”,
c. When the work activity is finished, personal locks and tags shall be removed and the Safety Representative

shall be notified that the Lockout / Tagout is no longer required. If work under a lockout / tag out is to be delayed or interrupted for a period in excess of 24 hours, personal locks shall be removed until the work restarts. Personal locks shall be removed prior to the worker(s) leaving the project at the end of shift unless the key(s) are maintained at the project.

**4. REMOVAL OF LOCKS AND TAGS**

a. When the lockout / tag out is no longer required, the Safety Representative or Area Supervisor shall obtain the Lockout / Tagout Request Permit from the work package for LOTO removal. Prior to removing locks or tags that may allow equipment to be energized, a check shall be made to verify that the equipment is free to safely operate (i.e., will not cause damage or injury). The locks and tags shall be removed and returned to the Lockout / Tagout Coordinator. Isolation devices may be repositioned at the discretion of the Engineer in Charge according to operational requirements. The Isolator shall complete the Lockout / Tagout Request Permit indicating each lock and tag has been removed and the Safety Representative or Area Supervisor forward to the Lockout / Tagout Coordinator.

b. The Lockout / Tagout Coordinator shall discard the tags and maintain the completed Lockout / Tagout Request Permit for future reference.

c. In the event that an employee leaves the job site without removing the personal lock I tag, the following measures shall be taken and documented. The measures listed below are a minimum set of guidelines and under all circumstances, refer to the site-specific safe work plan for detailed procedures:

- Attempt calling / contacting the employee to return to the site for removal.
- In the event an employee cannot be contacted, the Site Manager and Safety Manager shall sign an Emergency Lockout/Tagout Removal Form, which has been completed by the Area Supervisor.
- Employee shall be notified upon returning to the site, prior to beginning any work.

**5. INTERRUPTION OF A LOCKOUT / TAGOUT**

**Operational Emergency**

The Engineer in Charge / Safety Manager /Area Supervisor may deem it necessary to temporarily remove the locks and tags from isolation devices, prior to the end of the work activity. The standard procedure for removal of locks and tags shall be followed. Extreme caution shall be taken by the Isolator removing the locks and tags to prevent personnel injury.

**Testing**

When the performance of a work activity requires the functional testing of a machine, component, or system, the locks and tags may be temporarily removed in accordance with the tag removal, to perform the test. As a result of the testing, if it is determined that the equipment needs further work, the locks and tags shall be positioned back on to the device. If it is not necessary to replace all the locks and tags, then the unnecessary locks and tags may be returned to the Lockout / Tagout Coordinator. The Engineer in Charge shall initial the Lockout / Tag out Request Permit in the removal block to indicate that these locks and tags have been removed. When testing has been satisfactorily completed, the locks and tags shall be removed.

**ISOLATION DEVICES**

- In most industrial applications, there are isolation devices that were not designed to accommodate a locking device. In these instances, an acceptable alternative that physically obstructs or prevents the use of the isolation device shall be found. Chains shall be placed on valves or electrical panels. Wires shall be determinate, pulled back, taped, and secured.

- If an isolation device does not accept a lock, a tag only is acceptable; however, all possible precautions shall be undertaken to provide a level of safety for the workers. The tag shall be readily visible to anyone attempting to operate the device.
- If more than one Lockout / Tagout Request Permit requires that a single isolation device be locked and tagged, a lock and tag for each request shall be placed. Each lock in itself prevents the inadvertent operation of the device.

**GROUP / COMPLEX LOCKOUT**

In a multiple lockout / tag out procedure, each person working on the machinery or equipment must place a lock or tag on the energy isolating device. If the energy isolating device will not accept multiple locks or tags, a hasp (a multiple lockout device, may be used. The locks or tags must be placed in such a way that energy cannot be restored to the machinery or equipment until every lock or tag is removed. As each employee involved no longer needs to maintain lockout / tag out protection that employee removes his - her lock and/or tag. The employee attaching the lock or tag is the only person authorized to remove the lock or tag.

