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CONSTRUCTION SAFETY MANUAL FOR WORKS CONTRACT

Prepared by

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GOVERNMENT OF INDIA
ATOMIC ENERGY COMMISSION

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60 *Abstract :* Construction Industry is highly prone to hazards related to site activities and construction projects engage large number of contract workers. Contract workers come from varied trades especially from rural areas and agricultural background and do not have proper training in construction safety. During execution at site, these workers are exposed to various risks involved in construction works and other occupational diseases and health hazards which cause injuries and illnesses. As a result, the construction projects get delayed due to loss of working hours and other legal hassles. Therefore, it is essential for any construction project to have certain safety guidelines for site activities and to create awareness among the workers, site supervisor and engineers. The aim of the Construction Safety Manual is to enable to maintain safe working condition at all construction sites under Architecture and Civil Engineering Division, Bhabha Atomic Research Centre. This manual covers safety policy, principles and objectives of Architecture and Civil Engineering Division, Bhabha Atomic Research Centre, general guidelines on safe working procedures for various construction activities, Site Level Safety Committee responsible for implementation of these procedures, monitoring and reporting procedures and training and awareness building programmes. This manual also includes annexures containing various formats to be followed for implementation of safe working procedure and legal compliance.

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निर्माण कार्य ठेके के लिए निर्माण संरक्षा नियमावली

सारांश

निर्माण उद्योग, संयंत्र स्थल गतिविधियों से संबंधित जोखिमों की ओर अत्यधिक प्रवृत्त है और निर्माण परियोजनाओं में अत्यधिक संख्या में ठेके के कामगार काम करते हैं। ठेके के कामगार विभिन्न व्यवसाय के विशेषकर ग्रामीण क्षेत्रों और कृषि पृष्ठभूमि के होते हैं तथा उन्हें निर्माण संरक्षा से संबंधित उचित प्रशिक्षण प्राप्त नहीं होता है। कार्यस्थल पर कार्य निष्पादन के दौरान, इन कामगारों को निर्माण कार्य में शामिल विभिन्न जोखिमों और अन्य व्यवसाय जनित रोगों तथा स्वास्थ्य संकटों का सामना करना पड़ता है जिससे क्षति एवं बीमारियां होती है, जिसके फलस्वरूप, कार्य समय की हानि और अन्य कानूनी परेशानियों के कारण निर्माण परियोजनाओं में देरी होती है। अत: किसी भी निर्माण परियोजना के लिए आवश्यक है कि संयंत्र स्थल गतिविधियों के लिए कुछ संरक्षा दिशानिर्देश जारी हो जिससे कामगारों, कार्यस्थल पर्यवेक्षकों तथा इंजीनियरों में जागरूकता पैदा की जा सके। निर्माण संरक्षा नियमावली का उद्देश्य, वास्तुविद्या एवं सिविल इंजीनियरी प्रभाग, भाभा परमाणु अनुसंधान केंद्र के अधीन सभी निर्माण कार्य स्थलों को सुरक्षित कार्य स्थिति में रखने के योग्य बनाना है। इस नियमावली में वास्तुविद्या एवं सिविल इंजीनियरी प्रभाग, भाभा परमाणु अनुसंधान केंद्र की संरक्षा नीति, सिद्धांत और उद्देश्य, विभिन्न निर्माण गतिविधियों के लिए सुरक्षित कार्य प्रक्रिया पर सामान्य दिशानिर्देश, इन प्रक्रियाओं के क्रियान्वयन के लिए उत्तरदायी कार्य स्थल स्तर संरक्षा समिति, मानीटरन तथा रिपोर्ट करने की प्रक्रियाएं और प्रशिक्षण तथा जागरूकता निर्माण करनेवाले कार्यक्रम शामिल हैं। इस नियमावली में अनुलग्नक भी शामिल हैं जिनमें सुरक्षित कार्य प्रक्रिया तथा विधिक अनुपालन के क्रियान्वयन के लिए विभिन्न प्रारूप निहित हैं।

Construction Safety Manual for Works Contract

Abstract

Construction Industry is highly prone to hazards related to site activities and construction projects engage large number of contract workers. Contract workers come from varied trades especially from rural areas and agricultural background and do not have proper training in construction safety. During execution at site, these workers are exposed to various risks involved in construction works and other occupational diseases and health hazards which cause injuries and illnesses. As a result, the construction projects get delayed due to loss of working hours and other legal hassles. Therefore, it is essential for any construction project to have certain safety guidelines for site activities and to create awareness among the workers, site supervisor and engineers. The aim of the Construction Safety Manual is to enable to maintain safe working condition at all construction sites under Architecture and Civil Engineering Division, Bhabha Atomic Research Centre. This manual covers safety policy, principles and objectives of Architecture and Civil Engineering Division, Bhabha Atomic Research Centre, general guidelines on safe working procedures for various construction activities, Site Level Safety Committee responsible for implementation of these procedures, monitoring and reporting procedures and training and awareness building programmes. This manual also includes annexures containing various formats to be followed for implementation of safe working procedure and legal compliance.

PREFACE

Architecture & Civil Engineering Division, Bhabha Atomic Research Centre takes up construction of new facilities and maintenance of existing facilities through public tender. The contractor engages contract workers to execute these works. These workers are mostly from varied background and they may be exposed to the hazardous conditions prevailing at construction sites. A&CED recognizes the responsibility of ensuring safety of these workers at site and therefore it is necessary to formulate the safety guidelines for execution of civil works at site.

This safety manual for works contract is prepared with the objective to ensure a safe working environment at work site, to complete the project in a safe and accident-free manner by creating safety awareness among the workers and staff. This manual is designed to enhance the safety standards presently being followed and to reduce occurrence of near-misses and accidents in construction projects under taken by BARC.

Implementation of the safety guidelines recommended in this manual will help Engineer-in-charges of the projects to strengthen the safety measures at site and to ensure the welfare of all contract workers as well as staff of the contractor and the department.

K. Srinivas 31/1/11

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31/1/11

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Safety Manual for Works Contract

CONTENTS

List of Annexures Page No.

1.0 DEFINITION AND SCOPE:

1.1 Definition:

Construction: Construction is the process of making, building, fabrication and/or erection of structures for some facility to be housed in the same.
Safety: Safety is the state of being safe or free from any kind of hazard.
Contract: A contract is a legally binding mutual agreement between the parties identified in the agreement to fulfil all the terms and conditions outlined in the agreement.

1.2 Scope: The manual covers Civil and Public Health construction safety and the scope of this safety manual shall be for all the construction activities undertaken by Architecture & Civil Engineering Division of Engineering Services Group of Bhabha Atomic Research Centre. This manual may be referred to for any Civil and Public Health construction works for BARC Trombay or any BARC outstation facilities.

2.0 SAFETY PRINCIPLES AND OBJECTIVES:

2.1 Safety Principles:

2.1.1 Ensuring safety at construction sites is mandatory requirement as it is directly related to welfare of staffs and contractors' workers.
2.1.2 All accidents and occurrences of near-misses can be avoided by proper planning and thorough implementation of safe practices at work place.
2.1.3 All types of injuries, fatalities, loss of property and time can be minimized through preventive measures.
2.1.4 To increase the safety consciousness of the workforce and the supervisory staffs through continuous training and motivation towards safe practices.
2.1.5 Regular monitoring, inspections and safety audits will form an integral part of the safety programmes at the worksite.

2.2 Safety Objectives:

2.2.1 To provide a safe working environment to all workers and supervisory staffs.
2.2.2 To ensure safety at each and every level of the project as an integral part of the activities.
2.2.3 To enhance the safety standards as a continuous effort.
2.2.4 To complete project in an incident-free manner, without any damage to health, property and environment.

3.0 SAFETY POLICY:

Architecture and Civil Engineering Division, BARC is committed to ensure the highest standard of occupational health, safety and environment in all construction activities undertaken in order to achieve zero-accident working period in all projects and thereby contributing towards enhancement of the safety performance of the centre.

4.0 SAFETY ORGANIZATION:

Contractor shall form a Site Level Safety Committee (SLSC) comprising employees from all sections and one representative from the department. As per chapter XXI, Rule 208, BOCW Central Rules 1998, SLSC shall be constituted by the contractor (Employer) wherein 500 or more workers are employed. In addition, the corporate office of the contractor shall have a safety and environmental control section to liaise with the Competent Authority and carry out periodic safety audit at site. Contractor shall not be self-complacent with mere compliance with sections and rules of various Acts and Rules applicable to construction safety. He shall promote health, safety and environment practices by identifying the personnel and assigning specific responsibilities to them so that proper safety is implemented at site and a safety culture is created among his all employees and workmen and maintained until completion of the project.

4.1 Site Level Safety Committee: (SLSC)

For a project site having maximum strength of less or equal to 500 numbers of workers, Contractor shall identify a Site Engineer to perform the duty of the Safety Engineer/Officer at site. The numbers of representatives from the contractor and the workers in the Site Level Safety Committee (SLSC) shall be as per chapter XXI, Rule 208, BOCW Central Rules 1998. The committee shall meet at regular intervals, at least once in every month and shall be chaired by the senior most person having over all control of the affairs of the construction site, normally the Project Manager or the authorized signatory (power of attorney holder) of the contractor with Safety Officer as Member Secretary. All section-in-charges including site engineers, electrical, mechanical, QA/QC, Stores, administration section, representatives of the workers and one representative of the department shall be the members of this committee. The duties of the committee are enlisted as under:

The main job of the Site Level Safety Committee is to ensure health and safety of all employees, workers and the neighbourhood and for this the committee shall -

(a) See that all the provisions of relevant Acts & Rules and conditions referred in contract agreement are conformed to.

(b) See that a well documented safety programme exists.

(c) See that a work permit system exists for all construction activities, especially for-
  (i) Any work at hazardous locations such as at height or at depth;
  (ii) All hot jobs, fabrication works and electrical repairs & maintenance works;
  (iii) All concreting works; and
  (iv) Under high noise and high dust environment.

(d) See that all employees are informed of the hazards involved in their work and are provided with adequate protective equipments.

(e) See that the work environment and the neighbourhood is free from debris, muck, insects and any unhygienic conditions at any time and proper access and illumination is ensured at the workplace.

(f) See that a detailed schedule for periodic calibration and preventive maintenance of all the machinery and equipments is being implemented.

(g) See that periodic medical examination of all employees and workers are carried out to the extent required as per the work environment.

(h) Assess the potential hazards and dangerous occurrences at the work place and examine the effectiveness of the safety and control measures.

(i) See that various processes of construction and disposal of debris and effluents are safe to ensure conformance to the Environmental Protection Act, 1986.

(j) Discuss accidents and dangerous occurrences at the work place and examine root causes of accidents and suggest to the management necessary improvements.

(k) Organize safety circles in the site for developing safety culture.

(l) Investigate complaints received from anybody about the risks or dangers.

(m) Promote safety and health by organizing accident prevention programs, campaigns and meets on continual basis by organizing safety weeks, safety competitions, safety talks and film shows on safety, displaying posters and other promotional activities to stimulate interest among staff and workers about safety.

The agenda and minutes of the meeting to be circulated to all concerned. The decisions and recommendations of SLSC shall be complied with by the contractor within specified/reasonable time.

4.2 Safety Officer and Safety Steward:

General: Number of Safety Officers and Stewards: The number of Safety Officers and Stewards to be engaged by the contractor shall be as per Chapter XXI, Rule 209 and schedule VIII of BOCW Central Rules, 1998. For a project site having maximum strength of less or equal to 500 numbers of workers, Contractor shall identify a Site Engineer to perform the duty of the Safety Engineer/Officer at site. The above provision does not absolve the concerned Site Engineers / Section-In-Charges of the Contractor from the responsibility of ensuring safe working condition for the workmen deployed at a particular area under their control. The respective Site Engineer stands equally accountable for occurrence of any near-miss and / or any accident at site and the Department reserves the right to take suitable actions, as deemed fit, against the Contractor's personnel responsible for such lapse in ensuring proper safety at site.

4.2.1 Duties of Safety Officer: The duties of Safety Officer shall be to advise and assist the management in the fulfilment of its obligations, statutory or otherwise, concerning Atomic Energy Factory Rules, 1996 and BOCW Act & Central Rules, prevention of personal injuries and maintaining a safe working environment. These duties shall include the following, namely:-

(a) to advise the concerned departments in planning and organizing measures necessary for creating a safe working environment for all workmen engaged at site and to prevent any kind of personal injuries and damage to property;

(b) to advise on safety aspects in all job studies, and to carry out detailed job safety studies of selected jobs and to formulate Job Hazard Analysis Report and Safety Manual during initial mobilization stage of the project;

(c) to check and evaluate the effectiveness of the action taken or proposed to be taken to prevent personal injuries and damage to property;

(d) to ensure that all Personal Protective Equipment (PPE) provided to workers as required under any of the provisions of the Act or the Rules conform to the relevant Indian Standards and to advise all Site Engineers / Section-In-Charges / Supervisors to ensure proper use of such PPEs by workers at site;

(e) to provide advice on matters related to carrying out site safety inspections, daily walk-through surveys, etc.;

(f) to carry out site safety inspections in order to observe the physical conditions of work and the work practices and procedures followed by workers and to render advice on measures to be adopted for removing the unsafe physical conditions and preventing unsafe actions by workers;

(g) to render advice on matters related to reporting and investigation of industrial accidents and diseases;

(h) to report and investigate all accidents and near-misses and to recommend the preventive measures so as to ensure non-occurrence of such cases;

(i) to investigate the cases of industrial diseases contracted and reportable dangerous occurrences.

(j) to advise on the maintenance of such records as are necessary relating to accidents, dangerous occurrences and industrial diseases;

(k) to promote setting up of Site Level Safety Committee (SLSC) and to act as adviser and catalyst to such committees;

(l) to organise in association with the concerned departments, campaigns, competitions, contests and other activities which will create awareness and will develop and maintain the interest of the workers in establishing and maintaining safe conditions of work and procedures; and

(m) to design and conduct either independently or in collaboration with the training department, suitable training and educational programme for the prevention of personal injuries.

4.2.2 Facilities to be provided to Safety Officers: The Contractor shall provide each Safety Officer with such facilities, equipment and information as are necessary to enable him to discharge his duties effectively. Such typical facilities may include personal computer, testing facility, facilities for storage of PPE, documents and stationery, etc.

4.2.3 Qualifications for Safety Officer:

A person shall not be eligible for appointment as a Safety Officer unless he

a) possesses- (i) a recognised degree or equivalent in any branch of engineering or technology and has had practical experience of working in a construction project site in supervisory capacity for a period of not less than 2 years; or

(ii) a recognised diploma or equivalent in any branch of engineering or Technology and has had practical experience of working in a construction project site in supervisory capacity for a period of not less than 5 years;

(b) possesses a degree or diploma in industrial safety recognized by the Central / State Government in this behalf; and

(c) has adequate knowledge of the language spoken by majority of the workers in the region in which the construction project site where he is to be appointed is situated.

5.0 GENERAL SAFETY PROVISIONS:

5.1 Work Planning: The contractor shall identify the requirements of good practices at site for fulfilment of legal requirement related to environment, occupational health and safety. The contractor shall enlist all the activities under the contract in advance and their effect on safety, health and environment. The contactor shall establish, implement and maintain procedure to identify and have accesses to applicable legal requirements related to environment, occupational health and safety. The contractor shall maintain register **(Refer Annexure-1)** of applicable legal requirements which shall be kept updated from time to time.

5.2 Job Hazard Analysis Report: Contractor shall analyse job-specific hazards in order to identify the probable causes to these hazards, well in advance, and recommend the remedial measures in Job Hazard Analysis Report **(Refer Annexure-2)**; which shall be submitted to the Department within one month from the issue of work order in the approved format and as per guidelines of the Engineer-In-Charge for approval of the Competent Authority as per regulatory requirement of BARC. Contractor shall implement the recommended remedial measures at site in order to create and maintain an accident-free working condition at site.

