

GUIDELINES NO. AERB/NRF/SG/IS-1 (Rev. 1)



GOVERNMENT OF INDIA

GUIDELINES NO. AERB/NRF/SG/IS-1 (Rev. 1)

AERB SAFETY GUIDELINES

CONTROL OF WORKS



ATOMIC ENERGY REGULATORY BOARD

AERB SAFETY GUIDELINES NO. AERB/NRF/SG/IS-1 (Rev. 1)

CONTROL OF WORKS

**Atomic Energy Regulatory Board
Mumbai-400 094
India**

December 2011

Price

Order for this guidelines should be addressed to:

The Administrative Officer
Atomic Energy Regulatory Board
Niyamak Bhavan
Anushaktinagar
Mumbai-400 094
India

FOREWORD

Activities concerning establishment and utilisation of nuclear facilities and use of radioactive sources are to be carried out in India in accordance with the provisions of the Atomic Energy Act, 1962. In pursuance of the objective of ensuring safety of members of the public and occupational workers as well as protection of environment, the Atomic Energy Regulatory Board (AERB) has been entrusted with the responsibility of laying down safety standards and enforcing rules and regulations for such activities. The Board, therefore, has undertaken a programme of developing safety standards, safety codes and related guides and manuals for the purpose. While some of the documents cover aspects such as siting, design, construction, operation, quality assurance and decommissioning of nuclear and radiation facilities, other documents cover regulatory aspects of these facilities.

Safety codes and safety standards are formulated on the basis of nationally and internationally accepted safety criteria for design, construction and operation of specific equipment, structures, systems and components of nuclear and radiation facilities. Safety codes establish the objectives and set requirements that shall be fulfilled to provide adequate assurance for safety. Safety guides and guidelines elaborate various requirements and furnish approaches for their implementation. Safety manuals deal with specific topics and contain detailed scientific and technical information on the subject. These documents are prepared by experts in the relevant fields and are extensively reviewed by advisory committees of the Board before they are published. The documents are revised when necessary, in the light of experience and feedback from users as well as new developments in the field.

Construction work is a labor-intensive industrial activity with large number of unskilled and migratory workforce under various contracts ranging from a mega package contract to a small work contract. Accidents during construction work are of major concern because of the high severity of injuries. The analysis of the accidents at construction sites indicates that 'fall from height' type of accidents are significantly higher than the other types of accidents. AERB safety guide titled 'Works Contract' (AERB/SG/IS-1) was issued in 1991 to emphasise safety requirements and ensure their implementation in execution of contracts. In view of the continual development of construction technologies and the need for enhancement of industrial safety in DAE units, inputs from AERB discussion meets on the subject, safety and occupational health professionals of DAE, AERB Fatal accident Assessment Committee, and directives on industrial safety issued by Chairman, AERB, the need for revision of the safety guide was felt.

This revised 'safety guidelines' is effective from the date of issue and supersedes the earlier guide on the subject. Part-A of the revised safety guidelines highlights safety requirements by 'Facilities' and Part-B highlights the requirements on safe execution of jobs by 'Contractors'. The facility management shall be strictly liable as a principal

employer for ensuring the compliance with the safety requirements by the contractors as laid down in Part-B. It should be noted that Part-A and Part-B should be read in conjunction, as the requirements are complementary to each other. However the 'Facility' may issue the Part-B along with the tender documents. The requirements spelt out in this 'safety guidelines' are in addition to the statutory requirements such as Factories Act 1948, Atomic Energy (Factories) Rules, 1996 and other applicable statutory requirements.

Consistent with the accepted practice, 'shall' and 'should' are generally used to distinguish between a firm requirement and a desirable option respectively. Appendices are an integral part of the document, whereas bibliography are included to provide further information on the subject that might be helpful to the user.

Specialists in the field drawn from the Atomic Energy Regulatory Board, the Bhabha Atomic Research Centre and the Nuclear Power Corporation of India Limited and other consultants have prepared this 'safety guidelines' document. It has been reviewed by the Advisory Committee on Industrial and Fire Safety (ACIFS).

AERB wishes to thank all individuals and organisations who have prepared and reviewed the document and helped in its finalisation. The list of persons, who have participated in this task, along with their affiliations, is included for information.



(S. S. Bajaj)
Chairman, AERB

SPECIAL DEFINITIONS

(Specific for the Present ‘Guidelines’)

Approval

A type of written consent issued by the designated authority.

Construction Agency/Contractor

An individual or organisation rendering services of design/construction/fabrication/installation/repair/inspection/review/maintenance/supplying items by the deployment of workers at site.

Dangerous Manufacturing Processes or Operations

The manufacturing processes or operations as specified under Rule 88 of the Atomic Energy (Factories) Rules, 1996.

Engineer-in-charge

A person designated by the Facility to act as an overall in-charge of work.

Facility

Any Unit of the Department of Atomic Energy awarding the contract.

Head, Industrial Safety

The chief safety officer or the overall in charge of Industrial Safety Section of the facility.

Line Managers

The person who has the field level managerial and supervisory control on the concerned work.

Safety Related Deficiency

The unsafe acts/unsafe practices/unsafe conditions in the work area, which have potential to cause injury/accident resulting into undesirable consequences to human beings or damage to the equipment/property/environment.