## 6. TRAINING

The training must include recognition of hazardous energy source, type and magnitude of energy available, methods and means necessary for energy isolation and control. Each authorized employee shall receive adequate training. The training should address that all affected employees are instructed in the purpose and use of the energy control procedure. There should be training provisions included for any other employee whose work operations are or may be in an area where energy control procedures may be utilized. The employee training should also address when tag out systems are used including the limitations of a tag (tags are warning devices and do not provide physical restraint). The training should also include that a tag is not to be removed without authorization. The tag is never to be ignored or defeated in any way. Retraining is required when there is a change in job assignments, in machines, a change in the energy control procedures, or a new hazard is introduced. All training and I or retraining must be documented with employee's name and dates of training.

## 7. PROGRAM REVIEW

The lockout / tag out program must be reviewed at least annually. The review must ensure that procedures are being followed and that they are effective. A documented review of the inspection must include the date, the equipment, employees involved & the inspector. The inspector must be someone other than those actually using the lockout / tag out in progress.

**ATTACHMENTS**

#1. Danger (DO NOT OPERATE) Tags

#2. Device & Personal Locks and Multi Lock Hasp:

#3. Lockout / Tagout Request Permit

| | | |
|---|---|---|
| BHEL | **LOCKOUT / TAGOUT REQUEST PERMIT** | LOTO Request Permit No.: |
| | | Work Permit No.: |
| Equip. Out of Service: | LOTO Date Required by: _____/_____/_____ | Estimated Duration: |
| | | **LOTO Requested** Date: |
| Scope of Work: | | **LOTO Authorization** Signed by: |
| | | Date: |
| | | **LOTO Removal Authorization** Signed by: |
| | | Date: Time: |

| Tag No. | Device to be Tagged / Locked I.D. No. | Device Location | Device Position *OPEN / CLOSED* - | Lock No. | Tag/Lock Placed by Print/Sign - Date/Time | | Tag /Lock Removed by Print/Sign - Date/Time | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Comments Instructions: **Attachment 3.Lockout / Tag out Request Permit:**

#4. Lockout / Tag out Request Log

| **LOTO Permit No.** | **Requestor Name** | **Equipment & Location** | **Est. Work Completed Date** | **Approval Date** | **LOTO Placed Date** | **LOTO Removed Date** | **Comments** |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## 14. RISK ASSESSMENT

**Risk and Hazard Analysis**

In order to produce an overall Project EHS Plan, a project must be assessed for its risks. There are two components to the risk and hazard analysis. The procedure used to examine and plan for the identified risks and hazards is called a General Hazard and Risk Assessment.

**JSA/HIRA review**

Prior to commence the following activities Method statement and JSA/HIRA to be prepared by the concern engineer in coordination with EHS officer and submit to the client for review and approval. After getting approval the work will be started under PTW after clearance. For HIRA and criteria for the defining the high, medium & low risk the relevant annexure be referred. In case any deviations required in the approved method statement the concerned engineer/supervisor has to prepare additional HIRA/JSA to cover the new activities and associated risk. Following activities to be covered,

- Deep excavation (more than 5 feet)
- Significant concrete pouring (like heavy foundation, TG deck, Slab casting etc.)
- Confined entry
- Blasting
- Working on electrical/ energized equipment's
- Steel erection more than 5-Ton weight
- Working at height prior to completion of stairs/ladders/hand railing etc.

**Definition:**

**HAZARD** - Any potential or present danger to persons or property within the project site, e.g., oil on the floor is a hazard.

**INCIDENT -** An unintended happening that may result in injury, loss or damage, e.g., Slipping on the oil is an Incident.