5.3 Work Permit: The contractor's Site Engineer shall seek work permit for all new activities to be taken up at site and submit the form duly signed by him in quadruplicate **(Refer Annexure-3)** to Safety Officer before commencement of the work daily. The Safety Officer will inspect the site and give the clearance to the concerned site engineer. One copy of the work permit shall be made available with the contractor's site engineer, site supervisor, safety officer and departmental staff each. No work shall commence at site without approved work permit. In case of renewal of work permit, such noting shall be made on the work permit.

5.4 Safe Working Procedure:

5.4.1 Guidelines for general and enabling works:

The contractor shall submit the layout of proposed location of site office, stores, batching plant & silos, mechanical workshop, electrical panel rooms, water points, first aid centre and safety office and other temporary structures for prior approval of Engineer-in-charge. It shall be ensured that the proposed locations of temporary structures do not hinder the existing permanent structures, roads, drains, services, movement of workers and equipment during construction, etc. and shall be easily accessible. The trial pit location for finding existing underground services shall also be submitted for advance approval.

5.4.2 Demolition:

Before any demolition work is commenced and also during the progress of the work:

a) All roads and open area adjacent to the work site shall either be closed or suitably protected. Appropriate warning signs shall be displayed for cautioning persons approaching the demolition area. The area shall be cordoned off properly.
b) Protection of adjacent building, underground service lines should be ensured. Underpinning operations shall not be permitted unless adequate measures against collapse of structure are ensured.
c) Before demolition operations begin, the Contractor shall ensure that the power on all electric service lines is shut off and the lines are cut or disconnected at or outside the demolition site. If it is necessary to maintain electric power during demolition operation, the required service lines shall be adequately protected against damage.
d) Persons handling heavy materials /equipments shall wear safety shoes.
e) No floor, roof or other part of the building shall be overloaded with debris or materials that may render it unsafe.
f) Entries to the demolition area shall be restricted to authorized persons only.

5.4.3 Piling:

5.4.3.1 Piling rig: The legs of the tripod shall be properly spiked in the ground to prevent accidents due to slipping of the tripod legs when rested on a paved ground or sleepers. The shear legs and bases become thin and fatigued with usage. They should be replaced frequently.

5.4.3.2 Pulley and rope: The pulley and rope shall be checked with reference to the Rule 71 and 72, Section- I of BOCW Central Rules, 1998. In addition to this, the pulley and rope shall be checked before the commencement of day's work, in this respect-

a) Check for loose strands and wear, deformation, corrosion and breakage of wires.

b) Check whether the end of the rope has become loose or has slipped wire clips or wire sockets.
c) Check against slippage of rope from the sleeve during work.
d) Check if there is any occurrence of torsion in the wire rope while working and if so, unwind it normally at once.
e) Check if there are any adhesions like mud, earth, etc, on the rope. If so, clean with wire brush or compressed air.
f) Check if the grease applied on the rope is adequate.
g) Check for wear and cracks on the lining of the clutches and brake band; and the engine condition.
h) The pulley shall be checked for any cracks in wheel, etc.

5.4.3.3 Field operation: Contractor shall take following precautions during boring of pile and concreting activity:

- *Centering the Pile* — the workers helping while marking the pile centre shall be protected from possible injury by bailer / chisel.
- *Driving the casing & cap* — workers shall be protected from chances of slippage of driving bar / clutches falling accidentally.
- *Lowering Reinforcement Cages* — the lifting and lowering of re-bar cage shall be done with utmost care since it is very heavy and at the same time flexible enough to buckle. Adequate supporting arrangement shall be ensured. The workers shall be protected from projected parts like binding wire, wire nails, etc. while preparing the pile cages or handling and lowering them.
- *Jammed Casings* — while withdrawing the casing, sometimes the casings may get jammed. During the process of extracting them, the tripod legs shall be secured properly for prevention of toppling / collapse of tripod due to sudden jerks. The withdrawal process of casing shall be executed slowly and with proper care in order to ensure smooth movement of the casing.
- *Grounding the Bailers/Chisels* — workers shall keep safe distance while the bailers and chisels are grounded so as to be safe from any injury due to swing of them. Minimum distance of 5 m shall be maintained.
- *Guarding of flywheels* – the flywheels of the machine of the piling rigs shall be guarded properly.
- *General precautions* — workers shall wear tight fitting clothes and all necessary PPEs. Care shall be taken for nearby permanent structures for vibrations, etc. during piling.

5.4.4 Earthwork in excavation and backfilling: The Contractor shall take all safety precautions during the execution of awarded work and shall maintain and leave the site safe at all times.

5.4.4.1 Excavation:

5.4.4.1.1 All trenches 1.2 m or more in depth shall at all times be provided with at least one ladder at a spacing of 15m or part thereof in case of hazardous work and 30m or part thereof in case of less hazardous works. Ladder shall be extended from bottom of the

trench to at least 1 m above the surface of the ground and the legs of the ladder shall be secured against slipping.

5.4.4.1.2 The sides of the trench which are 1.2 m or more in depth shall be stepped back to give suitable slope (angle of repose depending on the type of the soil) or securely held by steel or suitable shoring, so as to avoid the danger of sides from collapsing. A provision of clear berm of a width not less than one-third of the final depth of excavation is recommended. In areas, where this width of the berm is not feasible due to space constraint, the clear berm width (clear space) not less than 1 m shall be provided. Cutting shall be done from top to bottom. Under no circumstances mining or under-cutting shall be done.

5.4.4.1.3 The Contractor shall ensure the stability and safety of the excavation, adjacent structures, existing services and the works of other agencies.

5.4.4.1.4 Open excavations shall be cordoned off by suitable railing/barricading and photo-luminescent warning signals installed so as to prevent persons slipping or falling into the excavations. Warning signals shall be visible at night also and the area shall be well illuminated during the work.

5.4.4.1.5 All blasting operations, if permitted by Engineer-in-charge, shall be carried out on the basis of procedures approved by Inspector of Explosives. All works in this connection shall be carried out as per I.S Code of Practice. Barricades, photo-luminescent warning signs, etc. shall be placed on the roads/open area. Prior approval of such operation shall be obtained from Safety Officer/Engineer-In-Charge of Works.

5.4.4.1.6.

a) For removal of earth from an earth mound work permit shall be obtained from the Engineer In-charge / safety officer of the work.

b) As far as practical, earth shall be removed mechanically. Ramp shall be made by the contractor with suitable hard material for movement of trucks / tippers, etc. with proper slope, compaction and drainage so as to ensure safe and easy movement of the above transport vehicles carrying excavated earth.

c) Wherever manual removal of earth is involved, earth shall be removed from the top by maintaining the proper slope equal to the angle of repose of the earth.

d) Such work shall be constantly supervised by the contractor's responsible person and frequently inspected by the departmental representative to ensure that no under-cutting is done.

e) The excavating equipment should be parked at a distance of not less than the depth of the trench.

f) For excavation in greater depths, separate access for workers with proper steps/slope and temporary railing arrangement shall be provided apart from ladders. The access shall be maintained in proper condition until backfilling is completed in the excavated area.

g) Experienced and qualified supervisors shall be put in charge of the excavation work by the contractor. The supervisor shall brief workers about the working plan before the commencement of work and explain potential hazards to them. He

shall pay attention to existing water pipelines, electric cables below the surface or during excavations of underground structures and arrange for proper protection to them. Contractor shall report the condition of excavated pit to departmental staff/Engineer-in-charge after every rain and accordingly shall take necessary corrective action for safety at site.

h) Contractor shall arrange adequate and efficient mechanical dewatering system as recommended by Engineer-in-charge. These pumps shall be inspected and maintained in proper working condition. The electrically operated pumps shall be connected to ELCB of proper rating for safety of the person operating/shifting them.

i) Contractor shall wash the wheels, of the transport vehicles carrying excavated soil, with water jet before moving out of the site premises so that there is no spill over of soil on the existing roads. In case there is any such spill over on the roads, the same shall be cleaned by the contractor by manual / mechanical means immediately at no extra cost.

5.4.4.2 Backfilling:

5.4.4.2.1 The earth to be used for backfilling shall be taken from approved location or borrow pit if the soil is taken from inside BARC. For outside BARC supply, the source shall be approved by the Department in advance.

5.4.4.2.2 The contractor shall take precautions for earth mounds stacked for backfilling as mentioned above under the head of earthwork in excavation. The soil shall not be pushed indiscriminately by mechanical means into the excavated pit as far as possible. If mechanical dumping / pushing are unavoidable, it has to be done with proper guidance / warning (helper / reverse horn to be provided to all vehicles) and the pits have to be vacated from manpower.

5.4.4.2.3 The final backfilling shall be done in layers and compacted as per technical specification of the tender. Utmost care shall be taken by the contractor for protection of permanent structure or already cast structures during use and movement of mechanical compactors.

5.4.4.2.4 The temporary power supply points or panels are to be protected from water spraying or any other damages during backfilling process.

5.4.5 Reinforcement and Concrete works:

5.4.5.1 Concreting:

a) Manual handling of concrete shall be restricted as far as possible. Proper exhaust ventilation shall be available at the cement store and during casting work in confined places. PPE for protection of workers viz. respirators, hand gloves, gumboots, etc. shall be provided by the contractor to the workers handling cement bags and concrete manually.

b) The contractor shall provide ear-muffs to the operator / worker exposed to continuous high-level of noise and ear-plugs to all workers involved in the concreting work.

c) The out riggers / wheels of concrete pump / concrete mixer shall be placed on firm ground / platform. Pump accessories shall be checked for its safe working pressure considering maximum pipe line height. A pressure release valve shall be attached to the pump to release the excess pressure.

d) The pipeline for transporting the concrete shall have the shortest route with minimum bends and shall be installed on firm supports at suitable intervals. Pipeline shall be properly joined with clamps and securely tied to nearby support and checked in advance before starting the concreting. Pipe segments shall be cleaned in advance to avoid choking of concrete during casting.

e) Length of flexible hose shall be such that it can be easily handled by the workers. The end of flexible hose shall be checked before commencement of concreting and it shall be free from loose wires, concrete lumps, etc. The “swan neck” position of the flexible hose shall be avoided as it results in building up excessive pressure on concrete pump and clogging of concrete.

f) Ball catcher / Trap to arrest the ball must be provided at the end of the pipe line after the concreting is over and flexible pipe is removed. The supervisor, who is authorized to give clearance for ball passing, shall check that whether the ball catcher / trap is fixed properly before passing the ball. The supervisor shall instruct all workers to keep safe distance during ball passing.

g) Signalling system - Red and green flags shall be displayed by the supervisors/ designated signalmen, standing in visible locations, for commencement and stopping the flow of concrete. These signalmen shall not be engaged in any other work during concreting activity. They shall be trained along with the concrete pump operator in advance by the contractor for correct signalling. During concreting in night, electric torches fitted with red/green cellophane papers may be used instead of red/green flags.

h) All mechanical equipment/tools used in concreting activity like batching plant/concrete mixer, concrete pumps, vibrators, etc. shall be operated by trained person only.

i) Ready Mix Concreting – Loaded transit mixers shall move / park on firm ground as far as possible. The reversal of transit mixers shall be guided by helpers and reverse horn shall be used for reversal. Cleaning/washing of transit mixers shall be done at designated area only.

j) The concrete mixers used for preparation of concrete may be tilting or non-tilting type, driven by electric motors or by diesel engine depending upon the location of the structure. For electric driven mixers, the wire connecting the mixers shall be in good and sound condition, and the circuit breaker shall be well maintained.

k) Exhaust gases of a diesel engine if inhaled for long period may cause diseases. They shall be directed away from the operator. All gears and moving parts shall be well guarded. Care shall be taken to display notice “Under Repairs” while cleaning the drum. Wire ropes operating the drum and clutches shall be inspected regularly and replaced, if required.

5.4.5.2 Reinforcement:

a) Bar bending and cutting yard shall be properly cordoned / barricaded and entry shall be restricted.

b) Re-bar bending and cutting machines shall be handled by trained operator / skilled workers.

c) Shifting of cut re-bars shall be done by mechanical means as far as possible. When re-bars are shifted manually, it shall be done with proper care and proper balance shall be maintained. Clear access shall be provided for shifting of re-bars.

d) Proper support shall be given to the column bars by means of rings / props against undesirable sway.

e) Free ends of the binding wires shall be bent inside to avoid injuries.

f) Proper PPE viz. leather / cotton hand gloves, goggles, etc., for the people handling / shifting and cutting / tying of re-bar, shall be used for protection from injury and other occupational diseases.

5.4.5.3 Formwork for concreting:

a) Shuttering and supporting members viz. props, tie rods, etc. shall be of adequate strength to support the load / pressure of concrete and the formwork scheme shall be approved by Engineer-In-Charge in advance. The procedure approved by Engineer-In-Charge shall be followed for mixing, transporting and pouring of concrete.

b) The process of stripping of formwork shall be planned in advance and approved by Engineer-in-charge. Stripping shall enable the structural member to behave in desired manner. The area shall be suitably cordoned / barricaded and unauthorized entry shall be restricted by displaying signboards, etc.

c) While removing formwork from vertical surfaces, the shuttering board shall be adequately supported by props, in order to prevent the same from toppling / slipping, until it is lowered on ground safely. Same support with props shall be provided during erection of formwork too until the plywood is secured in desired place with tie rods.

5.4.6 Scaffolding and Working at Height:

5.4.6.1 General:

a) All the workers, supervisors and engineers of the contractor, who will work at height, shall have valid height passes issued as per **Annexure-4** by the Safety Officer / Medical Attendant in consultation with the Authority of the Safety Unit, ESG, BARC. Each such individual shall be medically examined by a Medical Practitioner, for blood pressure, vision, hearing, and efficient movement of limbs, epilepsy, vertigo or any other persistent diseases that make him/her medically unfit for working at height. The fit persons shall be issued height passes, which shall be valid for maximum 6 (Six) months, for working at height. After every 6 (Six) months, these persons shall be medically examined in order to find out their fitness for working at height. List of unfit workers shall be submitted to the departmental representative and such persons may be allowed to work at ground level and in no case shall be engaged by the contractor to work at height. The records of

medical checkups / fitness tests certified by the Medical Practitioner shall be maintained at the first aid centre / safety office of the contractor and shall be produced to the departmental representative as and when asked.

b) The scaffold to be erected for working at height shall be designed for the estimated load (load of the RCC structure to be supported, live load and other vibrations load during casting, etc.) and design shall be submitted for approval of the department in advance. The scaffold components shall be designed for at least 4 times of the maximum intended load. The use of Bamboo/Wooden scaffoldings shall not be permitted irrespective of height of work and only steel scaffolding shall be used by the contractor.

c) The erected scaffold shall be inspected and cleared by the safety officer of the contractor. The safety check list **(Refer Annexure-5)** for scaffolding erection shall be submitted by the site engineer of the contractor to the safety officer in triplicate. The standard format of safety check list for scaffolding erection is enclosed as **Annexure- 5**. The safety officer shall physically inspect the erected scaffolding and after his satisfaction, shall give clearance for the use of the scaffold. One copy of safety check list, duly filled in and cleared by safety officer of the contractor, shall be submitted to the departmental representative. Other two copies shall be available with site engineer and safety officer of the contractor respectively.

d) Base of the structure shall be supported on levelled and firm ground as far as possible. In case such firm ground is not available at site then the load of the vertical members of the scaffold shall be distributed with the help of base plates, sole plates or channels, etc. The base of the scaffold shall be away (at least 1.5m) from excavated pits, open drains, manholes, water logged area, etc. Contractor shall ensure that there is no vehicle movement near the erected scaffold and it shall be protected by proper barricading/warning sign, etc.

e) The scaffold shall be checked for its condition i.e. it shall be free from bends, cuts, rust, etc. All vertical members shall be in plumb and correctly spaced. The joints of vertical and horizontal members shall be properly connected with couplers, lock pins, etc. The scaffold shall be securely tied with permanent structure as per the requirement of IS: 3696 – 1991 (Part 1) (Reaffirmed in 2002).

f) The access to the scaffolding shall be free from obstructions, undesirable and slippery materials. Stair tower, monkey ladders, gangway, etc. shall be provided in the scaffolding for movement of the workers.

g) The working platform and the access to the scaffold shall be free from all debris and loose materials.

h) The diagonal face bracing/Zig zag face bracing shall be provided at a spacing of maximum 10 m centre to centre for pipe scaffolding.

i) Safety tag (for 'Unsafe Scaffolding DO NOT USE' in red letters or tag / 'Safe Scaffolding' in yellow letters or tag) shall be displayed on the erected scaffold at ground level. Such safety tag / sign boards shall be written in the language understood by the majority of the workers. Unsafe scaffolds shall be repaired / removed.

j) Contractor shall provide necessary PPEs as per relevant I.S. Codes for the workers working at height viz. full harness safety belt, fall arrestor, kinetic shock absorber, safety helmet, gloves, etc.