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PART-A
CONTROL OF WORKS
(FACILITIES)

1. INTRODUCTION

1.1 General

Department of Atomic Energy (DAE) through its constituent units execute various site works either by their own manpower or by manpower of various outside agencies. The nature of contracts with outside agencies can be works contracts, engineering procurement contracts, minor fabrication contracts etc. These site works involve entire gamut of conventional industrial activities like excavation, rock blasting, earth handling, construction, material handling, fabrication, installation, operation, maintenance etc. of nuclear or conventional plants/facilities. This is a challenging responsibility for the facility due to the complexity of problems like quality of workforce (which may be unskilled, illiterate, migratory) available for labor-intensive jobs, lack of coordination among agencies at site, lack of safety awareness among concerned authorities, time schedules of project etc. As primary employer of the workforce (facility or contractor) at site, it is the responsibility of the facility management to ensure health and safety of personnel engaged for the work. Any accidental injury or loss of life is detrimental to the facility as well as the society. This 'guidelines' covers the safety organisation and the safety management system requirements in sections two and three. The work specific safety precautions are covered in section four. The requirements relating to personal protective equipment and medical management are covered in sections five and six.

1.2 Objective

This 'guidelines' has a basic framework of industrial safety organisation, safety management systems, safe work procedures to maintain a safe working environment for all personnel and to prevent any unsafe condition/act endangering the life of personnel engaged for industrial activities. The major objectives of this 'guidelines' are:

- (i) To create awareness among workers about industrial hazards and safe working procedures.
- (ii) To lay down safe work procedures and systems to be followed for different type of industrial activities
- (iii) To establish a robust safety management system.
- (iv) To protect the health and ensure the safety of the workers from industrial activities.

1.3 Scope

This 'guidelines' is essential for implementation and assurance of conventional safety in areas such as industrial, chemical, electrical, fire, environmental and is applicable for all works taken up by the facility as well as contracted works like engineering procurement contract, minor fabrication contract etc. Where the execution of work is envisaged in radiation controlled area or involves handling and fabrication of any nuclear material, additional precautions noted in relevant AERB safety documents on radiation protection shall also be applicable.

2. SAFETY ORGANISATION

2.1 General

- (a) Construction projects have significant health and safety hazards, which need to be managed systematically since the project inception stage to achieve adverse incident free completion. A well-defined safety organisation helps in effective implementation of safety management systems and ensures health and safety of workers.
- (b) The safety organisation should assure the management that all the provisions of relevant Acts and Rules are conformed to.
- (c) Safety organisation should comply with all the requirements such as safety surveillance, safety training, safety enforcement measures, safety audit etc. related to all works to fulfill the overall safety requirements of this 'guidelines'.
- (d) Safety functionaries should be exclusively assigned with the work related to protection of health and safety of workers.
- (e) Safety organisation should directly report to the Project Director / Project Manager.
- (f) IS: 18001: 2007 gives detailed requirements of health and safety management system requirements. IS: 15793 gives requirements of good practices for managing environment, occupational health and safety legal compliance. This 'guidelines' prescribes requirements in addition to IS: 18001: 2007 and IS: 15793 and gives guidelines on implementing these specific to a construction project.
- (g) The requirements prescribed in various central and state regulations including *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996* and rules framed thereunder with respect to managing health and safety in construction projects, shall be complied with.

2.2 Organisational Structure for Safety Management

- (a) Organisational structure depends on the construction project. As an example, a typical organisational chart for safety management in a construction project would be as given in Fig 1.

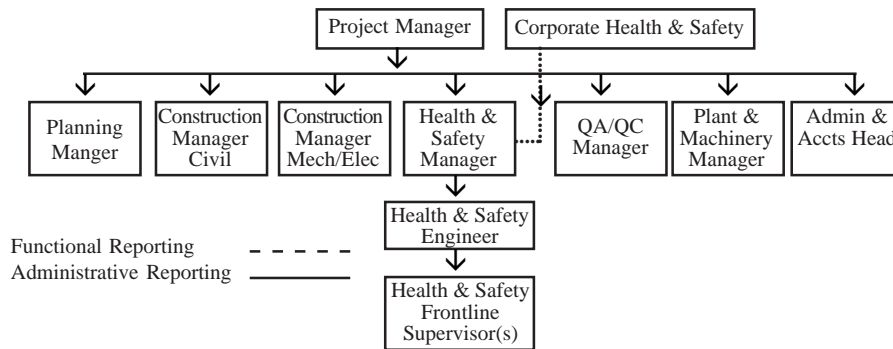


Fig -1 : Typical Organisation Chart

- (b) The organisational structure for Health and Safety will vary from project to project. On large and medium projects, it may be necessary to have a separate safety team for each sub-contractor who in turn shall report to safety team of the main construction agency.
- (c) The qualification, experience and the minimum number of safety professionals to be deployed should be as per the following table:

TABLE-1 : QUALIFICATION, EXPERIENCE & NUMBER OF SAFETY PROFESSIONALS FOR CONSTRUCTION PROJECTS

Category of safety person	Mandatory requirement	Qualification
Head, industrial safety	One at each site/unit	Degree in engineering/technology and diploma in industrial safety with minimum three years of experience
Safety officer	One in each shift (minimum) up to 1000 workers. If number of workers in a shift (including contractor's workers) exceeds 1000, additionally one safety officer should be deployed for every 1000 workers or part thereof.	Degree in engineering/technology and diploma in industrial safety with minimum two years of experience or Diploma in engineering with diploma in industrial safety with minimum 6 years experience or A recognised degree in physics or chemistry and has practical experience of working in a factory in a supervisory capacity for a period of not less than 5 years.