**INJURY –** Physical harm, the result of an Incident, e.g., a sprained wrist from the fall would be an injury.

**Hazard Analysis Document**

- For high risk and dangerous work identified, the Applicant shall complete and submit a Hazard Analysis Document together with the PTW request. It will be a JSA (Job Safety Analysis) or Preliminary Hazard Analysis Checklist. And it shall be reviewed and approved by respective Construction and HSE Representatives.
- Issues such as work interface, coordination, drawings, toolbox meetings and work type/duration shall be detailed and included with supporting documentation for the Applicant's request for PTW.
- If applicable, Hazard Analysis Document shall be used as the foundation for development of Safe Work Method Statement. Each hazard identified shall be addressed in the Safe Work Method Statement and be submitted as part of the Applicant's submittal package.

**Evaluation of Sub-contractor Risk Assessments includes**

- Experience and expertise in performing similar type work.
- Duration of work performed
- Location of the work to be performed.

- Nature of the work to be performed.
- Potential for a subcontractor performing the work to expose themselves, other persons or employees, to hazards.
- Potential for exposure to work site hazards.

**Review of Subcontractor specific issues**

Preventive and protective measures must be introduced according to the following order of priority

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

## 15. HSE PREPAREDNESS FOR ADVERSE CLIMATES AND WEATHER

All Preventive and Precautionary measures to ensure Health & Safety of workers in all possible adverse weather conditions based on the analysis of the local area conditions to be taken by the subcontractor

### 15.1 SUMMER

1. The Working Time and Lunch Hour will be as per instruction of Statutory Authorities (no work between 11am to 3:30pm). However, in case temp comes down due to rain/cloudy weather work will continue as per normal routine.
2. During long lunch break, worker will be allowed to go back home for rest. Those who will like to stay back will avail at the facility of rest shed or other designed area.
3. They will be allowed to take small break during work as per their need.
4. Water sprinkling will be done on roads to reduce dust concentration.
5. Workers will be provided with adequate cool drinking water and Butter milk/Lemon water etc.
6. Adequate ORS stock will be made available at the work location in the First-Aid Box for use as needed and at First-aid Centre for emergency need.
7. Fire prevention shall be on high alert, with removal of dry grass and bushes, etc, inside and outside the surrounding work areas. No smoking, and control of open flame/sparks shall be maintained and monitored.
8. Worker will be informed about the Do's and Don'ts to be followed during summer in the Pre Job Brief.

**Dos & Don'ts**

1. Drink plenty of cool water and other non-alcoholic fluid and keep body well hydrated.
2. Eat salt in food to replenish loss of salt through sweating.
3. Avoid over physical exercise.
4. Have adequate sleep at night.
5. Eat light and less spicy food
6. Avoid eating food which was cooked long time ago.

7. Nobody should use small water bodies such as pits, running rain water through crevices etc. for drinking and cleaning purpose as it may be unhygienic.

**Emergency Handling**

In case of emergency due to heat disorder:

1. Rescue the victim from workplace and place under shed.
2. If to be rescued from height, use stoke basket or rescue kit.
3. Inform Ambulance immediately.
4. If nearby any air conditioned room/shed is available, place him inside the room/shed.
5. Administer First aid by trained First aider for Heat Disorder
6. If conscious, give him ORS solution to drink.
7. If required send the victim hospital immediately.

## 15.2 MONSOON

**A. Height Work & Structural Safety:**

1. Ensure that all height work platforms are barricaded and avoid any highly hazardous
2. Height work.
3. Ensure that all personnel have good quality and intact safety shoes
4. Stop all dangerous height work during rain
5. Explain Do's and Don'ts to workers during Tool Box Meetings
6. Ensure that there are no weak structures, boards etc. that can fall during high winds
7. Do not allow any loose material (e.g. GI sheet, Ply board, empty cement bag, aluminium foil, foam sheets etc.) on roof sheds or top of structures.
8. Do not permit any one to ride up or come down scaffolds frame work during heavy wind or rain.
9. Provide "anchor" of adequate strength to scaffolds and other high-rise structures.
10. All rest sheds and GI sheds will be anchored into the round and wall and roof panels will be secured with J hook to prevent shed from blowing over or parts/pieces becoming airborne. Proper earthing per IS standard is also to be installed.
11. Do not go alone nor permit anyone to stay at tower-tops, roof-tops, high structures or on electrical poles during the course of stormy weather or heavy rain.