5.4.6.2 Working platform:

a) The quality of wooden planks or MS grill plates for decking of working platform shall be made of good quality material and free from any defects, etc. The load carrying capacity of the working platform shall be designed in consultation with Engineer-in-charge. Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally. They shall be closely boarded, shall have adequate width (at least 2 planks/ grill plates wide or 600 mm whichever is more) for easy movement of persons and materials and shall be suitably guarded.

b) The steel walkways or wooden planks used for making working platform shall not project beyond the end supports to a distance of 150 mm. The planks shall be rigidly tied at both ends to prevent sliding and toppling. The thickness of the planks shall be adequate to take load of men and materials and shall conform to IS: 3696-1987 (Part-I) (Reaffirmed 2002) and they shall not collapse.

c) The overlaps of MS grill plates / wooden planks shall not be less than 300 mm.

d) The platform shall extend at least 600 mm beyond the end of wall in order to facilitate the worker to reach end of the wall.

e) All working platforms shall have guard rails at 1.0 m height with middle rails at 0.5 m height from the platform and 15 cm high toe boards securely tied with the vertical posts. The spacing of vertical posts shall not exceed 2.0 m centre to centre.

f) Every opening in the floor of a building or in a working platform shall be provided with fencing or railing and protective cover, to prevent fall of persons or materials, the minimum height of which shall be 1.0 m, along with 15 cm high toe board at floor level along the railing. The removal of such railing / protective cover shall be done only after seeking proper work permit from Safety Officer of the contractor.

g) The contractor shall provide grab rope / life line all around the working platform/level, at height, which will provide tying / anchoring facility for the safety belt / fall arrestor.

h) Contractor shall provide safety net under all working platform/level at height to protect fall of men and materials from above and such safety nets shall conform to IS: 11057-1984.

i) Adequate precautions shall be taken to prevent danger from electrical lines and equipment. Scaffolding, ladder, working platform, gangways, etc. shall not exist within 5m of any un-insulated electric wire. Whenever electric power and lighting cables are required to run through (pass on) the scaffolding or electrical equipments are used, such scaffolding structures shall have minimum two earth connections with earth continuity conforming to relevant IS Code of Practice.

5.4.6.3 Ladder:

a) Safe means of access shall be provided to all working platforms and other elevated working places with the help of ladders.

b) Ladder shall be placed in an inclination not steeper than 1 in 4 (1horizontal and 4 vertical).

c) Every ladder shall be securely fixed at bottom from sliding/slipping.

d) No single portable ladder shall be over 9 m in length.

e) For ladders up to 3m in length, the width between side rails in the ladder shall be a minimum of 300 mm. For longer ladders, this width shall be increased by at least 20 mm for each additional metre of length.

f) The spacing of rungs shall be uniform and shall not exceed 300 mm.

g) Ladder shall be of rigid construction having sufficient strength for the intended loads and made either of good quality wood or metal. All ladders shall be maintained well for safe working condition. The rungs shall be tested periodically as per provisions of IS: 3696 -1991 (Part 2) (Reaffirmed in 2002).

h) Whenever ladder is not securely fixed an extra worker shall be engaged for holding the ladder.

i) Ladders shall not be used for climbing while carrying materials in hands. While climbing, both the hands shall be free for holding the rails. Contractor shall make alternate safe arrangement for lifting of tools and implements for all his workers working at height.

5.4.7 Construction machinery and Tools:

General: The operation and maintenance of any construction machinery shall be as per manufacturer's guidelines & checklists and by trained personnel only.

5.4.7.1 Earth moving machinery:

General: The contractor shall ensure the stability of the equipment, while working, depending on the load bearing capacity of the ground; which may reduce due to presence of moisture and due to vibration effect. The contractor shall provide bearing plates, packing, etc. to strengthen the ground below outriggers or wheel or crawler of the equipment. All earth moving equipment shall have Roll Over Protective Structures, sound suppressers, seat belts, reverse alarms, warning horns, windshield wipers and easily approachable control and lever for brake system and emergency stop. They shall be checked at the time of delivery and they shall be properly maintained. Contractor shall display warning sign for keeping away from the moving parts of such equipment and the area of operation of such machinery shall be properly cordoned. The shovel / bucket of the earth moving equipment shall be rested on ground when the equipment is not working. Operation of such equipment shall always be carried out by trained operator accompanied by the designated helper.

a) Power shovels: The shovels both mechanical as well as hydraulic / pneumatic type need basic precautions while being operated. The excavators shall not lose their stability while operating. The Contractor shall adhere to the Load Charts for various boom lengths

provided by the manufacturers. For the mechanical shovels, the wire rope shall be changed as per the frequency mentioned in history sheet. For Hydraulic hoses, the connections shall be tight and leak proof. The fire extinguisher of appropriate type confirming to IS: 2190-1992 (Reaffirmed in 2007) shall be made available on the hydraulic excavator.

b) Bulldozers: The blade of Bulldozer shall be inspected at least once in a week. The blade shall not be used as a brake except in emergency. The position of the blade shall be adjusted while travelling up or down the gradient. The Bulldozer shall be parked on levelled ground, by applying hand brakes and by lowering blade.

c) Scrapers: The brakes of the Scraper shall be checked before putting it in operation. The scraper bowl shall be repaired and the cutting blades shall be changed periodically. The bowl shall be locked before carrying out the repairs. The bucket shall be raised while moving the scrapper. No vehicle movement shall be allowed within the radius of movement of scrapper and the area shall be properly cordoned. The wire ropes shall be checked periodically by visual inspection at least once in a fortnight.

5.4.7.2 Lifting and hoisting machinery: Use of lifting machines and tackles including their attachments, anchorage and supports shall conform to the Rules 55 to 71 of chapter VII of BOCW Central Rules, 1998 and shall also conform to the following conditions.

(a) Lifting machines and tackles shall be of good mechanical construction, sound material and adequate strength and free from any defects and shall be kept in good repair and in good working condition. Every rope used in hoisting or lowering materials or as the means of suspension shall be as per manufacturer's guidelines, of good quality and adequate strength and dimension and free from any defect. Test certificates of such ropes, D-shackles, etc. shall be submitted in advance by the contractor.

(b) Every crane operator or lifting appliance operator shall be properly qualified. No person under the age of 18 years shall be in charge of any hoisting machine or to give signal to operator of such machine.

(c) In case of every lifting machine (and of every chain, ring, hook, D-shackle, swivel and pulley block used in hoisting or as means of suspension) the safe working load shall be ascertained and clearly marked. In case of a lifting machine, having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing. This shall be approved by the Safety Officer of the contractor.

(d) The Contractor shall notify the safe working load of the machine to the Engineer-in-charge whenever he brings any machinery to site and get it verified by the third party testing, supported by a valid test certificate.

(e) The base of such hoisting equipment shall be kept in perfect horizontal condition since any tilt would reduce the load carrying capacity of the equipment. The foundation shall

be firm enough to support the equipment. The level shall be checked every day before starting the work in case of mobile hoisting equipment.
(f) Thorough inspection and load testing of lifting machines and tackles shall be done by a third party, at least once in every 12 months and the records of such inspection and testing shall be maintained and a copy shall be submitted by the contractor to the departmental representative at site. Motors, transmission, couplings, belts, chain drives and other moving parts of hoisting appliances shall be provided with adequate safeguards. Hoisting appliances shall be provided with such means as it shall minimize the risk of any part of a suspended load becoming accidentally displaced or lowered.
(g) Double sling shall be used for hoisting material. The angle of the sling shall be wide enough for safe hoisting and the sling shall be adjusted as per the centre of gravity of the material to be lifted. A guide rope (manila rope of sufficient length, normally 1.5m long) shall be attached to the end of the material lifted in order to pull the same conveniently during lowering.
(h) The contractor shall maintain a Register of Periodical Tests for Examination of Lifting Appliances and Gears (**Refer Annexure 7A**) at site as per Rule 74, Chapter VII, BOCW Central Rules, 1998 and record the periodic / annual thorough examination of such appliances (viz. winches, derricks, their accessory gears, loose gears, ropes, hooks, shackles, swivels, etc.). This register shall be kept available at site always for examination of the department.

5.4.7.2.1 Tower Cranes: Erection & Commissioning - The type of the tower crane to be used shall be selected based on the load to be lifted, the reach of the boom and the height at which the material is to be shifted. The contractor shall follow all the safety instructions given in the manufacturer's manual for erection, dismantling or extension (jumping) of tower cranes. The contractor shall submit the operation manual, provided by the manufacturer, to the departmental representative before erection of the same at site. For both movable and fixed tower cranes, the adequacy of the counterweight shall be ensured. The base of the tower crane shall be in perfect horizontal level. Base shall be capable of bearing the loads during the operation of tower crane.

The foundation of the tower crane (mainly for static tower crane) shall be properly designed, for at least 25% more than the maximum load carrying capacity of the crane. For erection of mobile tower crane, the contractor shall first level and compact the soil at the place of erection or shall lay PCC / RCC of sufficient thickness if the soil condition is poor. The out riggers / wedge of the mobile tower crane shall be properly secured. The limit switch of the tower crane shall be properly calibrated and checked periodically by the contractor in order to ensure safe load carrying capacity of the same. The load carrying capacity shall be tested, at least once in 12 months, by a third party and a copy of such test shall be submitted by the contractor to the departmental representative at site. The limit switch shall function in such a manner that it immediately cuts off the power supply to the hoisting motor of the crane on overloading. The electrical power supply system of the crane shall be through MCB / ELCB of proper rating which shall be

periodically checked. The height of the tower crane shall be such that it clears all obstruction like column dowels, protruding parts of scaffolds, overhead electric lines, etc. easily while hoisting the loads.

Operation – The crane shall never be used to pick the loads which are out of the crane's reach or to do skew pulls of any sort. The load (to be lifted by the crane) shall be free from any sticky characteristic which may cause sudden jerk while lifting. No worker / person shall be lifted by tower crane. Any kind of swinging of lifted load, to put them out of crane's reach, shall not be tried. The operator shall not reverse the motor in order to achieve quicker stop to save time. He shall execute one operation at a time only and shall never combine horizontal movement of trolley with vertical movement of lifting hook. Tower crane shall be protected from sway due to wind load, etc. during operation. Precautions in high wind load (more than 72 kmph or possibility of storm) shall be taken as per manufacturer's guide. Various components and parts of the tower crane like wire ropes, pulleys, structural members of the tower and boom, etc. shall be periodically checked and properly maintained by the mechanical engineer of the contractor. Proper lighting arrangement with the boom and the tower of the crane shall be provided as safety arrangements for clear visibility during night. The tower crane shall be provided with the siren / horn facility in order to caution the workers in vicinity during operation of the crane. The operator shall take "START" and "HOISTING" signal from the designated helper / supervisor only; however, "STOP" signal can be taken from anyone.

Maintenance - The balancing rope, trolley rope, hoisting rope and erection rope shall be checked as per maintenance guidelines given by the manufacturer and they shall be replaced immediately as and when required. For regular maintenance, the manufacturer's manual shall be followed.

5.4.7.2.2 Mobile Cranes: The contractor shall take care that, the engine of the crane shall be kept running with the gear engaged and maintain a slow speed, while moving down the hill. While travelling uphill or downhill, the boom shall always be kept downhill in order to prevent the boom from falling back. The soil of working area, movement area and parking area of the mobile crane shall be well compacted and shall have proper drainage arrangement. The area shall be dry, levelled and firm enough to hold the load of the mobile crane. In case the soil is soft, the area under the wheels should be made solid with stones, wooden slippers, etc. This also applies to the crawler mounted cranes. The chart for rated load vis-à-vis operation radii for mobile crane shall be referred to before any erection and the same shall be submitted by the contractor to the departmental representative in advance. In no case, the maximum operation radius shall be exceeded. The out- riggers / jacks along with bearing plates shall be used while in operation and no load shall come on the wheels. The lifting hook shall be tied / anchored while the crane is moving or not operational. Before starting operation at the beginning of day's work, the capacity load shall be picked up to 0.3 m above the ground to test the drift, if any, due to faulty brakes. The brakes shall be 'ON' when a rubber tyre crane is operated. The operator shall always avoid any jerky start or a fast swing during operation of the crane since it

increases the risk of overturning of the crane. The pressure in the pneumatic tyre shall be maintained correctly in all wheeled machines. The crane shall be equipped with the following features:

i) Anemometer to indicate wind pressure
ii) Anchors for rail mounted cranes
iii) Load Limiter to prevent failure of ropes
iv) Safety stops to restrict crane travel
v) Swinging radius indicator to indicate safe load at given radius
vi) Heel indicators to control crane heeling
vii) Electrical/mechanical safe limits to compare the weight actually hoisted and the load admissible at various swing radii

The standard formats for inspection and certificate of testing for crane and hoist are given as per **Annexure 6 and 7**.

5.4.7.2.3 Builder Hoists: The capacities of the builder hoists are limited. The structure of builder hoist shall be supported from permanent structure like column, slab, etc. so that the rails do not rattle while operating the hoist. The structure shall be vertically held in position. Periodic checking and maintenance shall be done by the contractor for the condition of ropes, rails, pulleys, bucket/hopper, locking system, etc. from time to time. There shall not be any obstruction or protruding part on the way of movement of builder hoist. The builder hoist shall never be used for movement of manpower. The openings shall be cordoned by guard rails as per safety provisions under working at height.

5.4.7.3 Transporting Machinery:

a) Trucks, tippers, dumpers used in transportation of excavated earth or other materials; which are loaded with mechanical excavators, shovels / loaders shall have strong canopies over the driver's cabin to protect them from injuries while loading. The driver's cabin for all the vehicles at construction site shall have a system of sound and vibration suppression, seat belts, reverse horn/alarm, rear view mirror, wide windshield, triplex glass, wiper, sun visor, etc. Brakes and control shall be designed so as to get locked when the vehicle is parked. While going down the gradient, the speed of the vehicle should be controlled. Hydraulic retarder shall be used for big dumpers. Persons holding valid driving licenses for heavy motor vehicle shall be engaged as drivers of the respective type of vehicles. Every dumper, tipper, truck, etc. shall be accompanied by helper and driver shall take all signals from his helper only. The access road of such transport vehicle shall be firm and levelled as far as practicable and shall be free from any obstacle.

b) Trucks shall be loaded at places where there is no danger of falling rock or landslide. While loading trucks with mechanical excavators, shovels, etc. suitable distance shall be kept to avoid the shovel touching the truck. Brakes shall be applied when a vehicle is loaded and unloaded. The vehicles shall not be overloaded and the loading shall be even. Stop logs shall be used while loading and transportation so that the back door of the dumper does not open undesirably.

c) For tough riders, the hydraulic system for the bucket shall be checked periodically as per manufacturer's maintenance manual. They shall not be overloaded.

5.4.7.4 Concrete mixers and batching plants: The concrete mixers and batching plants shall be calibrated by the contractor at least once in a month and such records shall be made available to the departmental staff for record.

5.4.7.4.1 Concrete mixers: The mixer shall be placed on levelled and firm ground. The hopper shall rest on ground while loading of aggregates and cement. The hopper shall not be overloaded. The gear, pulley, ropes, etc. shall be checked regularly and replaced as and when required. Concrete mixers shall be operated by trained / skilled operator only. In case of electrically operated mixer machines, the switch boxes shall be properly guarded from rain and dust.