Category of safety person	Mandatory requirement	Qualification
		<p>Notwithstanding the provision contained in the above criteria any person who (i) possesses a recognised degree or diploma in engineering or technology and has had experience of not less than five years in a department of the central or state government which deals with the administration of the Factories Act, 1948 or the Dock Workers (safety, health and welfare) Act, 1986 (54 of 1986) or (ii) Possesses a recognised degree or diploma in engineering or technology and has had experience of not less than 5 years, fulltime on training, education, consultancy, or research in the field of accident prevention in industry or in any institution, shall also be eligible for appointment as a safety officer:</p> <p>Provided that competent authority may, subject to such condition as it may specify, grant exemption from the requirement of this sub rule if in its opinion, a suitable person possessing the necessary qualification and experience is not available for appointment.</p>
Safety supervisor	<p>One in each shift (minimum) up to 500 workers.</p> <p>If number of persons working in a shift (including the contractors' workers) exceeds 500, additionally one safety supervisor should be deployed for every 500 workers or part thereof.</p>	<p>Diploma in engineering and diploma in industrial safety</p>

3. SAFETY MANAGEMENT

3.1 General

- (a) Pre-construction stage activities of the project shall be required to be reviewed before the project management processes are initiated for the construction stage. While the project documents and proposals are reviewed for the adequacy of health and safety measures, it is essential to ascertain timeframes and budgets relating to health and safety measures, including extent of management systems proposed to be employed during construction.
- (b) A concise safety management system of the facility shall be established from the pre-construction stage itself. The tender documents of the project shall clearly communicate the health and safety requirements of the project to the prospective contractors. These may include:
 - (i) Project specific objectives and targets
 - (ii) Project specific health and safety requirements (technical as well as management systems)
 - (iii) Requirement of posting safety officers
 - (iv) Coordination among owner/client, project manager, consultants and facility
 - (v) Welfare facilities at the project for workmen
 - (vi) Reward system for good health and safety performance
 - (vii) Penalty system for non-compliances, violation and adverse incidents
 - (viii) Health and safety monitoring measures
 - (ix) Health and safety reports to be submitted and frequency.
- (c) The construction agencies (contractors) should be asked to submit a project specific health and safety plan (construction safety management plan) proposing the methodology for managing health and safety and their capability in completing the project in a safe manner.
- (d) The proposed construction safety management plans of the construction agencies and their past health and safety performance shall be considered as one of the criteria during pre-qualification and selection of construction agencies.

3.2 Safety Policy

- (a) The facility and the construction agency jointly or separately shall have a written statement prescribing the health and safety policy of the organisation. The health and safety policy conveys the management commitment and intent of the organisation towards health and safety, its organisation and arrangements to ensure that the set objectives are met. It also provides a framework for establishing, maintaining and periodically reviewing health and safety objectives and targets.
- (b) Health and safety policy shall meet the requirements of *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996* and IS 18001.
- (c) The policy shall be communicated to all stakeholders through display and other means. The policy shall be displayed in local language(s) which may be understood by majority of the workmen.

3.3 Safety Plan

- (a) A project specific health and safety plan shall be developed by the facility. On approval by the project director, the project health and safety plan shall be reference document for implementation, control and monitoring of health and safety aspects of the project by the facility.
- (b) Project health and safety plan shall describe how the project specific health and safety objectives and targets shall be achieved. It shall define the road map for achieving the standards that an organisation lays down for itself so that efforts can be coordinated, synergised and monitored.
- (c) Health and safety plan shall explain the means of establishing a positive health and safety culture at the project site. Health and safety plan shall identify and enumerate the control measures to mitigate the risks to the project completion arising out of health and safety issues so that the project is allowed to proceed without interruption and executed as per schedule.

Salient aspects that may be covered in the project health and safety plan are:

- (i) Project specific health and safety objectives, targets and programmes in line with health and safety policy
- (ii) Hazard identification and risk assessment
- (iii) Meeting legal and other requirements

- (iv) Health and safety organisation
 - (v) Resources, roles, responsibility and authority
 - (vi) General health and safety rules
 - (vii) Health and safety requirements to be followed by sub-contractors
 - (viii) Operation control procedure
 - (ix) Activities requiring work permit system and its procedure
 - (x) Safe handling of chemicals, explosives, gas cylinders, electrical equipment etc.
 - (xi) Access control of employees
 - (xii) Safety of visitors
 - (xiii) Management of critical activities such as work at height, material handling and working with plant and machinery
 - (xiv) Ensuring the competency and awareness of the workmen
 - (xv) Fire prevention and fire fighting plan
 - (xvi) Emergency preparedness and response plan
 - (xvii) Traffic management plan
 - (xviii) Training matrix
 - (xix) Personal protective equipment matrix
 - (xx) Health and safety performance monitoring measures such as inspection and audit
 - (xxi) Incident reporting and investigation procedure
 - (xxii) Proactive and reactive indicators of health and safety
 - (xxiii) Reward and reprimand for health and safety performance
 - (xxiv) Checklist and formats
 - (xxv) Health monitoring plan for employees/workers exposed to hazardous job.
- (d) The risk control measures identified shall meet the provisions of *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996*, other legislations and provisions of various safety related standards.
- (e) Procedures shall be established for timely recording and reporting of information required for continual improvement of health and safety performance. Internal reporting procedures shall cover:

- (i) Incident reporting
- (ii) Non-conformance reporting
- (iii) Health and safety performance reporting
- (iv) Hazard identification reporting

External reporting shall cover

- (i) Statutory reporting requirements

The recording of reporting of health and safety performance shall be clearly documented in the project health and safety plan.