**B. Electrical:**

1. All electrical connections / loads have to be routed through ELCB / RCCB (residual current circuit breaker) whose rating should be 30mA.
2. RCCB operational checks need to be done DAILY / WEEKLY during monsoon season.
3. Avoid joints on power cables which need to be laid over-head or under-ground, better not to have any joint at all. In case joints become essential, such cables must be housed rigidly and insulation must be provided as per approved standard. The joint shall be suitable for outdoor use.
4. All electrical distribution board shall be properly covered at top and sides to protect from rain water. Extension boards shall be protected from rain water.
5. Ensure proper "earthing" for each and every electrical appliance.
6. Double earthing need to be provided for 3-phase power supply and for voltage more than 220V.

7. Provide lightening arrestors at the top of Boiler 3 and boiler 4 and rest sheds which are not covered by existing lightening arrestor of other installation.

**C. Others:**

1. Maintain smooth flow on open drains. i.e. no obstruction or blockade shall be made on storm water drains. If required, make temporary drains.
2. Arrange back-filling of excavated pits on war-footing basis.
3. Arrange bringing down booms of all cranes, hydra machines during stormy weather (wind speed 40-50 km/hr)
4. Confirm that all gantry cranes are effectively choked to prevent rolling and toppling.
5. Do not forget to deep ready a dew battery operated lights at site-offices during rainy season.
6. Avoid using wet damp clothes.
7. Hard Barricade excavated zone filled with water with scaffolding pipe & clamp with reflective net
8. Engage diesel operated water pump to dewater work area. For electrically operated water pump, the starter shall be protected from rain water. All rotating parts shall be guarded. Ensure availability of sufficient water pumps.

**D. Health and hygiene:**

1. Monsoon reduces the immunity of our body and makes us vulnerable to many diseases which are commonly associated with this season. It is time for us to keep our body challenging against disease by boosting our immunity and taking safety measures against these diseases.
2. The diseases associated with monsoon are Malaria, Jaundice, Gastro-intestinal infections, like typhoid, cholera etc. apart from these viral infections like cold and cough also make their presence felt. Majority of above said diseases are on account of:
3. Puddle of water formed due to rain become breeding grounds for mosquitoes which spread disease like, malaria and dengue fever. As a precautionary measure against mosquito-bite disease one can use mosquito net around the end which is better choice to mosquito repellents like mats and coils.
4. Pollution of drinking water during monsoon is very common. It is very necessary to drink clean and pure water when water-borne monsoon diseases like diarrhoea and gastro-intestinal infections threaten us.
5. Walking in dirty water during rainy season leads of numerous fungal infection which affect toes and nails. Diabetic patients have to take a special care about their feet. Keeping feet always dry and clean is very necessary. Avoid walking in dirty water. Keep shoes socks and raincoats dry and clean.

**E. Workmen will be made aware of following Do’s and Don’ts:**

1. Do not sleep in daytime.
2. Avoid over physical exertion.
3. During lightning and thunder storm, do not take shelter under tree. Take shelter inside rest shed or store room.
4. Wash vegetables with clean water and steam them well to kill germs.
5. Avoid eating un-cooked foods and salads should be washed properly before consumption.
6. Drink plenty of water and keep body well-hydrated.
7. Always keep the surrounding area dry and clean. Don’t allow to get water accumulated around.
8. Keep body warm as viruses attack immediately when body temperature goes down.