5.4.7.4.2 Batching Plant: The installation, operation, maintenance and decommissioning of batching plant shall be done as per manufacturer's guidelines and manuals. All electrical works and connections shall be done by a licensed electrician under supervision of electrical engineer of the contractor. The DG requirement (in case of power cuts) shall be of at least 150% of the overload capacity. The operations of hopper, scrapper and pan mixer shall be smooth and periodic inspection shall be done as per manufacturer's guidelines. The material bins shall be checked periodically for presence of any boulders, lumps, etc. which may choke in the hopper causing disruption of operation of the batching plant. Proper care shall be taken during feeding cement silo from the bulker for any loose joints in the feeder pipe and pump of the silo. The silo shall have a guarded monkey ladder for access to the top. The person accessing the top of silo shall seek work permit in advance and shall use proper PPE while climbing. The outer surface of the silo shall be properly painted and maintained against weathering effects. The contractor shall make available at least one fire extinguisher near the operator cabin of the batching plant and the same shall be maintained in good condition at all times. The operator cabin and the scrapper cabin shall be well ventilated and dust proof. The underground water tank/Vat of the batching plant shall be covered with suitable protective cover and shall be cordoned all around.

5.4.7.5 Hydraulic machines: Hydraulic operated machines like mechanical excavators, jacks, or any other hydraulically operated parts, etc. shall be handled carefully. The pressure relief valves mounted on the Hydraulic construction equipment shall not be tampered. These machines shall be equipped with the foam based fire extinguisher. These machines shall be maintained at regular intervals as per the manufacturer's manual, to avoid failure of brakes, hydraulic system, etc. Regular checking shall be done for such equipment for any leakage, condition of the hoses and connections, etc. Contractor shall give proper training to the operator, mechanic, etc. before they handle the equipment.

5.4.7.6 Dewatering pumps, Concrete pumps, Boom placer pumps:

5.4.7.6.1 Dewatering pumps: The rotating parts of the dewatering pump shall be well guarded. Only authorized operator / mechanic shall operate the pump on requirement. He shall not wear any loose clothes while operating the pump. The exhaust of the smoke shall be away from the workers working in the surrounding area. The pump shall be operated and maintained as per the manufacturer's guidelines.

For electrically operated dewatering pumps including submersible pumps, special care shall be taken while operating them. Such pumps shall be fitted with ELCB of proper rating. The power shall be put off before shifting or removal of the submersible pumps. Only authorized operator / electrician shall be allowed to operate the same.

5.4.7.6.2 Stationery Concrete Pumps and Boom Placer pumps:

The commissioning, operation and maintenance of concrete pumps (both stationery and boom placer type) shall be done as per manufacturer's guidelines or manual provided along with the equipment. The safety procedure and tips as mentioned in these guidelines shall not be violated. A copy of such manuals shall be submitted to the department before installing the equipment at site. Apart from manufacturer's manual, the following guidelines shall be followed for operation and maintenance of the concrete pumps:

a) The operation, maintenance and signalling of concrete pumps shall be done by trained and authorized personnel having minimum 18 years of age.

b) Place of work shall be so selected that the visibility of batching plant operator/transit mixer driver, concrete pump operator, signal man/supervisor and hose man (at the pouring point) is ensured all at a time. In case such visibility between all the above people cannot be ensured, then at least the pump operator shall be able to see the batching plant operator and signal man separately. The pump operator shall play most important role in pouring and he shall be properly trained by the safety officer/site Engineer of the contractor to understand the signalling process properly in order to ensure smooth concreting activity at site.

c) When the concrete is being placed in the hopper of the pump (either from batching plant chute or transit mixer chute), no person shall climb on the hopper of the pump.

d) The danger zones (within working area) like hose end position, beneath the placing boom, moving parts of the concrete pump and its hopper, its support legs and the area of the concrete pipe line, etc. shall be identified by the safety officer/ mechanical engineer in advance. Accordingly these areas shall be cordoned and restricted movement shall be ensured as practicable as possible.

e) The concrete pipeline (delivery system) for stationary pumps shall be checked by the mechanical engineer before he seeks work permit for concreting activity, for proper clamping of the pipe joints, supports for pipe line, etc. The pipe line shall have minimum number of bends and shall be straight as far as possible. In case pipe line needs to change the direction, then there shall be at least 5 m straight portion just after the concrete pump. The bends in the pipe line shall be as smooth as possible.

f) Inspection interval shall be decided based on manufacturer's guide line, age of the concrete pump, quantity of the operating hours and output of concrete.
g) Personal protective equipments like helmet, safety shoes, ear defenders (ear muff/ ear plug), protective gloves and goggles, face mask/respiratory protector, etc. shall be arranged by the contractor for all the workers working on concrete pump.
h) Concrete pump shall have suitable pressure relief valve, set at a predetermined pressure level, in order to ensure safety of the workers as well as the pump.

5.4.7.7 Tools:

5.4.7.7.1 Pneumatic Tools:

The hose of the compressed air shall not be directed towards a person's body. Compressed air shall not be used for cleaning of dust on the clothes of the workers. The compressed air line shall not be bent to stop the flow of air. This may cause building of pressure resulting in bursting of pipe and injury to the person. The operator shall use earmuffs on regular basis. The person cleaning certain area with compressed air shall be given safety goggles, dust respirators and ear plugs. Other workers shall not be present in the area which is being cleaned.

5.4.7.7.2 Abrasive Tools:

All machines, hand tools, etc. shall be test driven and necessary earthing shall be checked before actual use. All moving parts of mills, mixers and disintegrators shall have secure guards to avoid injury to workers. Contractor shall provide protective equipment to workers involving in crushing, grinding or pulverizing operations and all the machines shall be covered overall with hard material to keep them clean.

a) **Drills:** All the pneumatic drills shall be equipped with the additional lateral handles to avoid accidents wherein the back twisting torque exceeds 15 Nm. Compressed air hoses shall be suitably covered or hung from the ceiling.
b) **Saws:** The contractor shall ensure that all the built-in safety devices of the pneumatic saws such as adjustable riving knife, guard hood, replaceable blade aperture insert, push stick and start/stop switch shall not be tampered by the workers during operations. The contractor shall provide standard PPEs such as ear plugs or earmuffs as the noise level during operations of saws may exceed 90 dBA.
c) **Grinding machines:** The contractor shall use correct type of wheel depending on type of material to be ground such as separate wheel for concrete and steel surfaces, etc. The expiry date written on the wheel shall be referred before use. The RPM of the wheel shall match with that of the grinding machine. The wheel may get chipped or cracked in transportation or in storage. In order to check this defect, the wheel shall be held loosely on a finger through the arbor hole and tapped lightly with a wooden hammer. The grinding machine shall have proper earthing, guards, etc. and the operator shall use all necessary PPEs like hand gloves, goggles, ear plugs, dust respirators, etc.
d) **Pneumatic Tools Safety:** The contractor shall check all the rotating tools with the Tachometer for proper operating speed before accessories are attached. The

contractor shall operate all the grinding wheels under or inside the guards (except cone shaped wheels and small mounted points). The diameter of the wheel arbors shall match that of the grinding wheels. The wheel washer (blotter) and collar shall grip the wheel firmly and the two shall never be of different diameters. The nut which holds the wheel on the arbor and the washer (blotter) against the wheel shall be of ample size and strength. The contractor shall follow the manufacturer's charts about the applications and speed of the various types of the grinding wheels.

e) Hand Tools:

i) Impact Tools: The contractor shall use precision grip for the most commonly used impact tool, hammer for light work. For safe operations, the hammer shall have a straight cylindrical handle of 24 to 40 mm calibre with a maximum length of 600 mm and maximum head weight of 6.5 to 7.5 kg. Hammers shall be maintained such that cracked or weak handles are replaced and heads are in good condition and firmly secured to an undamaged handle.

ii) Cutting Tools: The contractor shall ensure that various cutting tools like axes, chisels and shovels, etc. are made up of material with adequate strength. The contractor shall ensure that wooden handles are to be moist before use during summer. Proper PPEs like hand gloves, ear plugs, goggles, dust respirators, etc. shall be provided to the worker as per the need of the work.

5.4.8 Structural Steel Fabrication:

5.4.8.1 Welding and Gas Cutting: Welding and gas cutting operations shall be done only by qualified and authorized persons and as per IS: 818-1968 (Reaffirmed in 2008). No hot job shall be done without approved work permit.

a) Welding and gas cutting shall not be carried out in places where flammable/any materials such as combustible/flammable chemicals, dyes, hessian cloth, wooden pieces, cylinders, etc. are kept within 10 m from the spot of fabrication or gas cutting.

b) Gas cylinders:

i) General precautions:

- Cylinders together with their valves and other fittings and identification colours shall be maintained in good condition.
- No lubricant shall be used in any fittings of the cylinders.
- No cylinder shall be subjected to any heat treatment or exposed to a high temperature or to the sun or stored with flammable or explosive material.
- Every cylinder containing compressed gas shall have its valve securely closed so as to prevent leakage. Valves fitted to the cylinders containing LPG and highly toxic gases shall be provided with security nut on the outlet to act as a secondary means of safeguard against leakage of gas.

- If the leak in the valve cannot be rectified by tightening the gland-nut or the spindle, the cylinder shall be removed to an open space where it is least dangerous to life and property and the Filler shall be informed.

ii) Handling and use:

- Cylinders shall be adequately supported during handling.
- Trolleys and cradles of adequate strength shall, as far as possible, be used when moving the cylinders.
- The cylinders shall be handled carefully and not be allowed to fall on one another or subjected to any undue shock.
- Sliding, dropping or playing with cylinders is prohibited.
- LPG cylinders and cylinders containing liquefied gas shall always be kept in upright position and be so placed that they cannot be knocked over.
- Cylinders used in horizontal position shall be so secured that they do not roll.
- Open flames, lights, lighting of fires, welding and smoking shall be prohibited in close proximity of any cylinder containing flammable gases except those in use for welding, cutting or heating.

iii) Storage of cylinders:

- Cylinders shall be stored in cool, dry, well ventilated place under cover, away from boilers, open flames, steam pipes or any potential sources of heat and such place shall be easily accessible.
- The storage room or shed shall be of fire-resistant construction.
- Thin-walled cylinders such as LPG and cylinders of dissolved gas shall not be stacked in horizontal position.
- Cylinders containing flammable and toxic gases shall be kept separated from each other and from cylinders containing other types of gases by an adequate distance or by suitable partition wall.
- Cylinders shall not be stored under conditions that will cause them to corrode.
- Cylinders shall not be stored with any combustible materials.
- Empty cylinders shall be segregated from filled ones and care shall be taken that the valves are tightly shut.
- Specificity of gas cylinders: Gas cylinders designed and approved for filling a particular gas should not be used for filling with any other gas without specific approval from the Chief Controller of Explosives.

iv) Transport of cylinders:

- Cylinders filled with any compressed gas shall not be transported by bicycle or any other two-wheeled mechanically propelled vehicle.
- Cylinders shall be so transported as not to project in the horizontal plane beyond the sides or ends of the vehicle by which they are transported.
- Cylinders shall be adequately secured to prevent their falling off the vehicle and being subjected to rough handling, excessive shocks or local stresses.

v) Restrictions on transport of cylinders:

- Cylinders containing flammable gases shall not be transported along with cylinders containing any other type of compressed gas.
- Cylinders containing toxic or corrosive gases shall not be transported along with food-stuff.

vi) Loading and unloading of cylinders for transport: No lifting magnet shall be used in loading or unloading of cylinders filled with compressed gas. When any such operation is carried out by means of a crane or fork lift truck, a proper cradle with chains or wire rope slings shall be used.

vii) Protection of valves: The valves of compressed gas cylinders should be protected against damage during transport.

viii) Notice of accident: Notice of an accident involving compressed gas cylinder should be given to the Chief Controller of Explosives, by an express telegram, followed by a letter within 24 hours giving particulars of the occurrence and to the Officer-in-Charge of the nearest Police Station.

ix) Condemning of Cylinders: Any cylinder which does not pass the periodical test or loses over 5% of its tare weight or found to be defective should be destroyed.

c) Barrier screens shall be erected to protect other persons from harmful rays and sparks from the work. When welding or gas cutting is carried out in elevated positions, precautions like providing metal sheet, etc. shall be taken to prevent sparks or hot molten metal falling on persons or flammable materials below.

d) Adequate ventilation shall be provided for easy dispersion of gas while welding, brazing and cutting in confined space.

e) Suitable type of protective clothing consisting of fire resistant gauntlet gloves, boots and aprons shall be provided to workers to protect from heat and hot molten metal splashes. Welding shields with filter glasses of appropriate shade shall be worn as face protection against UV & IR rays.

f) Welding and gas cutting shall not be carried out by standing on drums, barrels, tanks or other containers.

g) Appropriate type fire extinguisher and fire bucket shall be available near the location of welding operations.

h) Contractor's safety officer shall ensure at least half an hour fire watch after the hot work is over.

5.4.8.2 Electric Arc Welding: For Electric Arc welding the following additional safety precautions shall be taken:

i) All power connections shall be routed through ELCB of proper rating and machine connections shall be through MCB. Double earthing shall be provided to the welding machine. A provision of a separate return path shall be ensured.

ii) The cable to be used shall be of adequate capacity corresponding to output of the welding transformer / generator and shall be routed through dry isolated path. Welding cable terminals shall be provided with lugs and connected properly.

Proper insulation of cable with insulation tape of approved quality shall be ensured and only double insulated cable shall be used. Extension of welding cables shall be done using standard connectors.

iii) Pipe lines carrying flammables shall not be used as part of earth conductor, but a separate earth conductor shall be connected to the machine directly from the job. Painting and Dye Penetration testing shall not be done near electric arc welding.

iv) Personal contact with the electrode or other live parts of electric welding equipment shall be avoided. Wires and cables shall not be hung from any metal hook.

v) Accidental contact of electrodes with ground shall be prevented.

vi) The welding cables shall not be allowed to get entangled with power cables. It shall be ensured that the cables are not damaged by movement of materials. Dragging and coiling of cable shall be avoided.

vii) For Dye Penetration test, necessary care shall be taken so that there is no hot job going on nearby. Place of the test shall be well ventilated.

5.4.8.3 Grinding:

i) All portable grinders shall be used only with their wheel guards in position to reduce the danger from flying fragments should the wheel break during the use.

ii) Grinding wheels of specified diameter only shall be used on a grinder portable or pedestal in order not to exceed the prescribed peripheral speed.

iii) Goggles shall be worn during grinding operation.

iv) All safety procedures as mentioned in 5.4.7.7.2 shall also be followed for grinding activity.

v) Safety provisions for grinding activity as per IS:1991-1987(Part 1-10) (Reaffirmed in 2002) shall be followed.

5.4.8.4 Erection: Only trained operators and workers shall be engaged for the erection of structural fabricated members. For erection by mechanical means, the safety procedures as mentioned in 5.4.7.2 and 5.4.7.3 shall be followed in addition to the following guidelines:

a) The heavy materials shall not be manually handled. They shall be handled and shifted by mechanical means like crane, hydra, trolley, etc. of adequate capacity.

b) All mechanical transport devices and erection equipment shall be operated with the assistance of a helper / supervisor exclusively for proper signalling.

c) While erecting fabricated members, suitable guy rope arrangement shall be made to avoid sudden toppling of derrick.

d) Chain pulley block, D-shackles and wire ropes (lifting appliances) shall be of rated capacity at least 2.0 times more than the maximum desired load to be lifted. Hooks, jigs and fixtures used shall be marked with their capacities.

e) Two or more slings shall be used for lifting the loads and they shall be tied as per the centre of gravity of the load to be lifted.

5.4.9 Electrical Safety: Guide lines for providing temporary power supply at the site and general safety procedures for using electricity are given as under. Following safety requirements shall be complied with before the Contractor uses the power supply.