3.4 Roles, Responsibility and Authority

- (a) Project manager shall define, document and communicate the roles, responsibilities and authorities of all personnel who manage, perform and verify activities having an effect on health and safety risks. It shall also include contractors and visitors.
- (b) Ultimate responsibility for health and safety shall rest with top management of the respective organisation.
- (c) The line management personnel who are responsible for execution of activities are directly responsible for health and safety in the work under their control.
- (d) Health and safety group and health and safety officers are responsible for guiding the top management on health and safety issues and facilitating the implementation of health and safety in the project site. For duties and responsibilities of health and safety officers refer Atomic Energy (Factories) Rules-1996.
- (e) Health and safety officers shall administratively report to the project manager and functionally report to the senior health and safety representative of the organisation.
- (f) Health and safety officers and health and safety group shall be empowered by the project manager for stopping any unsafe practices which are of imminent danger to employees. Health and safety group shall directly report to no less than the head of the project.
- (g) Health and safety supervisors shall be engaged to assist the health and safety officers in performing their duties.
- (h) Management shall provide adequate resources essential to effectively manage the health and safety requirements of the project. The resources shall include human resources, organisational infrastructure, technology and financial resources.

3.5 Design and Engineering

- (a) Design drawings, construction methodology and plans shall be reviewed to determine whether any additional risks may arise during the construction due to the features in the design or methodology.

Attention shall be paid to:

- (i) Providing permanent hooks and loops for tying safety slings of workers
 - (ii) Providing holes or such arrangements to the structure to which safe working platforms and safety nets can be connected
 - (iii) Significant risks from construction materials, which cannot be avoided in the design
 - (iv) Laying permanent slings, grab rails/bars to be used by the workers
 - (v) Permanent provision for attaching railings
 - (vi) Provision for alternative access to the trapped or distressed workers
 - (vii) Provision for communication
 - (viii) Design facilitating barricading of the area around work site without causing hindrance to building functional activities
 - (ix) Durability of such safety related permanent design integrated elements
 - (x) Other safety practices required for the type of works involved.
- (b) Analysis of design and integration of safety measures, as described above, should be undertaken as value engineering through multi-stakeholder consultation, necessarily involving designers, owner/client, operation/maintenance management and construction agency.
- (c) While need for special work methodology and enabling infrastructure is considered to make conditions safe for construction, attention shall also be drawn to the safety during maintenance operations (including inspections which may be necessary before project commissioning as well as maintenance).
- (d) It shall also be ascertained whether it would be feasible (within the time and cost considerations) to erect necessary temporary enabling infrastructure. If, in the due assessment by the project manager, it is established that the design, as proposed, would continue to be unsafe during construction and maintenance operations unless special

enabling infrastructure is created and work procedures specifically drawn, the design shall be reviewed.

3.6 Construction Planning

- (a) Prior to the start of construction work, detailed planning shall be carried out which may include:
 - (i) Identifying aspects of design that have bearing on health and safety during construction stage.
 - (ii) While scheduling the various activities of the construction, allowing adequate time to carry work in accordance with health and safety requirements.
 - (iii) Reviewing the proposed work method of various activities, identifying health and safety hazards of activities in the project and assessment of the risk level.
 - (iv) When the risk level is unacceptable, taking additional control measures including revision of the work methodology so that identified risk is at ALARP (as low as reasonably practicable) level.
 - (v) Planning and establishing the facilities for implementation of health and safety such as workmen training facility, health centre for medical check-up and first aid, access control of employees, etc.
 - (vi) Ensuring that the temporary establishments at project site such as site offices, workmen camps, toilets, canteens and rest sheds, etc. are created meeting the requirements of the relevant statutes and standards.
- (b) Facility shall ensure that the construction agency has understood the challenges and has planned to meet the project specific health and safety requirement through appropriate competencies.
- (c) Health and safety measures need proper coordination by the construction agency and such efforts of the construction agency shall be reviewed, monitored and appropriately guided by the facility.
- (d) In respect of sub-contractors, project manager of the construction agency shall ensure that the sub-contractors meet the health and safety requirements of the project. Health and safety control and monitoring shall be established specific to the needs of the project.
- (e) Past health and safety performance and capability of contractors to complete the job safely shall be given due consideration during selection of contractors. The project specific health and safety

requirements shall be clearly communicated to the contractors and a commitment obtained from them on meeting the requirements.