9. Do not enter air conditioned room with wet hair and damp cloths.
10. Dry your feet and webs with soft dry cloth whenever they are wet.
11. Eat light and less spicy food.
12. Avoid eating food which was cooked long time ago.
13. Eat salt in food to replenish loss of salt through sweating.

## 15.3 EMERGENCY WEATHER CONDITIONS

**Cyclone/Severe thunder storm**

In the event of Cyclone/Severe thunder storm, alert will be issued by subcontractor on notification received by Govt. authorities/Metrological departments Customer or BHEL.

**The actions required during cyclone/rough weather:**

1. Check and advice subcontractors to clean-up work area. Pick up all loose and unused material of respective supervisor's area.
2. Tie to secure all gas cylinders to avoid displacement and unsafe conditions which could be due to wind pressure.
3. Secure portable electricity generating sets and other equipment, pumps, hoses etc.
4. Make preparation for removal of water logging.
5. Take review of work activity and make preparation for removal of equipment and material from vulnerable areas.
6. Isolate/turn off all electrical power form the main panel/switches. Secure and anchor panels properly.
7. Recheck anchorage/tie of all temporary structures/sheds, tall objects, cranes, rigs, scaffolds etc. to avoid toppling due to wind force.
8. Cranes boom shall be secured, either locked or lowered the booms as reasonably and practicably possible and rigs to safe position for the safety point of view.
9. Group up all trash barrels, wooden pallets, forms; wooden decks etc. and anchor properly.
10. Welding machines, air compressors and such equipment are to be grouped together and secured to the stable objects. Welding leads, electrical cables, hoses are to be rolled up and secured properly.
11. Set on site vehicles on high ground in the site area with brakes set firmly.
12. Anchor all tanks, vessels, gas cylinders that may be moved by high wind and water.
13. Evacuate job site.

**Personnel Evacuation:**

1. Personnel Evacuation will be required if predicted wind speed and storm surge heights are beyond acceptable limits as per the instructions from Govt. Authorities/ Metrological departments or Customer.
2. Once the warning is received for personnel evacuation, an emergency response team shall be formed. The team will work with local authorities and other agencies formed/deployed to evacuate and transport all personnel involved in the project to the cyclone shelter.
3. Cyclone may be followed by the calm "EYE", be aware of it. If the wind suddenly drops, don't assume the cyclone is over. Violent wind may resume from the opposite side direction. Wait for the official "All clear Signal".

4. After the cyclone, do not go outside until officially communicated about safe situation outside. Use recommended routes for returning. Do not panic or rush while returning.
5. Checking of gas leaks and well-being of electrical appliances is essential before leaving the site.
6. Follow local communications for official warning and advice. The construction Manager shall also obtain updates from customer/metrological departments and communicate to the personnel on project site.

### 15.4 PREVENTION OF COVID-19 (COVID-19 HERE TO BE READ AS COVID-19 AND OTHER PANDEMICS/ COMMUNICABLE DISEASES) AT PROJECT SITE & LABOUR COLONY:

Resumption of Construction Activities after Lock Down and Prevention of Coronavirus Infection during Site Operations and OCP 61A: Prevention of COVID-19 Infection in Labor Colony will be strictly followed.

**A. <u>Preventive measures at project site:</u>**

- BHEL and Agencies shall nominate COVID Marshalls, who will be responsible for monitoring the COVID prevention measures and apprising management on the same.
- Mandatory health check-up for every worker/ official joining the site
- All activities to be carried out using least amount of paperwork and physical proximity as far as possible.
- ***HSE Observer App*** to be used to monitor HSE Activities and follow up with agencies for closure of non-conformities.