The Contractor shall submit a list of licensed electrical staff to be posted at site. It shall be the responsibility of the Contractor to provide and maintain complete installation on the load side of the supply point with regard to the safety requirements at site. All cabling and installation shall comply with the appropriate statutory requirements given below and shall be subject to approval of the Departmental Engineer-in-charge/ Electrical Engineer.

a) The Electricity Act, 1910 (as amended in 2003)
b) Electricity (Supply) Act, 1948
c) Indian Electricity Rules, 1956 (as amended in 2005)
d) National Electric Code 1985 (as amended in 2005)
e) Other relevant rules of Local Bodies and Electricity Boards

5.4.9.1 After installation of the electrical power wiring works by the contractor, form of completion certificate as per IS: 732 – 1989 (Reaffirmed in 2005) **(Form SGCW – 1 – Annexure 11)** shall be submitted by the contractor duly signed by the authorized valid licensed electrical contractor and /or supervisor along with one copy of the contractor's license and/or competency certificate of supervisor issued by the Electricity Board/Government Electricity Organisations as per the enclosure. The power supply shall be regulated as per the terms and conditions of the supply of the respective electricity boards.

(a) For purposes of electrical load and power planning by the electrical section, the contractor shall furnish along with the tender, the estimated load requirement of electric power for the execution of the contract works in terms of maximum Kilo Watt or KVA demand during various periods/months of the contract period along with the details of the construction electrical equipment/machinery with their individual load details and location/locations of power supply required for availing temporary electric power supply in the standard proforma enclosed **(Form SGCW- 2 – Annexure 12).**

(b) The electric power supply will be generally made available at one point in the works site of the contractor by the department.

(c) Where distribution boards are located at different places the Contractor shall submit schematic drawing indicating all details like size of wires, overhead or cable feeders, earthing, etc. The position and location of all equipment and switches shall be given.

(d) The Contractor shall make his own arrangements for main earth electrode and tapping thereof. The existing earth points available at site can be used at the discretion of the Departmental Electrical Engineer with prior permission. Method of earthing, installation and earth testing results shall conform to relevant IS Specifications [IS: 3043 – 1987 (Reaffirmed in 2001)]. All three phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.

(e) All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.

(f) The Contractor shall not connect any additional load without prior permission of Departmental Electrical Engineer. For obtaining additional power required, test reports of the tests mentioned in (d) of Form SGCW - 1 **(Refer Annexure – 11)** shall be submitted.

(g) Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However tappings from an earth bus may be done.

(h) The entire installation shall be subjected to the following tests before energizing of installation including portable equipment:

i) Insulation resistance test
ii) Polarity test of switches
iii) Earth continuity test
iv) Earth electrode resistance.

The test procedures and their results shall conform to relevant IS specifications. The Contractor shall submit a test report for his complete installation every 2 months and also every time after rectifying any faulty section. One such test report for the complete installation shall be submitted before onset of monsoon.

The following are provided for general guidance of the Contractor and shall be read as specific requirement, in addition to complying with Indian Electricity Act, Indian Electricity Rules and IS Specifications.

5.4.9.2 Installation:

a) Only persons having valid wireman's license/competency certificate shall be employed for carrying out electrical work and repair of electrical equipment, installation and maintenance at site. The job shall be supervised by a qualified licensed supervisor.

b) Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like short circuits, overheating, etc. Installation shall not cause any hindrance to movement of men and materials.

c) Materials for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards.

d) The minimum clearance to be maintained for all overhead lines along roads and across roads shall be 6.10m (minimum) as per the Rules 77-80 of Indian Electricity Rules, 1956 (Amended in 2005).

e) Grounding conductor of wiring system shall be of copper or other corrosion resistant material. An extra grounding connection shall be made in appliances/equipment where chance of electric shock is high.

f) Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses shall be used in all circuits. As Earth Leakage Circuit Breaker shall be provided for all 3 Phase supply irrespective of kilo watt rating and for all single phase supply equal to or exceeding 5 Kilo Watt rating.

g) Wires and cables shall be adequately supported and an approved method of fixing shall be adopted. Loose hanging of wires & cables shall be avoided. Lighting and power circuits shall be kept distinct and separate.

h) Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing, etc.

i) All cables and wires shall be adequately protected against mechanical damages. In case the cable is required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC) tile or any other approved means.

j) All armoured cables shall be properly terminated by using suitable cable glands. Multi-stranded conductor cables shall be connected by using cable lugs/ sockets. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections shall not be allowed.

k) All cable glands, armouring and sheathing of electric cables, metal circuits and their fittings, metallic fittings and other non-current carrying parts of electrical equipment and apparatus shall be effectively grounded.

l) All the Distribution Boards, Switch Fuse units, Bus bar chambers, ducts, cubicles etc. shall have Mild Steel enclosures and shall be dust, vermin and water proof. The Distribution Boards switches etc. shall be so fixed that they shall be easily accessible. Changes shall be done only after the approval of the Departmental Electrical Engineer.

m) The Contractor shall provide proper enclosures/covers of approved size and shape for protection of the entire switch board, equipment etc. against rain. Exposed live parts of all electrical circuits and equipment shall be enclosed permanently. Crane trolley wires and other conductors which cannot be completely insulated shall be placed such that they are inaccessible under normal working conditions.

n) Iron clad industrial type plug outlets are preferred for additional safety.

o) Open type Distribution Boards (DBs) shall be placed only in dry and ventilated rooms; they shall not be placed in the vicinity of storage batteries or otherwise exposed to chemical fumes.

p) Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply when repair or maintenance work has to be done on them.

q) In front of distribution boards (DBs) a clear space of 1.0 m shall be maintained in order to have easy access during an emergency. Pathway to DBs shall be maintained free from any obstacles. If there are any attachment/base connection at the back side of the switch board, the space, if any behind the switch board shall be either less than 20cm or more than 75cm in width, measured form the farthest outstanding part of any attachment or conductor. If the space behind the switch board exceeds 75cm in width, there shall be a passage way from either end of switch board clear to a height of 180 cm.

r) As far as possible electrical switches shall be excluded from a place where there is danger of explosion. All electrical equipment such as motors, switches and lighting fittings installed in work room where there is possibility of explosion hazard shall be explosion proof.

s) All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulated, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, switches shall not be mounted on wooden boards. Only sheet steel mounting or iron frame work shall be used.

t) All the lighting fixtures and lamp holders shall be of good quality and in good condition. Badly repaired or broken holders, etc. shall not be used.

u) Only PVC insulated and PVC sheathed wires or armoured PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weather proof rubber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.

v) Lamps used for illumination and testing purpose shall have cover or guard to protect them from accidental breakages. Only 24 Volt supply system shall be used for hand lamps etc, while working inside metallic tanks or conducting vessels.

w) After installation of new electric system and or other extensive alterations to existing installations, thorough inspection shall be made by Departmental Electrical Engineer before the new system or new extension is put in use.

5.4.9.3 Operation & Maintenance:

a) All persons who work with electrical installation/equipment shall be aware of the electrical hazards, use of protective devices and safe operational procedures. At least two persons in a shift shall be given training in fire fighting, first aid and artificial resuscitation techniques. Fist Aid treatment of electrical shock shall be displayed at Fist Aid Centre.

b) The supervisor shall instruct the workers for the proper procedure, specify and enforce the use of necessary protective equipment such as adequately insulated pliers, screw drivers, fuse pullers, testing lamps and similar hand tools. Only wooden ladders shall be used to reach the heights in electrical work.

c) No material or earth work shall be allowed to be dumped below or in the vicinity of the bare overhead line conductors. Minimum clearance of 6.10m shall be maintained.

d) Separate work permits shall be issued in accordance with IS: 5216-1982 (Reaffirmed in 2010) working on the same system which shall be returned after the completion of the work to Safety Officer and no system shall be restored without the clearance of Safety Officer.

Before any maintenance work is commenced on electrical installations/equipment, the circuits shall be de-energized and ascertained to be

dead by positive test with an approved voltage testing device. Prior to attempting repairs on the equipment Switch off, Isolate, Discharge and Earth (SIDE) Rule should be strictly followed. Switches shall be tagged or the fuse holders withdrawn before starting the work. During electrical works, minimum two persons shall be available. Adequate precautions shall be taken in two important aspects viz.

(i) That there shall be no danger from any adjacent live parts and

(ii) That there shall be no chances of re-energizing of the equipments on which the persons are working.

f) While working on or near a circuit, whenever possible the use of one hand may be practiced even though the circuit is supposed to be dead. The other hand may preferably be kept in pocket.

g) When it is necessary to touch electrical equipment (for example when checking for overload of motors) back of the hand may be used. Thus, if accidental shock were to cause muscular contractions, one would not 'freeze' to the conductor.

h) Operation of electrical equipment shall be avoided when standing on wet floor or when hands are wet.

i) Before blown fuses are replaced, the circuit shall be locked out and an investigation shall be made for the cause of the short circuit or overload.

j) When two persons are working within reach of each other, they shall never work on different phases of the supply.

k) When structural repairs, modification or painting works are to be undertaken, appropriate measures shall be taken for the protection of persons whose work may bring them into the proximity of live equipment/circuit.

l) It shall be ensured that the insulation and wire size of extension cords are adequate for the voltage and current rating.

m) While tapping electricity from the socket, plug top must be used. It shall be ensured that no extension boards are over loaded while tapping. Only standard three pin plugs shall be used for tapping electricity. Broken sockets/plugs shall be replaced immediately with good ones. Only joint free cables shall be used for connecting equipment/apparatus.

n) Floors shall be kept free from trailing electrical cables to avoid tripping hazard.

o) Power supply to all the machines and lighting fixtures shall be switched off when not in use.

p) Temporary electrical connections shall be removed as soon as the stipulated work is over. After completion of the works, the contractor shall dismantle the distribution boards and the other facilities he may have erected.

q) Unauthorized tapping of power by others from distribution boards under the control of the contractor shall be prohibited at all circumstances.

r) Safety work permits shall be used for switching off the main feeder and equipment by the contractor.

s) "MEN ON LINE", "DO NOT SWITCH ON", "DANGER" or "CAUTION" boards as applicable shall be used during maintenance works on the electrical equipment.

t) Power tapping of electrical equipment shall as near as possible of the equipment.

u) During maintenance at height, proper access by ladder shall be adopted.

5.4.9.4 Portable Electrical Equipment:

a) Portable electrical equipment shall be regularly examined, tested and maintained to ensure that the equipment and its leads are in good order. Register shall be maintained for inspection recording the testing dates and results of the equipments. The insulation and winding resistance of the portable electrical equipment shall be checked at least once in a month and report shall be submitted for all such machines. A typical format for testing portable and other electrically operated equipment is enclosed as **Annexure-15.**

b) All portable appliances shall be provided with three core cables and three pin plugs. The third pin of the plug shall invariably be earthed. It shall be ensured that the metal part of the equipment shall be effectively earthed.

c) All connections to portable equipment or machines from the panel/distribution board/extension board shall be taken using 3 core double insulated PVC flexible copper wire in one length. No joints shall be allowed in this flexible wire. In case, single length of wire is not sufficient for a particular location then the supply can be tapped by providing another extension board comprising of switch and socket. Isolation switch shall be made available as close as possible to the equipment.

d) Flexible cables for portable lamps, tools, and apparatus shall be regularly examined, tested periodically and maintained to ensure safety and protected against mechanical damages.

5.4.10 Fire Safety: The contractor shall take all necessary precautions to prevent outbreak of fires at the construction site. Adequate provisions shall be made to extinguish fires should they still break out.

(a) Quantities of combustible materials like timber, bamboos, coal, paints, etc. shall be the minimum required in order to avoid unnecessary accumulation of combustibles at site.

(b) Containers of paints, thinners and allied materials shall be stored in a separate room which shall be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using.

(c) Fire extinguishers suitable for the different classes of fire such as Class A, B, C & D as per IS: 2190-1992 (Reaffirmed in 2010) shall be made available at the appropriate places in the construction site. The date of last maintenance of fire extinguisher shall be displayed properly on the same by using maintenance tag. The fire extinguishers shall be sent for maintenance/refilling at least once in 6 months or whenever exhausted. The safety officer shall inspect the condition of the plunger, safety pin, switch grip, hose tube, etc. at least once in a month and

report shall be submitted to the departmental representative as per the format enclosed as **Annexure 14**.

(d) Adequate number of contractor's workmen and supervisors shall be given training in fire fighting and extinguishing methods.

(e) The safety officer of the contractor shall plan for site evacuation in fire emergency in order to facilitate to easy and safe exits for entire site work force and supervisory staff. He shall identify and train the designated staff or supervisor for specific role in site evacuation plan.

(f) The telephone number of the nearest fire station shall be displayed at suitable locations (near telephone, main entrance of the site, first aid centre, stores, etc.) in bold distinct font.

5.4.11 Housekeeping:

5.4.11.1 The Contractor shall promote and upkeep the practice of good housekeeping throughout the contact period in order to create a safe and hygienic working environment at site. The contractor shall maintain a separate housekeeping team of workers and supervisors who shall maintain the hygienic conditions at site. He shall at all times, keep his work spot, site office, labour toilets and surroundings and roads clean and tidy from rubbish, scrap, surplus materials and unwanted materials, tools and equipment. The contractor shall follow the recommendation of IS: 4082-1996 (Reaffirmed in 2003) for stacking and storage of construction materials and components at site.

5.4.11.2 Welding and other electrical cables shall be so routed as to allow safe traffic by all concerned. Electrical cables shall not trail on the ground and they shall be raised above ground with the help of posts, etc.

5.4.11.3 The plan of temporary structures shall be such that they do not hamper easy movement of worker and vehicles. No materials on any of the sites of work shall be so stacked or placed as to cause inconvenience to any person or the public. The Engineer-in charge may require the contractor to remove any materials which are considered to be of danger or cause inconvenience to the public. If necessary, the Engineer-in-charge may cause them to be removed at the contractor's cost.

5.4.11.4 After the completion of the work, the contractor shall have removed from the work premises all scaffoldings, surplus materials, scrap, rubbish and all temporary structures, huts and sanitary arrangements used/installed for his workmen at site. The contractor shall stack all undesirable materials and debris to the designated area at his own cost, as directed by Engineer-in-charge.

5.4.11.5 The Engineer-in-charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

5.4.11.6 The contractor shall instruct workmen to keep all accesses clear from any obstruction and unwanted material for free and safe movement of the workers and staffs including departmental staffs. He shall provide tool box and safe means for carrying tools (for working at height) to all his workers so that tools and tackles are kept in proper place.

The working area shall be free from wastes like nails, binding wires, nuts & bolts, used plastics, etc. so that they do not cause injury to others.

5.4.12. Safe access to workplace:

5.4.12.1 Adequate and safe means of access and exit shall be provided for all work places, at all elevations. Ladders shall be always used for approaching high elevations.

5.4.12.2 Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Safety procedures for ladder shall be as per 5.4.6.3 above.

5.4.12.3 Safety procedures for Scaffolding and working platform shall be as per 5.4.6 above.

5.4.12.4 All access to the work place shall be well guarded viz. stairs, ramps, etc. and shall be well illuminated as per the requirement of clause 15.8 (Illumination Guidelines) of SP: 70-2001. The access shall not have any water logging; they shall be levelled and dry so that people do not slip. Sign boards, written in language understood by majority of the workers, and exit signs shall be displayed at suitable location for easy identification. The steps of the stair shall be periodically cleaned for any accumulation of debris, dust, etc.

5.4.13 Common Hazards:

5.4.13.1 Barricading and Sign Boards: All work areas around excavated pits, trenches, openings, scaffolding, vehicle movement areas, etc. shall be well cordoned / barricaded with the help of railing, safety tapes (photo luminescent), etc. Photo luminescent sign boards and warnings shall be displayed at required locations and they shall be clearly visible from a distance even at low or no illumination.

5.4.13.2 Noise: Suitable ear protection (ear muff) shall be provided to the workers, who are exposed to high noise levels (85dBA and above), e.g. concrete pump operator, vibrator operator, batching plant operator, air compressor operator, grinding machine operator, breaking rocks with pavement breaker, cutting of marble/granite, etc. The exposure duration in case of these workers shall be restricted to the stipulation of Table-1 of Schedule-XI, Rule-88 of AEFR, 1996. Other workers and staff who are in the close vicinity of high noise level such as unskilled worker engaged in concreting works, etc. shall be provided with ear plugs.