3.7 Safety Communication

- (a) Procedures shall be established to communicate significant hazards and risks to and from employees and other interested parties. The health and safety hazards and risks may be communicated in the following ways:
 - (i) Sharing of accidents case studies which occurred in the project site as well in other similar projects
 - (ii) Health and safety posters and displays
 - (iii) Health and safety campaigns and competition involving the employees
 - (iv) Sharing of results of the audits, inspections and other monitoring systems
 - (v) Establishing a system for collecting feedback on health and safety from employees and other interested parties
 - (vi) Tool box meeting
 - (vii) Safety signage.
- (b) Health and safety communications addressed to workmen shall preferably be in local language(s) understandable by majority of the workmen.
- (c) The owner/client, consultant and construction agency shall jointly endeavour to promote a positive health and safety culture at the project. Top management of the organisations should exhibit a visible management commitment and felt leadership towards health and safety. This shall be achieved by participating in health and safety programmes such as,
 - (i) Project health and safety committee meeting
 - (ii) Health and safety walk down
 - (iii) Including health and safety in all performance review meetings
 - (iv) Exhibiting a safe behaviour while at site.
- (d) The top management should clearly communicate that it considers safety as core value and it shall not allow it to get compromised. Such messages when it reaches down the level in the organisation enable to create a positive health and safety culture.

3.8 Safety Monitoring Programme

- (a) The objective of the safety surveillance programme should address assurance of effective implementation of safety measures in execution of works. Following surveillance programme should be in place at sites. The safety organisation should monitor, maintain record and follow up for corrective actions.
- (b) The surveillance programme should consist of identification of safety related deficiencies and status of corrections thereof, the implementation of protective measures, the safe work practices, human behavior etc.
- (c) Specific surveillance should be ensured with respect to testing of equipment, portable power tools, electrical equipment and tools, hand tools, surveillance of material handling equipment, transport equipment, earth moving equipment, gas cylinders etc. to comply with various statutory requirements.
- (d) Surveillance on safety awareness and training compliance including induction training, on the job training and refresher training, job specific pre-job briefing, job hazard analysis, etc. as per facility's guidelines should be ensured.
- (e) Safety related deficiencies should be detected by any employee of the facility and communicated by the safety officer to their line managers with a record and corrective measures monitored and recorded. The engineer-in-charge should specifically ensure this. These should be informed to Head, Industrial Safety within the stipulated time period as per the category of safety related deficiencies (SRDs).
- (f) Systematic record of safety related deficiencies (SRDs) attended and pending should be made by the facility and other executing agencies.
- (g) Head, Industrial Safety should verify periodically, at least once in 15 days that all safety related work permits issued are executed and recorded.
- (h) The health and safety performance monitoring and measurement procedures shall provide for:
 - (i) Both qualitative and quantitative measures appropriate to the project
 - (ii) Monitoring the extent to which project health and safety objectives are met

- (iii) Proactive measures of compliance that measures compliance with health and safety plan, operational control procedures and legislation
 - (iv) Reactive measures of performance to monitor accidents, ill health, near misses and non-conformances
 - (v) Monitoring dangerous occurrences
 - (vi) Fire occurrences
 - (vii) First aid injuries.
- (i) Health and safety audit is a systematic and independent examination to estimate if planned arrangements and activities are effectively fulfilling organisation's health and safety policy, plan and objectives. Its purpose is to find out:
- (i) Whether the organisation has adequate procedures for identifying specific health and safety requirements
 - (ii) Whether such laid down procedures are followed and specific health and safety responsibilities are understood
 - (iii) Whether health and safety policies and risk assessment procedures identify the measures needed to avoid risks to employees and other interested parties
 - (iv) Whether the company has adequate procedures for devising, reviewing its health and safety standards
 - (v) Whether the company's health and safety standard identifies measurable targets
 - (vi) Whether the company has established adequate procedures for planning, implementing, controlling, monitoring and reviewing the health and safety measures.
- (j) Project health and safety management audits provide the method for monitoring and controlling health and safety activities and procedures throughout the life of the project. Audits can be internal or external. Internal audit can be conducted by the persons from the same organisation who are not directly connected with the work site to be audited. The external audits are performed through external professional experts.
- (k) Health and safety inspections shall be preferably conducted by a team of the concerned engineer, health and safety officer and area in-charge. Project manager and other senior personnel shall also join in some of the health and safety inspections.

- (l) The type of inspections that shall be carried out and the frequency shall be decided during the planning stage and documented in the project health and safety plan. The health and safety inspections should include:
 - (i) General site health and safety inspection
 - (ii) Electrical safety inspection
 - (iii) Plant and machinery inspection
 - (iv) Health and hygiene inspection
 - (v) Scaffolding safety inspection
 - (vi) Portable tools and tackles
 - (vii) Lifting tools and tackles
 - (viii) Fire equipment inspection
 - (ix) Illumination level and noise level monitoring
- (m) Project health and safety committee shall be constituted with project manager as the chairman, health and safety head as the secretary and representatives from various groups including workmen representatives as the members. The constitution and functioning of the committee shall meet the provisions of *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996*.
- (n) This committee shall review the status of implementation of project health and safety plan, health and safety objectives and targets. Health and safety indicators and findings of the walk down by the committee members shall also be discussed and action plan derived.
- (o) Status of health and safety implementation shall be measured and monitored by several proactive indicators which include the following:
 - (i) Compliance level of project health and safety plan
 - (ii) Compliance level of health and safety observations with in the target date
 - (iii) Implementation status of training plan
 - (iv) Implementation status of corrective and preventive actions
 - (v) Compliance level of pre-employment medical checks and periodic medical checkups
 - (vi) Compliance level of legal and other requirements

- (vii) Percentage of activities for which detailed project specific risk assessment is conducted.
- (p) Procedures shall be established to report, investigate and analyze incidents. The procedures shall involve:
 - (i) Members of the incident investigation team
 - (ii) Agencies to be reported in case of incidents
 - (iii) Time period within which incidents need to be reported
 - (iv) Methodology for investigation and determining the root cause of accidents.