**<u>a. Strict Control at the Gate/ Banning Entry to Anyone Not Wearing Masks</u>**

i. Security personnel at the gate may erect a barricade preferably approx. 10 meters from the gate and only allow personnel who are wearing proper masks inside.

ii. Public address system may be used to warn any non-compliant visitors

iii. Near entry gate, round markers at minimum 1-meter distance to be ensured so that distancing is ensured

iv. A hand-wash or hand sanitiser facility is preferable at the gate to allow entry after hand wash or hand sanitisation. These are also to be provided at key locations to enable hand wash / hand sanitisation before starting work, before eating, etc.

v. Gutkha, Paan, tobacco etc. to be banned from the site. Spitting to be strictly prohibited.

**<u>b. Screening at Gate with Contactless Thermometer & Action on Suspected Cases</u>**

i. Security Personnel at the Gate to screen each person entering the premises using a non-contact infrared thermometer, which is duly serial numbered and calibrated.

ii. In case any site worker/ official is found to have fever more than 99 Degrees Fahrenheit or found coughing/ sneezing, he/she may be advised rest till recovery and entry to be permitted after obtaining clearance from medical officer/assistance/attendants.

- Parcel to be collected from gate by concerned person preferably with provision of Special Box
- Any construction material received at site, unless properly sanitized, to be kept undisturbed for at least 3 days and to be used only after that period.
- During Toolbox Talks, minimum 1-meter distance between any two workers to be ensured

**<u>c. During site execution activities:</u>**

For all site execution activities, social distancing is to be maintained. In case this is not possible due to nature of work, speciality of work, etc, ensure sensitisation of the labour/staff involved and use of appropriate PPEs, especially mandatory face mask. In any case, close working to be allowed only in special

circumstances and ensuring these activities are preferably time staggered to the extent possible

**d. In office premises:**

i. Sharing of items like pens, water bottles etc. in office premises to be avoided

ii. Doors preferably to be in open condition to avoid contact

iii. All common touch points to be frequently disinfected in a day.

**e. Regular disinfection of all Areas, Equipment and facilities**

i. A dedicated disinfectant gang to be identified for the task by each agency. The disinfectant gang to be provided full body suits for the task.

ii. All areas (including office premises, site areas, chairs, tables, furniture etc.), tools & equipment to preferably be disinfected by dedicated gang every day before resumption of work.

iv. Common touch points like handrails, lift buttons, door/window knobs or handles, vehicle door handles, taps, conference room & dining hall tables/chairs, common sofas/chairs, visitor sofa/chairs, files & folders, etc to preferably be disinfected regularly at frequent intervals every day.

v. Pool vehicles, to be disinfected after every use. Social distancing to be maintained inside the common pool vehicles as per Govt./ statutory body guidelines.

**f. Disinfecting the operator/driver touch points of Vehicles/cranes, T&Ps etc.**

Disinfection to also be carried out for all Cranes, Vehicles, Equipment, consoles, T&Ps etc. which come into contact with operating personnel.

**g. Posters on COVID-19**

Sufficient Posters on COVID-19 to be ensured across the site in languages understood by most workers.

**h. Brief guidelines for hand washing are as below:**

i. Soap to be provided at each wash basin and replenished regularly.

ii. Washing with soap for at least 20 seconds is recommended.

iii. As a general guideline, for every 100 workers, 1 wash-basin may be provided at site areas.

iv. Close queue to be avoided near wash-basins and 1-meter distance to be maintained. Round markers at 1-meter distance can be ensured as guidance

**Composition of Disinfectant:**

i. Readily available 1% hypochlorite solution or 4%

ii. Liquid chlorine-1% solution

Iii. Surgical spirit-95% alcohol content

iv. Hand sanitizer should have: Isopropyl alcohol-75%, Gycerol-1.45%, Hydrogen Peroxide-0.125%

**B. Prevention of COVID-19 Infection in Labor Colony:**

- Spacing of minimum 2 meters between living areas of workers inside a room may be maintained. Preferably, the living area of each worker may be partitioned using sheet of cloth, plastic etc.
- Rooms to be properly ventilated as far as possible
- Sanitation to be given prime importance and personal hygiene to be promoted
- Face masks shall be worn by everyone inside the colony premises
- Spitting of Pan. Gutkha etc. inside the colony and urinating etc. outside the toilets to be strictly avoided
- Regular visits by Doctors to the labor colony can be arranged on non-working day for check-up of all workers
- **Identification of "COVID Wardens" (CWs) by each agency for maintaining the following:**

  i. Keeping an eye on the health of workers and report any suspected cases of fever, coughing etc. to the

management

ii. Keeping an eye on the social distancing measures in the labor colony and report any non-conformances to the management.

iii. Educate the workers about social distancing and COVID prevention measures.