5.4.13.3 Area Illumination: Adequate lighting facilities such as flood lights, halogen lamps, hand lights and area lighting shall be provided by the contractor at the site of work, storage area of materials and equipment and temporary access roads within his working area. The area illumination shall be such that it promotes work and safety for all workers at site and creates a pleasing environment at work site. The contractor shall obtain written approval of the Engineer-in-charge to the lighting scheme and place of tapping prior to its installation. The intensity of illumination shall depend on the nature of work and the same shall be planned by the contractor in advance based on the recommendations of Hand Book on Functional Requirements of Industrial Buildings

(Lighting & Ventilation: SP32-1986). However, a minimum illumination as per the task performed shall be maintained at site; which can be augmented based on nature of work from time to time.

5.4.13.4 Dust and fumes: Confined areas like basement, bunkers, etc. shall be under forced ventilation (using blowers) for at least 3-7 air changes per hour depending on presence of dust and fumes generated from grinding, gas cutting, welding, etc. Adequate measure like dust extractor/arresters shall be available for use to prevent spread of dust to nearby areas during open area operations. Workers shall be rested for sufficient time after every one hour of continuous working in dust. The same worker shall not be engaged for grinding for many days continuously and they shall be engaged/kept on job rotation. All necessary PPEs like dust respirators, safety goggles, hand gloves, ear plugs, protective clothes, etc. shall be provided. Any illness due to continuous work in dust or fume shall be immediately reported to the First Aid Centre.

5.5 Personal Protective Equipment:

All necessary personal protective equipment (PPE) shall be provided by the contractor at his own cost, for his workers, supervisors, staffs and visitor/visiting staffs. All PPEs shall conform to relevant IS code / ASTM / BS or any other international code of practice as given under. The contractor shall make available all type of personal protective equipment for use of workers, supervisors and visitors at site as considered necessary by the Engineer-in-charge and they shall be maintained in a condition suitable for immediate use. Also the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

Safety Helmet:	IS: 2925-1984 (Reaffirmed 2000)
Safety Goggles:	IS: 5983-1980 (Reaffirmed 2002) or EN 166:2001
Full body harness safety belt:	IS: 3521-1999
Ear Muff / Ear Plug:	IS: 6996-1973 (Reaffirmed 1998) or EN 352-1:2002 and EN 352-2:2002 or
Face shield:	IS: 8521 (Part II) – 1977 (Reaffirmed 2002) IS: 8521 (Part I) –1994 (Reaffirmed 2002) or EN 175F
Fall arrestor:	EN 353-2:2002
Respirators:	IS: 15321 – 2003, IS: 15322 – 2003
Safety shoes:	IS: 15298 – 2002
Hand gloves:	IS: 4770 – 1991 (Reaffirmed 2001)

(a) All persons employed or supervising at and / or visiting the construction site shall use safety helmets. The colour coding of helmets may be adopted by the contractor as per site requirement. The contractor shall provide safety shoes for all his workers, supervisors, staffs and visitor/visiting staffs.

(b) Workers employed on mixing asphaltic materials, concrete, cement and mortars shall use PPEs such as protective goggles, protective foot wears, respirators and hand gloves, etc.

(c) Persons engaged in welding and gas cutting works shall use appropriate welding face shields, leather hand gloves and protective clothes. The persons who assist the welders shall use appropriate goggles.
(d) Workers breaking rock, grinding and chipping shall use protective goggles, dust respirators, ear muffs/ear plugs, etc. In addition, leather hand gloves shall be used where there is no possibility of entanglement with rotating parts. During work, other workers should maintain the safe distance.
(e) Persons working at height above ground level or floor and exposed to risk of falling down shall use full harness safety belts, kinetic shock absorbers, fall arrestor, life lines, and grab ropes. The working platform and access shall be protected by cages, guard railings, etc. The area beneath shall be protected by safety net of adequate strength (as per IS: 11057 – 1984) fastened to substantial supports.
(f) Wherever two-wheelers are allowed, motorcycle and scooter drivers and their pillion riders shall wear crash helmets inside the Project/Plant sites. Safety helmets shall not be replaced with crash helmets and vice-versa.
(g) When workers are employed in sewers, septic tanks and inside man-holes which are in use, the contractor shall ensure that the manholes are opened and are adequately ventilated. After it has been well-ventilated, the atmosphere inside the space shall be checked for the presence of any explosive mixture, toxic gas or oxygen deficiency. The workers shall be allowed to get into the man-holes under safe working environment only. The man-holes opened shall be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There shall be proper illumination in the night. All safety measures for working in confined space as given in the Factory Act shall be ensured. In case of forced ventilation, battery backup for ventilation and measures to rescue workers shall be ensured.

5.6 General Health Management at site:

The contractor shall arrange adequate facilities for medical aid and treatment for his staff and workers engaged on the work site and visiting staffs including the first-aid facilities at the project site.

5.6.1 General:

5.6.1.1 **General medical examination**: The contractor shall follow the guidelines of Rule 81 (iv), Schedule VII of BOCW Central Rules, 1998 for periodicity of medical examination of building workers.
5.6.1.2 **High noise level**: The contractor shall arrange for audiometry examination for workers exposed to high noise level as per Chapter IX, Rule 88, Schedule XI, Sub-Rule 3 (f) (ii) of AEFR, 1996.
5.6.1.3 **High dust exposure**: The contractor shall arrange for medical examination for workers exposed to high dust level as per Chapter IX, Rule 88, Schedule IV, Sub-Rule 9 of AEFR, 1996.

5.6.1.4 **Eye sight examination for crane operators, etc**.: The contractor shall arrange for medical examination for crane operators and other vehicle operators like operators of material transportation/handling equipment, mechanical excavators, etc. as per Chapter IV, Rule 55 of AEFR, 1996.

5.6.2 First Aid Facility:

The contractor shall ensure medical and first aid facility at site as per Rule 223 to 232, Chapter XXIV, BOCW Central Rules, 1998 in order to facilitate immediate relief to the injured person before shifting him to the nearest departmental dispensary or public hospital. All the provisions of the above mentioned rules of BOCW Central Rules, 1998 viz. medical examination of building workers, duties of medical attendant, occupational health centre, ambulance room (first aid centre), ambulance van or safety vehicle, etc. shall be arranged by the contractor at site.

5.6.3 Full-time Medical Attendant:

First aid posts shall be established and be manned by a full-time trained medical attendant. The medical attendant shall have a degree of B.Sc in Nursing or equivalent and a minimum 5 years of working experience in any nursing home or general hospital. The contractor shall submit his/her certificates and credentials to the department in advance for approval before employing him/her at site. The duties of the medical attendant shall be as given below:

(a) First-aid care including emergency medical treatment
(b) Immunisation services
(c) Medical records upkeep and maintenance
(d) Health education including advisory services on family planning, personal hygiene, environmental sanitation and safety
(e) Referral services

5.6.4 First-Aid Box, Medicines and Medical Equipment:

a) First-aid box containing bandage, sterilized dressing, ruler bandage, triangular bandage, crape bandage, dry gauge, band aid, antiseptic such as savlon/dettol, cotton wool, plaster, scissors, antiseptic creams shall be arranged by the contractor, at a readily accessible place in work site. The quantities of the listed items shall conform to Schedule III of BOCW Central Rules, 1998 **(Refer Annexure-8)**. These shall be maintained in good order under the charge of Full-time Medical Attendant or the Safety Officer or a responsible person in absence of them.

b) The articles for ambulance room or first-aid post with effective communication system shall be arranged by the contractor as per Schedule IV of BOCW Central Rules, 1998. The list is enclosed as per **Annexure 9**. The size of the room shall be adequate for proper treatment of the injured persons and keeping the enlisted articles in an organized manner. The room shall be well ventilated and well illuminated, preferably by natural

means. The contractor shall keep a refrigerator of approx. 150 liters capacity for proper storage of injections and temperature sensitive medicines.

5.7 Hygiene at workplace:

The contractor shall ensure hygiene at work place as well as at the residing place for all his workers and staff. He shall submit the plan of labour colony and labour toilet in advance for approval of the Engineer- in -charge.

a) Labour Toilet and urinal: Latrines and urinals, as the case may be required to be provided, shall be as specified below:

a. Every latrine shall be under cover and so partitioned off as to secure privacy and shall have a proper door and fastenings.

b. i) Where both male and female building workers are employed, there shall be displayed outside each block of latrines or urinals a notice containing therein "For Men Only" or "For Women Only", as the case may be written in the language understood by the majority of such workers.
ii) Such notice also bear the figure of a man or of a woman, as the case may be.

c. Where females are employed, there shall be at least one WC for every 25 females. There shall be at least one WC for every 25 males. If the number of males exceeds 100, there shall be one latrine for every 25 males up to the first 100 males, and one for every 50 males thereafter. The W.C shall be cleaned at least once in a week and maintained properly by the contractor throughout the project duration. The privacy of the all workers shall be ensured by providing partitions of suitable heights. Proper disposal of excreta by septic tank and soak pit shall be made by the contractor. In no case, the excreta shall be disposed off in any open drain, nallah, etc. which may cause outbreak of disease or reduce the overall hygiene of the workplace. Urinals shall be provided for the use of male workers and there shall be at least one urinal for every 50 males and where the number of males employed exceeds 50, it shall be sufficient if there is one urinal for every 50 males up to the first 500 employed, and one for every 100 thereafter.

b) Drinking water: contractor shall provide adequate number of water taps, water purifiers and water coolers for the potable water supply for the staff and workers at his own cost. However, the water connection will be given by the department based on the contract condition.

c) The contractor shall apply pesticides and mosquito repellent at regular interval or whenever required, by fogging machine, etc., in the labour colony and at work site at his own cost.

6.0 MONITORING AND REPORTING:

The contractor shall monitor, measure and regularly evaluate compliance with applicable legal requirements. He shall recognize the importance of monitoring and reporting of

hazards associated with site activities. He shall instruct his safety officer and site engineers to monitor the unsafe conditions and unsafe acts regularly in order to record the observations so that remedial measures can be taken in time. The contractor shall not neglect or underestimate the near-misses occurred at site and shall establish a procedure to record all such near-misses since the lessons learnt from them can prevent recurrence of such incidents in future. The contractor shall report any accident occurred at site as per format of Injury Report for Contract/Casual Worker **(Refer Annexure 13)**. He shall make available all the legal documents and records (as mentioned in 6.2 below) related to safety for internal as well as external audits from time to time.

6.1 Walk-through survey: The Safety Officer and site engineers shall carry out a walk through survey every morning at site in order to monitor any unsafe conditions and unsafe acts. This measure reduces the hazards in site activities and creates a safe working environment at site. The safety officer and site engineers shall record any observation of unsafe condition / act in the observation register immediately and the corrective action to be taken along with the name of person responsible for the same. The safety officer shall make a review visit to the place of observation, during next day's walk through survey, to review whether the corrective actions are taken or not and shall inform his higher authorities / departmental staff in case the corrective measures are not taken. The standard format of Observation Register / Complaint Record is enclosed herewith as **Annexure 10.**

6.2 Records: The contractor shall maintain all safety and first aid / medical related records and registers in the safety office / first aid post at site and such records and reports shall be made available during audits and whenever required. These records and reports shall be updated by safety officer and / or medical attendant at site in consultation with their superiors and departmental staff from time to time. A typical list of records under good practices for compliance with legal requirements related to environment, occupational health and safety is given below:

- **i.** Safety Organization Chart
- **ii.** Training Records like initial safety induction training, pep-talk, etc.
- **iii.** Record of site safety inspection, walk through survey and observation register
- **iv.** Accident investigation report
- **v.** Record of Accidents, Near-misses / dangerous occurrences
- **vi.** Record of test and examination of equipment and structures (like scaffold check list, etc.) as per statutes/codes/standards
- **vii.** Safe Operating procedure for various site activities
- **viii.** Record of work permits
- **ix.** Record of monitoring flammable and explosive substances at work place
- **x.** Records of maintaining and testing of fire fighting equipment

xi. Medical records of workers and staffs (separate register shall be maintained for injury at work and for general ailments and medical check-up for height passes)
xii. Site emergency plans
xiii. Record of waste disposal
xiv. Housekeeping inspection record
xv. Minutes of Site Level Safety Committee meetings and monthly safety reports
xvi. Record of modification carried out in construction equipment
xvii. Calibration and testing record
xviii. Record of previous audits
xix. Records of applicable legal requirements **(Refer Annexure-I)**
xx. Tree plantation record, if any
xxi. Environment and hygiene management plan
xxii. General complaint register

6.3 Inspection and Safety Audit: The contractor shall arrange internal safety inspections by safety organisation, designated for the project, at least once in a month in order to monitor the status of implementation and adherence to the safety procedures. The project shall be subject to external audit by a team / committee headed by Chief Safety Officer, Engineering Services Group, BARC at least once in a year. However, the contractor shall be prepared for surprise inspections and audits by the department or any third party authorised by the department.

7.0 TRAINING AND AWARENESS BUILDING PROGRAMME:

The contractor shall train and build up a general awareness in safety among the workers and staffs as a continuous effort throughout the project duration. He shall develop and nurture a good safety culture among the staff and workers for an incident free completion of the project. The contractor shall arrange for celebration of National Safety Day / Week on 4th March every year and shall plan for conducting various safety events, competitions, etc. during this period. He shall identify good safety performers among different trades of workers and staff and shall reward them for their performance so as to motivate the others.

7.1 Safety Event Calendar:

The Safety Officer shall chalk out a safety event calendar for various safety events, training programmes, mock drills, demonstration, inspections and audit etc. and shall intimate the concerned people in advance. The contractor shall submit a copy of safety event calendar to the department at the onset of the project / in the month of January every year. This calendar shall be displayed at the site safety office / first-aid post and the contractor shall ensure that these events are conducted as per schedule.

7.2 Safety Induction Training:

The contractor shall ensure that each and every new worker attends initial safety induction training before reporting at respective place of work. The workers shall report to the safety officer first for receiving safety induction training and after successful completion of such training they shall report to respective site engineer. The safety officer shall intimate the workers about the probable hazards related to the work and shall explain and demonstrate the importance and use of PPEs to them. The medium of instructions shall be chosen depending on the language understood by the majority of the workers. He shall also explain to the workers the security restrictions to be followed inside BARC premises. The duration of such induction training depends on the type of worker and shall be decided by the Safety Officer in consultation with the department.

7.3 Pep talk, Tool-box training:

Subsequent to the initial safety induction training, the Safety Officer shall also conduct safety pep talks and tool box training for various teams of workers in regular interval at site. He may identify the groups in advance and finalise the topic of pep talk and schedule the pep talk accordingly so that it does not affect the working hours of the group. He shall arrange pep talks / tool box training on work related topics like use of various PPEs and tools, housekeeping, hot job, electrical works, etc. He shall solicit active participation of workers in such tool box training by asking them to share their experience with their fellow workers. Record of such pep talks and tool box training along with a list of people trained shall be kept at safety office and such records shall be submitted along with monthly safety report.