These procedures shall form a part of the project health and safety plan and monitored on a regular basis for its effectiveness.

- (q) All incidents including near miss cases, accidents and dangerous occurrences shall be thoroughly investigated, direct and root causes determined and corrective action planned. Incidents should be analysed covering the following ways to prepare and implement an effective prevention plan:
 - (i) Body part injured
 - (ii) Age of the victims
 - (iii) Time of accidents
 - (iv) Causes of accidents
 - (v) Nature of injury.

For detailed guidelines on analysis of incidents and computation of injury rate refer IS 3786.

- (r) The following reactive health and safety indicators should be used to measure and monitor the health and safety performance of the project site:
 - (i) Number of near miss cases
 - (ii) Number of first aid cases
 - (iii) Lost time injury frequency rate
 - (iv) Lost time injury severity rate.
- (s) The health and safety performance of contractors shall be monitored on a regular basis and necessary directive and support shall be given to achieve the set health and safety objectives and targets.

- (t) All accidents leading to property damage/fatal accidents/personnel injuries/near miss and dangerous occurrence should be reported to the engineer-in-charge immediately.
- (u) All 'near-miss' accidents should also be recorded/reported and investigated and recommendations arising out should be implemented on priority.
- (v) Facility/Contractor should also submit a monthly statement of accidents to engineer-in-charge/head, industrial safety by 4th of the following month showing details of accident, nature of injury including disability, days lost, treatment required, etc. and the extent of property damage.

3.9 Training/Orientation

- (a) It shall be ensured that all employees are competent to perform the assigned work safely on the basis of appropriate education, training or experience. The competency requirements of different categories of employees shall be mapped and procedures shall be implemented to ensure that those deployed meet the competence requirements.
- (b) Training needs of the different category of employees shall be identified at the beginning of the project and a training matrix and plan shall be prepared for implementation.
- (c) The objective of health and safety training shall be to equip the employee with necessary knowledge and skill to perform the work assigned to him in a safe manner, to foster continual improvement and to imbibe safety culture.
- (d) Preferably, the training should be carried out away from the working place of the participants to ensure focused attention on the training for both trainer as well as trainees.
- (e) After completion of training due procedure shall be followed for obtaining the feedback from the participants on the effectiveness of the training. Effectiveness of training imparted shall be monitored for continual improvement and necessary corrections in implementation.
- (f) The training/orientation programme should be implemented to meet the mandatory requirements. [Rule 43(2) (m) of the Atomic Energy (Factories) Rules 1996]. The training should be phased as follows:
- (g) Induction cum orientation training should include the overall safety aspects of the work and give a general overview of the various hazards, the particular activities and the do's and don'ts. As a part of training, workers should also be given demonstrations on use of

personal protective equipment, first aid, fire-fighting equipment, fire mock drills, other emergency preparedness etc.

- (h) The line manager along with the safety representative should conduct pre-job briefing on day-to-day basis prior to specific hazardous jobs. This will make the workers aware of the hazards and the precautions to be taken.
- (i) Refresher training should be imparted to each worker at least once in a year.
- (j) A training schedule should be prepared by the facility for implementation.
- (k) Records of training, demonstration and pep talk should be maintained.

3.10 Permit to Work System

- (a) Activities requiring permit to work shall be decided before starting the construction and shall be suitably documented in the project health and safety plan. Some of the activities which should require permit to work are:
 - (i) Excavation
 - (ii) Entry into confined spaces
 - (iii) Electrical work (HV/LV)
 - (iv) Opening manholes, covers and grills
 - (v) Blasting operation
 - (vi) Hot work
 - (vii) Work on plant and machinery & other power driven equipment
 - (viii) Working at height
 - (ix) Working at night
- (b) The facility should establish a permit to work system for any other hazardous activity, which it feels necessary to be controlled administratively for safe execution.
- (c) Record of safety work permit should be maintained in a systematic manner. All the safety conditions and requirements stipulated in the safety work permit should be ensured strictly.
- (d) Occupier should ensure that only authorized personnel are deployed for hazardous works/jobs (Refer item 3.11 for hazardous job) and provide facilities for the same.

3.11 Job Hazard Analysis

- (a) It should be ensured that a safe work procedure exists for all the hazardous jobs as mentioned hereunder and the requirements of the safety procedures are ensured at the work sites. Job hazard analysis (JHA) should form a part of such safe work procedures. A checklist based on JHA should be prepared. This checklist should be crosschecked by the line managers and verified by safety officer.