- Training/ Awareness regarding COVID-19 to be provided to workers regularly.
- Workers to be instructed to maintain social distancing of minimum 1 m at all time
- **Posters on COVID-19:** Sufficient Posters on COVID-19 to be ensured across the labor colony in languages understood by most workers.
- All workers to be instructed to inform any suspected cases of illness (individual or others) to an emergency contact number of CW, the emergency contact numbers and CW contact numbers to be displayed at prominent locations
- **Inspection & Review**

  i. Daily Inspection by concerned COVID Wardens and reporting to Agency

  ii. Regular inspection by Agency & BHEL

### 15.5 Noise Mitigation

High noise is harmful to the human health and it can cause impairment if exposed for long duration at regular intervals, and also cause disruption in nearby communities.

- Noise monitoring shall be carried out in all construction locations periodically.
- Use of silent DG is allowed at site during construction.
- Low noise generation equipment's to be preferred.
- Work areas where noise levels exceed the 85db shall be posted as hearing protection required.
- Use of PPEs / ear plug/ear muff for personnel entering into high noise area.
- Activities generation High noise will be planned in day shift.

**Noise Level Chart**

| Parameter | Night Noise level dBA | Daytime Noise Level dBA |
|---|---|---|
| At 1-meter from each piece of equipment | 85 | 85 |
| At Property boundary | 70 | 70 |

# ANNEXURE J

First-Aid Box

**Details & Contents of First Aid Box as per Contract Labor (Regulation & Abolition Act), Central Rules, 1971**

(1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

**(a) For establishments in which the number of contract labor employed does not exceed fifty, each first aid box shall contain the following equipment:**

| | |
|---|---|
| (i) | 6 small sterilized dressings |
| (ii) | 3 medium size sterilized dressings |
| (iii) | 3 large size sterilized dressings |
| (iv) | 6 pieces of sterilized eye pads in separate sealed packets. |
| (v) | 6 roller bandages 10 cm wide. |
| (vi) | 6 roller bandages 5 cm wide. |
| (vii) | One tourniquet |
| (viii) | A supply of suitable splints |
| (ix) | Three packets of safety pins. |
| (x) | Kidney tray. |
| (xi) | 3 large sterilized burn dressings. |
| (xii) | 1 (30ml) bottle containing a two percent alcoholic solution of iodine |
| (xiii) | 1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label |
| (xiv) | 1 snake bite lancet |
| (xv) | 1 (30gms) bottle of potassium permanganate crystals. |
| (xvi) | 1 pair scissors |
| (xvii) | 1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labor Institutes, Government of India. |
| (xviii) | A bottle containing 100 tablets (each of 5 grains) of aspirin |
| (xix) | Ointment for burns |
| (xx) | A bottle of suitable surgical anti-septic solution |