7.4 Signboards, Posters, Displays: The contractor shall display adequate numbers of signboards (written/painted in photo-luminescent paint) at various workplaces, movement area of mechanical equipment, diesel store, scaffoldings, first aid post, etc. in order to warn the workers and staff of probable hazards at work site. Such signboards shall be written in the language understood by majority of the workers. The contractor shall also arrange for display of posters as an awareness building programme. He shall have to maintain these signboards and posters in good condition throughout the contract period and shall have to replace them periodically. Some of the important topics for signboards are given as under for guidance; however, work specific sign boards can be designed and displayed at site.

a) Use of proper Personal Protective Equipment (PPE) viz. Safety helmet, safety shoes, safety belt, safety goggles, face shield, ear plug / ear muff, gloves, dust respirators, etc.
b) No Smoking specially near diesel room, stores or near combustible materials
c) Moving parts of equipment viz. fly wheels of piling rigs, motors of pumps, etc.
d) Hot job and fabrication works viz. welding, gas cutting, grinding, etc.

e) Unsafe Scaffolding (wherever the scaffold is in unsafe condition)
f) Open Excavation / Openings in floors (especially near excavated pit, trenches, lift well, stair well, etc.)
g) Electrical installations and high voltage equipment viz. welding transformers, meter panels, fuse distribution boards, etc.
h) Dismantling / demolition work in progress
i) High noise level area especially near concrete pumps, demolition areas, etc.
j) Fragile roofs (where sheeting and roofing work is going on)
k) Vehicle movement areas, access roads, etc.
l) Fire extinguisher (class wise)
m) Emergency exit

8.0 REFERENCES:

- AERB Safety Guide for Works Contract
- Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998
- Atomic Energy Factories Rules, 1996
- Job Hazard Analysis Report for Construction of Common Facility Building (CFB) Project, at North Site BARC
- Operation and Maintenance Manual of Mobile Tower Crane (MTC-3625 of M/s Action Construction Equipment Ltd.)
- Operation and Maintenance Manual of Batching Plant (CP30 of M/s Schwing Stetter)
- Operation and Maintenance Manual of Concrete Pump (M/s Putzmeister)
- SP32:1986 (Hand Book on Functional Requirements of Industrial Buildings - Lighting & Ventilation)
- SP53:1992 (Hand operated hand tools - Safety code for the use, care and protection)
- SP70:2001 (Handbook on Construction safety practices)
- IS: 732 – 1989 (Reaffirmed 2005) Code of Practice for Electrical Wiring Installations
- IS: 818-1968 (Reaffirmed 2008) Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations.
- IS: 1991 - 1987 (Part 1 to 10) (Reaffirmed 2002) Safety Requirements for the Use, Care and Protection of Abrasive Grinding Wheels
- IS:2190-1992 (Reaffirmed 2007) Selection, Installation and Maintenance of First-aid Fire Extinguishers - Code of Practice
- IS: 3043 – 1987 (Reaffirmed 2001) Code of Practice for Earthing
- IS:3696-1987 (Reaffirmed 2002) Safety Code for Scaffolds and Ladders (Part 1-Scaffolds)
- IS:3696-1991 (Reaffirmed 2002) Safety Code for Scaffolds and Ladders (Part 2-Ladders)
- IS: 4082-1996 (Reaffirmed 2003) Stacking and storage of construction materials and components at site
- IS:4379-1981(Reaffirmed 2007) Identification of the Contents of Industrial Gas Cylinders
- IS: 5216-1982 (Reaffirmed 2010) Recommendations on safety Procedure and Practices in Electrical work; Part – I: General; Part – II: Life Saving Technique
- IS: 10302 – 1982 (Reaffirmed 2005) Unified Nomenclature for Workmen for Civil Engineering
- IS: 11057 – 1984 Specification For Industrial Safety Nets

Annexure 1

FORMAT FOR LEGAL REGISTER

Sl. No.	Products, Processes or Services	Legislation on OHS	Date of Effect	Validity Date From to	Reference of Applicable Chapter/ Sec./ Rule	Person Responsible for Compliance Monitoring	Frequency of Reporting	Reference to procedures and Control	Record to be submitted to External agency

Annexure 2

FORMAT FOR JOB HAZARD ANALYSIS REPORT

Sl. No.	Activity / Sub-activity	Potential hazards	Causes	Precautions recommended

Annexure 3

FORMAT FOR WORK PERMIT

(To be filled in by contractor in quadruplicate)

Name of the work:
Name of the principal contractor:
W.P. No.: Date:
Work Permit valid from _____ on _____ to _____ on _____
(time) (date) (time) (date)
Name of the Site Engineer seeking work permit: _____
Name of the Site Safety Officer: _____
Name of site supervisor: _____
Work Permit sought for: *(Please tick in the box)*

	Piling		Excavation & backfilling		Formwork at G.L.
	Reinforcement work at yard		Hot Jobs		Mechanical handling/shifting/transportation
	Formwork/rebar work at height		Concreting		Structural Erection
	Electrical Installation		Maintenance/repair		Other works at height
	Finishing works		Grinding/chiseling		Demolition
	Miscellaneous works (please specify)				
	Working on fragile roof				

Work Description: _____
_____
Location: _____

I confirm that I have been given charge of the above mentioned work and I will take all necessary precautions to avoid danger to the workers engaged at the above site as well as property. I will abide by the recommendations of the Safety Officer and implement them and I will assign jobs to only trained personnel.

_____
(Name and Signature of Site Engineer)

---------- (To be filled in by Safety Officer before issuing work permit) ----------

Following safety precautions are taken care of:

Sl. No.	Safety Precautions	Yes	No	NA
1.	All concerned personnel are instructed about the nature of work			
2.	Access ladder/crawling ladder to work/roof provided & properly secured			
3.	Safety clearance/check list for scaffold erection obtained/submitted			
4.	All workers have valid height passes			
5.	Safety net provided under the work place			
6.	Life line/Grab rope is provided at height			
7.	Work area is properly cordoned/barricaded			
8.	Work area is properly illuminated			
9.	Proper access to site is ensured			
10.	Openings are properly covered with safety net/steel jalli & barricaded			
11.	Electrical equipments are de-energized (fuses removed)			
12.	Electrical equipments are checked for earthing			
13.	Portable electrical equipments are tested by site maintenance section			
14.	All rotating parts of machine are well guarded			
15.	Whether any inflammable is present in vicinity of the area of hot job			
16.	Fire extinguisher is available at the work site			
17.	Whether fire watch is required			
18.	Half-an-hour fire watch is complied after hot jobs			
19.	Whether cylinders are kept vertically, properly tied and are under shed			
20.	Work area is well ventilated			
21.	“NO SMOKING” board is displayed			
22.	Personal Protective Equipment (strike out whichever is not applicable) Helmet/Shoe/Hand Gloves/Goggles/Ear Muff/Ear Plugs/Safety Belt/Face Shield/Nose Mask/			
23.	Free escape route is available			
24.	Workers are in good health on the day of work			

I have checked the safety precautions taken at site and allowed the work to be carried out.
Special precautions (if any) _____

_____
(Name and Signature of Safety Officer)

Cc: 1. Safety Officer
2. Site Engineer
3. Site Supervisor
4. Departmental Representative

Annexure - 4

Part - A
Application for Height Pass

Project _____

Group/Section: _____ Contractor: _____

1. Applicant's Name : _____
2. Departmental Address: _____
3. Residential Address : _____
4. Age : _____
5. Sex : _____
6. Height : _____
7. Gate Pass No. : _____
8. Name of contractor/Agency with whom engaged at present : _____
9. Height pass requirement for work at _____ mtr. height.
10. Description of present job : _____
11. Previous experience of working at height: _____

Sl.No.	Name of the Employer	Duration of Employment	Work Experience
1.			
2.			

12. Is the applicant suffering from any of the following ailments (If yes details to be given):

Blood Pressure _____
Seizure disorder (Fits / Epilepsy Convulsion) _____
Flat Foot _____
d) Frequent attacks of headache or reeling sensation _____
e) Mental depression _____
f) Limping gait _____
Acrophobia (Fear of height) _____

Declaration:

I hereby declare that the above information furnished by me is true and correct. I shall always wear the safety belt and tie the life-line whenever working at unguarded heights of 3 mtrs and above. I shall not misuse the height pass issued to me or transfer it to any other person. I shall never come to duty or work at height/depth under the influence of alcohol/drugs.

Date: Name:

Sign:

(Applicants Name & Signature or Left Thumb Impression (LTI) in case he cannot sign. Incase of LTI; an authorized person shall explain each point/item to the individual and certify on his behalf below the LTI).

I certify that I am satisfied with the above certification of the individual for the application of Height Pass and request for issue of height pass to him.

Name:

Sign:

(Agency Concerned)

Part – B
MEDICAL FITNESS CERTIFICATE

Certified that I, Dr. _____ have examined Shri. _____ aged _____ on (date) _____ of M/s. _____ who has signed below in my presence. General & Physical examinations of Shri. _____ do not reveal any abnormality. He does not suffer from any acute/chronic skin disease or any contagious or infectious disease. His eyesight is normal with/without glasses. In my opinion, Shri _____ is physically and mentally fit for working at height.
Details of examinations:

1. Age: _____

2. General & Systemic Examination:

2.1	Pulse			2.10	Depth of Vision	Normal:	Abnormal:
2.2	B.P.			2.11	Nystagmus :	Present:	Absent:
2.3	Weight			2.12	Rhomberg Sign:	Positive:	Negative:
2.4	Height			2.13	Hearing:	Normal:	Abnormal:
2.5	Pallor	Yes:	No:	2.14	Muscular Co-ordination	Normal:	Abnormal:
2.6	Flat foot	Present:	Absent:	2.15	Cardio Vascular System	Normal:	Abnormal:
2.7	Gait	Normal:	Abnormal:	2.16	Respiratory System	Normal:	Abnormal:
2.8	Vision	Normal:	Abnormal:	2.17	Central Nervous System	Normal:	Abnormal:
2.9	Colour Vision	Normal:	Abnormal:				

3. Previous History of:

3.1	Seizure disorders (Epilepsy)	Yes	No
3.2	Frequent headache or reeling sensation	Yes	No
3.3	Mental depression	Yes	No
3.4	Acrophobia	Yes	No

4. Investigation:

4.1	Urine
	Albumin:
	Sugar:
4.2	Blood
	CBC:
	Random blood sugar (if age is >35 years.)

5. X-ray:
Required / not required : _____
If required – details of report : _____

(Signature of workman)

(Signature & Rubber stamp)
of Medical Practitioner with Reg. No.

Part – C
Height Pass Certificate

(Considering the above medical certificate; the applicant has appeared on the following practical tests conducted by BARC and the results are given below (strike off whichever in-applicable)

Affix photograph (3.5cm x 2.5cm) for contractor workers only

a) Walking freely over a horizontal structure bar at 1 ft. height : Pass / Fail

b) Wearing a safety belt and tying the rope knot : Pass / Fail

c) Walking over a horizontal structure at 10 ft. height wearing a belt. : Pass / Fail

The above applicant's performance in the above tests has been satisfactory/ unsatisfactory.

I certify issue of this height pass to Shri _____ of M/s. _____ with Registration No. _____ in the height pass register. This is valid for one year from the date of issue i.e. up to _____.

Date : Signature : _____
Name : _____
(Safety Supervisor)

Signature : _____
Name : _____
(Safety Officer)

Annexure - 5

FORMAT FOR SAFETY CHECK LIST FOR HEAVY DUTY TOWER / SCAFFOLDING ERECTION

(To be filled in by contractor in TRIPLICATE)

Name of the work:
Name of the principal contractor:
Ref. No.: Date:
Location / Block / Grid:

(Please tick in the box)

Sl. No.	Checklist points	Yes	No	Remarks
A.	Check the base of the scaffolding:			
1.	Is the ground below base plate levelled and firm?			
2.	Are the base plates/sole plates provided or are proper supports placed under the structure?			
3.	Is the base away from excavation, drain cover, manhole, etc.?			
4.	Is there any vehicle movement near structure?			
5.	Is the frame supported on any make-shift arrangements like barrels, boxes, concrete blocks, bricks, empty drums, etc.?			
B.	Check the structure:			
1.	Are all members in good condition (free from bends, cuts, rust, etc.)?			
2.	Whether all the vertical members in plumb and correctly spaced?			
3.	Whether the joints of frames/vertical members are properly connected with couplers & spring-lock pins/cuploks?			
4.	Are all vertical & horizontal bracings provided and are they properly tied with pins/swivel couplers?			
5.	Whether the scaffold structure is securely tied / restrained with permanent structure? (max. vertical height between ties is 4 times of the least base width)			
6.	Is there any electrical cable / wire within 5m above the top most part of the structure?			
C.	Check the working platform:			
1.	Is the working platform at least two boards wide?			
2.	Is there any gap in the working platform?			

3.	Whether the condition of the scaffold boards is good?			
4.	Whether the ends of the scaffold boards / jallis are securely tied at the ends?			
5.	Is the overlap of the boards at least 300 mm?			
6.	Whether the last scaffold board is extended at least 600 mm beyond the end of the wall?			
7.	Are the guard rail and knee rail provided at 1.00 m and 0.50 m height from the working platform?			
8.	Whether toe board of good condition and of min. 150 mm height is provided?			
9.	Whether the working platform is over loaded?			
10.	Whether safety net is provided below the working the platform?			
D.	Check the access:			
1.	Whether stair/monkey ladder/walkway are provided as access?			
2.	Whether the access is properly supported / tied / made?			
3.	Whether the steps / landing of the access have any slip resistance arrangement?			
4.	Whether the access steps / landings are free from any obstacle and undesirable & slippery materials?			
5.	Whether the entry / exit of the access is free from any obstruction			
E.	Housekeeping and maintenance:			
1.	Are all debris / undesirable material removed from the working platform and access?			
2.	Are all the scaffold members maintained from time to time?			
3.	Are all the damaged / weakened parts of the scaffold immediately removed or replaced?			
F.	Safety tag:			
1.	Whether safety tag “unsafe scaffolding” / “safe scaffolding” is displayed in the language understood by majority of the workers?			

_____ _____

(Name & Signature of Site Engineer) (Name & Signature of Safety Officer)

Annexure - 6

FORMAT OF CERTIFICATE OF TEST AND THOROUGH EXAMINATION OF CRANE BY THIRD PARTY

(To be filled in TRIPLICATE)

Sl. No.	Description	Details			
1.	Name and address of contractor				
2.	Name and address of manufacturer of the crane				
3.	Type of Crane and nature of power				
4.	a) Date of manufacture of the crane				
	b) Date of first use of the crane				
	c) Date of last examination of the crane				
5.	Identification No.				
	a) Manufacturer's serial number				
	b) Owner's distinguishing mark / number				
6.	Safe Working Load(s)	Length of jib (M)	Radius (M)	Test Load (MT)	Safe Working Load (MT)
		(1)	(2)	(3)	(4)
	In case of a crane with variable operating radius, the safe working load at various radii of the jib, trolley or crab must be given. Test loads at various radii shall be given in column (3) and in the case which has been calculated without the application of a test load, 'NIL' shall be entered in that column.				
7.	In case of a crane with a derricking jib or jibs, the maximum radius at which the jib or jibs may be worked (in m)				
8.	Defects noted and alterations or repairs required before crane is put into service (if none, enter 'NIL')				

I hereby certify that the crane described in this certificate was tested and thoroughly examined by me on (date: ____ / ____ / _____) and that the above particulars are correct.

Date of certification:

_____

(Signature & stamp)

_____

(Qualification)

(Name & address of the Person, Company or Association by whom the person conducting test and examination is employed)

Annexure – 7

FORMAT OF CERTIFICATE OF TEST AND THOROUGH EXAMINATION OF HOIST BY THIRD PARTY

(To be filled in TRIPLICATE)

Sl. No.	Description	
1.	Name and address of contractor	
2.	a) Type of hoist or lift and identification number and description	
	b) Date of manufacture	
	c) Date of last overhauling / substantial alteration	
3.	Design and manufacture: Are all parts of the hoist or lift of good mechanical construction, sound material and adequate strength?	
4.	Maintenance: Are all following parts of the hoist or lift properly maintained and in good working order? If not, state what defects have been found	
	a) Enclosure of hoist way or lift way	
	b) Leading gates and cage gate(s)	
	c) Interlock on the leading gates and cage gate(s)	
	d) Other gate fastenings	
	e) Bucket or cage or platform and fittings, gates, buffers, hoist way	
	f) Over running devices	
	g) Suspension ropes or chains and their attachments	
	h) Safety gear i.e., arrangements for preventing fall of bucket or platform or cage.	
	i) Brakes	
	j) Worm or spur gearings	
	k) Other electrical equipment	
	l) Other parts	
5.	Which parts (if any) were inaccessible?	
6.	Repairs, renewals or alterations required to enable the hoist or lift to be used or to continue to be used with safety:	
	a) Immediately	

	b) Within a specified time, the time is to be stated	
	If no such repairs, renewals or alterations are required, enter 'NIL'	
7.	Specify defects (other than those specified at 5 above) which require attention	
8.	If no defects requiring attentions are found and no repairs, renewals or alterations are required then state that the hoist or lift is in safe working condition.	
9.	Maximum safe working load subject to repairs, renewals or alterations (if any) specified at 5.	
10.	If the hoist is to be used for the carriage of passengers specify the maximum number of passengers that may be carried safely.	
11.	Other observations	

I hereby certify that on (date: ____ / ____ / _____) I thoroughly examined this hoist or lift and the that the foregoing is a correct report of the result.