Typical list of jobs requiring job hazard analysis (this list is illustrative only and not exhaustive) is as follows:

- (i) Excavation
 - (a) Blasting including under water blasting
 - (b) Earth and stone removal/backfilling/dumping of earth/stones
 - (c) Any excavation more than 1.8 m depth.
- (ii) Work at height (working beyond 3.5 meters above ground)
 - (a) Erection and dismantling of scaffolding, platforms, shuttering/de-shuttering work
 - (b) Dome work, rod bending, construction of chimney and cooling towers
 - (c) Working on tower crane.
- (iii) Materials and material handling
 - (A) Critical equipment handling e.g.
 - (a) Calandria
 - (b) Steam generators
 - (c) Turbine generator components
 - (d) Diesel generator set
 - (e) Generator stator
 - (f) End shields
 - (g) Fuelling machines components
 - (h) Heat transport pumps etc.
 - (B) Hazardous chemical handling e.g.
 - (a) Acids and alkalis
 - (b) Chlorine

- (c) Hydrazine
- (d) Morpholine
- (e) Freon
- (f) Ammonia
- (g) LPG
- (C) Movement of heavy material by crane
- (D) Movement of tractor trolley on slopes
- (E) Manual lifting of heavy material to height
- (F) Erection of heavy machinery, equipment.
- (iv) Electrical connection
 - (a) Field connection for electrical installation
 - (b) Installation of lighting fixtures
 - (c) Charging of electrical system
 - (i) Charging of transformer, switch yard, switch gears
 - (ii) Working near high voltage lines
 - (iii) Use of portable electrical tools.
- (v) Equipment/structural erection work
 - (a) Material handling
 - (b) Loading and unloading
 - (c) Transportation of material from one place to other
 - (d) Steel fabrication and erection
 - (e) Cleaning and maintenance of batching plant equipment.
- (vi) Finishing/painting work
 - (a) Painting at height
 - (b) Painting in confined space.
- (vii) Other specific work
 - (a) Work with pneumatic tools/compressed air
 - (b) Work on pressure vessels/lines
 - (c) Work in the vicinity of steam lines
 - (d) Work in high enthalpy area

- (e) Work in high noise area
- (f) Work in confined space including tunnels & trenches
- (g) Work in isolated area (away from main site)
- (h) Radiography work
- (i) Work related to welding, gas cutting, grinding
- (j) Working near conveyor, rotating machine
- (k) Leak detection testing.

3.12 Reward and Reprimand

- (a) It is important to acknowledge and encourage good health and safety performance and suitably reprimand repeated violations, non-conformances and poor health and safety performances. Project specific reward and reprimand system shall be prepared as a part of the project health and safety plan.
- (b) To motivate the employees and organisation to work safely measures can be implemented based on the suitability. Selection and rewarding for the following categories may be considered on regular basis:
 - (i) Safest workmen
 - (ii) Safest supervisor
 - (iii) Safest area
 - (iv) Safest contractor, etc.
 - (v) Contractors and employees may be rewarded when the project achieves significant million man-hours without any lost time injury.
- (c) Unsatisfactory health and safety performance in the form of repeated violations, frequent adverse incidents and accidents shall be dealt with firmly. Depending on the seriousness of the violation the following options shall be considered:
 - (i) Issue of violation memorandum and obtaining written commitment for safe working
 - (ii) Suspension or termination of the employee from the present work
 - (iii) Suspension or termination of contract in case of construction agency
 - (iv) Imposition of penalty to the construction agency.

- (d) When penalties are imposed due records shall be maintained in a transparent manner. The main contractor shall be responsible wherever he deploys sub-contractor/petty contractor/piece rate contractor. The funds thus accrued may be spent in the form of rewarding employees for their sincere efforts towards improving the health and safety performance.

4. WORK SPECIFIC SAFETY SAFETY MEASURES

4.1 General

- (a) The occupier should ensure that safety precautions are taken during the execution of awarded work and work areas are maintained safe at all times. At the end of each shift and at all times when the work is suspended, it should be ensured that the work area is left safe in such a way that no materials and equipment that can cause damage to existing property, personal injury or interfere with the other works of the project or station are left in an unsafe manner.
- (b) The occupier should ensure to provide and maintain all lights, guards, fencing, warning signs, caution boards and other safety measures and provide for vigilance as and when necessary for the protection of workers and for the safety of others. The caution boards should also have appropriate symbols.
- (c) Adequate lighting facilities such as floodlights, hand lights and area lighting should be provided at the site of work, storage area of materials and equipment and temporary access roads within the working area.
- (d) All works should be planned so as to avoid interference with other facilities, works of other contractors or sub-contractors at the site. In case of any interference, necessary coordination should be ensured for safe and smooth working.
- (e) It should be ensured that the instructions given by the safety officer or his designated nominee regarding safety precautions, protective measures, housekeeping requirements, etc. are complied with. The safety officer with due intimation to engineer-in-charge should have the right to stop the work, if in his opinion, proceeding with the work will lead to an unsafe and dangerous condition. Engineer-in-charge should arrange to get the unsafe condition rectified and/ or provide appropriate protective equipment.
- (f) Engineer-in-charge should ensure that each job with a hazard whether small or big is intimated to the safety officer of the facility well before it is taken up.
- (g) The facility should be fully responsible for non-compliance of any of the safety measures or requirements, implications, injuries, fatalities, dangerous occurrences and compensation arising out of such situations or incidents.

- (h) Maximum duty hours of an individual should be as per the Factories Act 1948 or its latest amendment.
- (i) Illumination levels should be as per the statutory requirements.