**(b) For establishment in which the number of contract labor exceeds fifty each first-aid box shall contain the following equipment:**

| | |
|---|---|
| (i) | 12 small sterilized dressings |
| (ii) | 6 medium size sterilized dressings |
| (iii) | 6 large size sterilized dressings. |
| (iv) | 6 large size sterilized burn dressings |
| (v) | 6 (15 grams) packets sterilized cotton wool |
| (vi) | 12 pieces of sterilized eye pads in separate sealed packets. |
| (vii) | 12 roller bandages 10 cm wide. |
| (viii) | 12 roller bandages 5 cm wide. |
| (ix) | One tourniquet. |
| (x) | A supply of suitable splints. |
| (xi) | Three packets of safety pins. |
| (xii) | Kidney tray. |
| (xiii) | Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times. |
| (xiv) | 4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops. |
| (xv) | 1 (60ml) bottle containing a two percent alcoholic solution of iodine |
| (xvi) | One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water. |
| (xvii) | 1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label. |
| (xviii) | 1 roll of adhesive plaster (6 cmX1 meter) |
| (xix) | 2 rolls of adhesive plaster (2 cmX1 meter) |
| (xx) | A snake bite lancet. |
| (xxi) | 1 (30 grams) bottle of potassium permanganate crystals. |
| (xxii) | 1 pair scissors |
| (xxiii) | 1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labor Institutes, Government of India. |
| (xxiv) | a bottle containing 100 tablets (each of 5 grains) of aspirin |
| (xxv) | Ointment for burns |
| (xxvi) | A bottle of a suitable surgical anti septic solution. |

(2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.

# ANNEXURE K

Vertigo Test

# Vertigo Test Procedure/ Guidelines

This document specifies minimum requirements for vertigo test. These may be supplemented by any additional requirements deemed fit by the medical examiner/ HSE department)

Fear of height may be physiological or psychological. Therefore, to rule out any possibility of physiological factor, detailed medical check-up of workers is carried out before vertigo test. Medical check-up of workers includes the following:

history of past illnesses (like epilepsy, drug allergy, diabetics/ hypertension, unconsciousness etc.), general physical examination (like height, weight, BMI, build and nourishment etc.), measurement of pulse rate, Blood Pressure, respiratory rate.

After this check-up, those who are found suitable for height work by examining doctor, are allowed to undergo vertigo test.

During this health check-up, psychology of workers is also studied. If any worker finds it extremely difficult/ frightening to climb the monkey ladder & walk on the beam, during/after performing vertigo test or even before performing, then he is treated as disqualified.

As per standard, during vertigo test, worker is allowed to climb on a foundation through monkey ladder, walk on a beam, then steps down at the other end of beam, through monkey ladder. Height of the beam should be at least six feet from ground level. All necessary safety precautions are taken during this test. Worker has to wear full body harness with double lanyard. A horizontal lifeline is run parallel to the beam and worker has to put his lanyards into the lifeline. Additionally, a safety net is also put below the beam for rescue of the victim in case of a fall from beam.

**Following activities are suggested to be carried out during testing:**

1. **Walking Bench Training:**
   a. Person should walk over the channel. He should maintain balance & walk without much problem.
   b. If the person has problem to balances himself on repeated chances, he may be having flat foot or some other problem. So, he may not be fit for height work.
2. **Rope Climb Training:**
   Person should be able to climb the rope up to the top channel for ensuring that in case of fall, a person hanging on the safety harness, will be able to safely climb back to the platform within minimum time period before the safety harness start breaking down under the load.
3. **Height Work Training:**
   Person should walk freely on the middle channel while holding the top channel with the help of safety harness.
4. **Ladder for Vertical fall arrestor Training:**
   Vertical fall arrestor rope is fixed from top to bottom of the ladder. It will ensure:
   - Usage of vertical fall arrestor.
   - Usage of two lanyards of a safety harness.
   - Ensure 3-point contact on the ladder while climb.
5. **Chair for work at height Training:**
   - Climb though vertical ladder with two lanyard ropes.
   - Hooking of two lanyard ropes to life line. With this safe arrangement, he can walk to chair.
   - Sits in the chair safely, comes out & walks back to the vertical ladder & come down from vertical ladder. After completion of vertigo test, blood pressure of worker is again measured. If it is not within acceptable limits for any worker, concerned worker is denied height pass.

Only those who pass the above training are to be considered as fit for height work.