Date of certification:

_____
(Signature & stamp)

_____
(Qualification)

[Name & address of the Person, Company or Association by whom the person conducting the test and examination is employed]

Annexure 7A

REGISTER OF PERIODICAL TEST – EXAMINATION OF LIFTING APPLIANCE AND GEARS, ETC.

(As per Form XXVI, BOCW Central Rules, 1998)

PART-I

INITIAL AND PERIODICAL LOAD TEST OF LIFTING APPLIANCES AND THEIR ANNUAL THOROUGH EXAMINATION

"Thorough examination" means a visual examination, supplemented, if necessary, by other means such as a hammer test, carried out as carefully as the conditions permit, in order to arrive at a reliable conclusion as to the safety of the parts examined, and if necessary, for such examination parts of the lifting appliances and gear shall be dismantled.

(A) Initial and periodical load tests of lifting appliance				
Situation and description of lifting appliances tested with distinguishing number of marks if any	*No of certificate of test and examination of competent person*	*I certify that on the date on which I have appended by signature the lifting appliance shown in column (a) was tested and no defects affecting its safe working condition were found other than those shown in column (5)*		*Remarks (to be, signed and dated)*
		Date and signature with seal	*Date and signature with seal*	
(1)	*(2)*	*(3)*	*(4)*	*(5)*
1.				
2.				

(B) Annual thorough examination:

I certify that on the date to which I have appended my signature, the lifting appliance shown in column (1) was thoroughly examined and no defects affecting its safe working conditions were found other than those shown in column (12)

Date and signature with seal	*Date and signature with seal*	*Date and signature with seal*	*Date and signature with seal*	*Date and signature with seal*	*Date and signature with seal*	*Remarks to be signed and dated*
(6)	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
1.						
2.						

PART II

Initial and periodical load test of loose gars and annual thorough examination:

List of loose gear:

The following classes of loose gears namely-

1. Chains made of malleable cast iron;
2. Plate link chains;
3. Chains, rings, hooks, shackles and swivels made of steel;
4. Pitched chains;
5. Chains, rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks, containers, spreaders, trays, slings, baskets etc. and any other similar gear
6. Hooks and swivels having screw threaded parts or ball bearings or other case hardened parts; and
7. Bordeaux connections

Initial Test And Periodical Load Test Of Loose Gears

Distinguishing no. or marks	*Description of loose gear tested and examined*	*No of certificates of test and examination of competent person*	*I certify that on the date on which I have append my signature the loose gears shown in column (1) and (2) were tested and no defects affecting the safe working condition were found other than those shown in column (6)*	
			Date and signature with seal	*Date and signature with seal*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
1.				
2.				
3.				
4.				

Annual Thorough Examination Of Loose Gears

Remarks (to be signed and dated)	*I certify that on the date to which I have appended my signature the loose gears shown in column (1) and (2) were thoroughly examined by me and no defects affecting their safe working condition were found other than those shown in column (10)*			
	Date and signature with seal	*Date and signature with seal*	*Date and signature with seal*	*Remarks (to be signed and dated)*
(6)	(7)	(8)	(9)	(10)
1.				
2.				

PART III

Annealing of chains, Rings, Hooks, Shackles and Swivels (other than those exempted)
(SEE PART II)

12.5 mm and smaller chains, rings, hooks, shackles and swivels in general use. Other chains, rings, hooks, shackles and swivels in general	If used with lifting appliance of driven by power, must be annealed once at least in every six months. If used solely with lifting appliance worked by hand, must be annealed once at least in every twelve months. If used with lifting appliance driven by power, must be annealed once at least in twelve months. If used solely with lifting appliance worked by hand, must be annealed once at least in every two years.

NOTE: It is recommended though not required by rues that annealing should be carried out in a suitable constructed furnace heated to temperature between 1100 degree and 1300 degree Fahrenheit or 600 degree and 700 degree Centigrade, for a period between 30 and 60 minutes

Distinguishing no. and mark	*Description of gear annealed*	*No. of the certificate of test and examination*	*I certify that on the date to which I have appended my signature, the gear described in cols. 1 & 2 was effectualy annealed under my supervision; that after being so annealed every article was carefully inspected and that no defects affecting its safe working condition were found other than those shown in col. 7*			*Remarks (to be signed and dated*
			Date and signature with seal	*Date and signature with seal*	*Date and signature with seal*	
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*

Annexure - 8

CONTENT OF A FIRST AID BOX

(as per Schedule – III, BOCW Central Rules, 1998)

1. A sufficient number of eye wash bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
2. 4 per cent xylocaine eye drops, and boric acid eye drops and soda-bi-carbonate eye drops.
3. Twenty four small sterilised dressings.
4. Twelve medium size sterilised dressings.
5. Twelve large size sterilised dressings.
6. Twelve large size sterilised burn dressings.
7. Twelve (fifteen cm) packets of sterilised cotton wools.
8. Two hundred ml bottle of certimide solution (1 per cent) or suitable antiseptic solution.
9. One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
10. One (one hundred twenty ml) bottle of salvolatile having the doses and made of administration indicated in the bottle.
11. One pair of scissors.
12. One roll of adhesive plaster (six cm x one metre)
13. Two rolls of adhesive plaster (two cms x one metre)
14. Twelve pieces of sterilised eye pads in separate sealed packets.
15. A bottle containing hundred tablets (each of three hundred twenty five mg) of aspirin or any other analgesic.
16. Twelve roller bandages five cms wide.
17. Twelve roller bandages ten cms wide.
18. One tourniquet
19. A supply of suitable splints
20. Three packets of safety pins.
21. Kidney tray.
22. A snake bite lancet.
23. One (thirty ml) bottle containing potassium permanganate crystals.
24. One copy of first aid leaflet issued by Director General
25. Six triangular bandages.
26. Two pairs of suitable, sterilized, latex hand gloves.

Tablets for: fever, headache, body ache, stomach ache, loose motion, acidity, cold, upper respiratory trac infection, urinary tarc infection, low backache, abdomen pain, minor injuries, Tab. Sorbitrate, Cap. Nefedine, etc.

Annexure 9

Articles for Ambulance Room/First Aid Post

(as per Schedule – IV, BOCW Central Rules, 1998)

1. A glazed sink with hot and cold water always available.
2. A table with a smooth top at least 180cm x 105 cm.
3. Means for sterilizing instrument
4. A couch and three chairs.
5. Two Stretchers and one examination bed with bed sheet, a pillow and cover
6. Two buckets or containers with close fitting lids and two rubber hot water bags.
7. A kettle and spirit stove or other suitable means of boiling water.
8. Twelve plain wooden splints 900cm x 100cm x 6cm.
9. Twelve plain wooden splints 350cm x 75cm x 12cm.
10. Six plain wooden splints 250cm x 50cm x 12cm.
11. Six wooden blankets.
12. Three pairs artery forceps.
13. One battle of spiritus annemiae arenatuins (120ml).
14. Smelling salt (60gm)
15. Two medium size sponges.
16. Six hand towels.
17. Four kidney trays.
18. Four cakes of toilet soap, preferably antiseptic soap.
19. Two glass tumblers, two wine glasses, two tea spoons and two clinical thermometers.
20. Two graduated (120ml) measuring glasses.
21. Two minimum measuring glasses.
22. One wash bottle (1000cc) for washing eyes.
23. One bottle (one litre) carbolic lotion 1 in 20.
24. One screen and one electric hand torch.
25. Four first-aid boxes or cupboards.
26. An Adequate supply of tetanus toxide.
27. Injections- morphia, pethidine, atrophine, adrenaline, coramine, novocaine (6 each).
28. Cramine liquid (60ml).
29. Tablets- antithistaminic antispasmodic (25 each).
30. Syringes with needles-2cc, 5cc, 10cc, and 500cc and needle destoryer
31. Three surgical scissors
32. Two needle holders, big and small.
33. Suturing needles and materials.
34. Three dissecting forceps, three dressing forceps and three scalpels.
35. One stethoscope and one Blood Pressure apparatus.
36. Rubber bandage-pressure bandage.
37. Oxygen cylinder (min. 330 litres capacity) with necessary attachments and one Ambu bag.
38. Weighing machine, measuring, near vision chart, distance vision chart, wash basin, high pressure drum for sterile items – one each.
39. Atropin eye ointment
40. IV fluids and sets – ten numbers
41. Suitable, foot operated, covered, refuse containers
42. Adequate number of sterilized, paired, latex hand gloves

Injections and other materials: Inj. Dexamethasone, Inj. Hydrocortisone, Inj. Avil, Inj. Dopamine, Inj. Adrenelin, Inj. Deriphyllin, emergency control drug, demulcent drink, etc.

Annexure - 10

FORMAT OF OBSERVATION REGISTER OR COMPLAINT RECORDS

(To be filled in by Safety officer or Site Engineers)

Sl. No.	Date	Area/ location	Observation/ hazard	Remedial measures recommended	Name of person responsible	Action taken on	Signature of Safety Officer

Annexure - 11

FORM NO. SGCW - 1

FORM FOR COMPLETION CERTIFICATE

(Prescribed under Cl.1.2 of Annexure of AERB Safety Guide for Works Contract))

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief, it complies with Indian Electricity Rules, 1956 as well as IS: 732-1963 code of practice for Electrical Wiring Installations. [System voltage not exceeding 650 Volts (Revised)].

Electric installation at .....

Voltage and system of supply a)

Particulars of work	Number	Total load	Type of system of wiring
i) Light Points			
ii) Fan points			
iii) Plug points (3 pin)			
iv) Motors			

b) If the work involves installation of overhead lines and/or underground cable

_____

c) Earthing:

Description of earthing electrode, size of earth wire and number of electrodes provided:

d) Test results:

1. Insulation resistance for the whole installation:

i. Between conductors:

ii. Between each conductor and earth:

2. Resistance of earthing electrode or earthing system

3. Maximum earthing resistance of installation

( ) ( )

Signature of Supervisor Signature of Contractor

Name and address of Supervisor Name and address of Contractor.

Annexure - 12

FORM NO. SGCW-2

'A' APPLICATION FOR SERVICE CONNECTION BY CONTRACTOR

(Prescribed under Cl.1.3 of Annexure of AERB Safety Guide for Works Contract)

(to be filled in triplicate)

1. Name & Address of Contractor:
2. Reference to Tender & Work Order:
3. Completion period:
4. Connected load details:

(please attach details in a separate sheet)

5. Max. demand anticipated :
6. Nature of service connection required:

(whether single or three phase)

7. Place where service required:

a) Works:

b) Colony:

8. If supply of electricity is free or chargeable:

(Please enclose extract of conditions from the tender)

9. Details of meter provided:

a) If meter required from the Department, whether Security Deposit is paid:

b) Details of SD (Security Deposit):

c) Whether meter is tested or not, if tested, attach test report, if not, details of testing fee deposited:

10. Name of Supervisor/Electrician in charge of installation and maintenance:
11. Electrical license No. of person mentioned against col. 10:
12. Electrical safety appliances available for use:
13. Fire extinguishers available for use:
14. First Aid facility/box available for use, if any:

(Signature of the Contractor)
Name:

Date:

'B' CERTIFICATE BY THE CONTRACTOR

Certified that my/our installations have been carried out in accordance with I.E. Rules and that I/We have employed competent persons to handle the installations.

I/we am/are agreeable to the bills, in respect of this service connections being raised on the basis the connected load furnished above, in case the actual consumption falls below the one stipulated by the tender conditions.

(Signature of the contractor)
Name:
Address:

Date:

'C' CERTIFICATE BY THE CONTRACT CONTROL ENGINEER

Verified the particulars and forwarded to the Engineer In charge.

(Signature of Contract control Engineer)
Name:
Section: Civil/Electrical/Mechanical.

'D' CERTIFICATE BY THE ENGINEER IN CHARGE

Certified that the particulars furnished by the Contractor are true to the best of my knowledge and belief and that I have satisfied myself as to the safe conditions of electrical installations for which the service connection is applied for.

Signature:
Name:

Date: Designation with section:

'E' CERTIFICATE BY THE SAFETY ENGINEER

Certified that I have inspected the electrical installations referred herein and after satisfying myself about the safe conditions of the installation, I hereby recommend that the service connection be given to the Contractor.

Signature of Safety Engineer.
Date: Name:

'F' AUTHORISATION BY THE ELECTRICAL ENGINEER

Service connection may be/may not be given for the reasons noted hereunder.

Signature of Electrical Engineer.
Name:
Date: Designation:

'G' 'REPORT OF COMPLIANCE'

Service connection is given by me on

a) Meter Nos. 1.
2.

b) Initial readings: 1.
2.

c) Locations: 1.
2.

d) Meter Sealings: 1.
2.

Signature of Electrical Engineer
(Metering and Billing)

Name:
Date: Designations:

Note:

1st copy to Contract Control Engineer

2nd copy to Safety Engineer

and 3rd copy to Electrical Engineer

After all the formalities are completed and Report of Compliance Electrical Engineer after power supply is given.

Annexure 13

FORMAT FOR INJURY REPORT FOR CONTRACT/CASUAL WORKER

1. Name of the injured person:
2. Age: Sex: Male / Female
3. Date and time of the accident:
4. Place where the accident occurred:
5. Name of Project and Contractor:
6. Name of contracting division/section:
7. Name of BARC supervisor:
8. Nature of job:
9. Was this his regular job?:

   _____
10. How did the accident occur (please give details):
11. Nature of injuries:
12. Was the patient referred to hospital?
13. If yes, whether admitted:
14. What was wrong with the working method/instructions:
15. What was defective? Any unsafe condition existed?:

16. Was the accident due to fault of any person other than injured?:

17. If yes, who and how?:

18. Did any similar accident occur earlier in the project?:.

19. What safe guards / instructions could have prevented the accident?:

20. What steps will be taken to prevent recurrence of similar accident?:

(Name & Signature of Contractor)

(Name & Signature of Engineer-in-charge)

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21. Comments from Head of the contracting Division/Section:

(Head of Contracting Signature Division/Section)

Annexure 14

FORMAT FOR INSPECTION OF FIRE EXTINGUISHERS

Sl. No.	Fire Extinguisher No.	Type of Fire Extinguisher	Date of monthly inspection	Date of annual inspection	Status	Place of Fire Extinguisher	Signature

Annexure 15

FORMAT FOR TESTING OF PORTABLE AND OTHER ELECTRICALLY OPERATED EQUIPMENT

Sl. No.	Name of Equipment	Capacity (HP)	IR value 1Ph	3 Ph IR Value			Remarks
				R MΩ	Y MΩ	B MΩ	

_____ _____

(Name & Signature of Contractor) (Name & Signature of Dept. Representative)

Annexure 16

ABBRIVATIONS

A&CED: Architecture & Civil Engineering Division
AEFR : Atomic Energy Factory Rules
AERB : Atomic Energy Regulatory Board
ASTM : American Society for Testing and Materials
BOCW : Building and Other construction Workers
BS : British Standards
DB : Distribution Board/ Box
DCP : Dry Chemical Powder
DG : Diesel Generator
ESG : Engineering Services Group
ELCB : Earth Leakage Circuit Breaker
HRC : High Rupturing Capacity
IHSS : Industrial Hygiene and Safety Section
IS : Indian Standards
kmph : kilometre per hour
KVA : kilo-volt-ampere
MCB : Miniature Circuit Breaker
MS : Mild Steel
PCC : Plain Cement Concrete
PPE : Personal Protective Equipment
Re-bar : Reinforcement bar
RCC : Reinforced Cement Concrete
RMC : Ready Mix Concrete
RPM : Revolution Per Minute
RSSD : Radiation Safety Systems Division
QA : Quality Assurance
QC : Quality Control
SU : Safety Unit
SLSC : Site Level Safety Committee
SIDE : Switch off, Isolate, Discharge and Earth
UV & IR: Ultra Violet & Infrared Radiation
WC : Water Closet