4.2 Rock Blasting

- (a) All blasting operations should be carried out on the basis of procedures approved by Head, industrial safety and engineer-in-charge. All works in this connection should be carried out as per BIS specification/code (IS 4081: 1986. Title:- Safety code for blasting and related drilling operations (First Revision)). Barricades, warning signs etc. should be placed on the roads/open area.
- (b) Blasting permit should be obtained from Head, industrial safety at least one day before the blasting operation and precautions mentioned there in shall be ensured by the engineer-in-charge before blasting operation.
- (c) The blaster should have a licence from competent authority under Explosive Rules, 1983 for blasting work. It should also be ensured that he knows about the risks involved.
- (d) Blasting should be done under the supervision of competent engineer/supervisor.
- (e) Blasting in the open site should only be carried out during fixed hours every day/fixed day in the week between sunrise and sunset. Residents of adjacent area should be informed in advance about the blasting schedule.
- (f) No blasting should be undertaken during thunderstorm.
- (g) Necessary precaution should be taken to ensure the stability/integrity/safety of the adjacent structure by limiting the peak particle velocity.
- (h) No loose material, such as tools, drilling equipment, etc. should be left on the surface to be blasted. Proper muffling arrangement of the blasting area should be ensured to avoid flying of blasted material.
- (i) Authorised blaster should personally ensure that all the personnel/equipment has been removed from the blasting area before the blasting operations.
- (j) Blasting area should be free of detonating gas, inflammable objects, sparking or damaged wiring system, stray currents and static electricity.
- (k) All electrical lines in blasting area should be de-energised.
- (l) Entry of unauthorised personnel should be prevented by displaying warning signs.

- (m) In case of misfire, no person should be allowed to approach the blasting site unless it is inspected and cleared by a competent engineer/supervisor.
- (n) Explosives and blasting material should be stored only in clean, dry, well-ventilated, suitably constructed bullet/ magazine which should be fire resistant and securely locked. Stock book should be kept accurate and maintained. Licence should be obtained for storage of explosive as per the Explosives Act, 1884.
- (o) Blasting caps, electric blasting caps or primers and detonators should not be stored in the same box, container or room with other explosives.
- (p) Precautions against lightning should be provided in accordance with Indian Electricity Rules, 1956 (amended in 2000).
- (q) The explosives should be transported in specially designed vehicles bearing a special sign or inscription entitled 'DANGER - EXPLOSIVES'. Also detonators separated from other explosive should be transported in a separate compartment.

4.3 Excavation, Trenching and Earth Removal

- (a) Before taking up excavation work, necessary permission should be obtained from the engineer-in-charge with reference to existing underground services.
- (b) The engineer-in-charge of the works should exercise full care to ensure that no damage is caused by him or his workmen, during the operation/excavation etc., to the existing water supply, sewerages, power or telecommunication lines or any other services or works. He should provide and erect before construction, substantial barricades, guardrails, and warning signs around the work area. He should also furnish, place and maintain adequate warning lights, display board, signals etc., as required.
- (c) All trenches 1.2 m or more in depth should at all times be supplied with at least one ladder for every 30 m along the trench. Ladders shall extend from bottom of the trench to at least 1 m above the surface of the ground.
- (d) The sides of the trench/pit in soil, which are 1.2 m or more in depth should be stepped back to give suitable slope (angle of repose) or securely held by timber bracing or appropriate shoring/support, to avoid the danger of soil slides from collapsing. The excavated material should not be placed within 1.5 m or half of the depth of the pit whichever is more from edges of the trench/pit. Cutting should be done from top to bottom. Under no circumstances mining or under-cutting should be done.

- (e) Workers should not be exposed to the danger of being buried by excavated material or collapse of shoring. Measures to prevent dislodgment of loose or unstable earth, rock or other material from falling into the excavation by proper shoring shall be ensured.
- (f) The stability and safety of the excavation, adjacent structures, services and other works should be ensured.
- (g) All excavated area should be fenced off by suitable railing and installation of caution board to warn the persons from slipping or falling into the excavation pit/ mound.
- (h) All excavated areas shall have an illumination level of at least 20 lux for night work and a red danger light shall be displayed at prominent place near the excavation site to warn approaching traffic and men.
- (i) For removal of earth from an earth mound/excavated heap a written permission should be obtained from the engineer-in-charge of the work. As far as practical, earth should be removed mechanically. Wherever manual removal of earth is involved, earth should be removed from the top by maintaining a slope equal to the angle of re-pose of the earth. Such work should be constantly supervised to ensure that no under-cutting is done and to ensure that no person is trapped.
- (j) Dumping of excavated soil should be done at a specified area under proper supervision with respect to signaling, illumination and safety clearance.
- (k) It should be ensured that at a construction site of a building or other construction work, every vehicle or earth moving equipment is equipped with a) silencers, b) tail lights, c) power and hand brakes, d) reversing alarm e) search light for forward and backward movement, which are required for the safe operation of such vehicle or earth moving equipment and f) the cab of the vehicle or earth moving equipment is kept at least one meter from the adjacent face of a ground being excavated. g) indicator etc.
- (l) It should be ensured that when a crane or shovel is traveling, the boom of such crane or shovel is in the direction of such travel and the bucket or scoop attached to such crane or shovel is raised and without load, except when it is traveling downhill.
- (m) Before loading or unloading power trucks or trailers attached to tractors, the brakes should be applied and if vehicle is on a sloping ground, the wheels should be blocked. Handcart should not be used for the transfer of construction/erection materials in the construction

area. However if the exigency demands urgent transfer of light materials a small handcart may be permitted with the prior approval of the engineer-in-charge.

- (n) It should be ensured that at a construction site of a building or other construction work:
 - (i) All transport or earth moving equipment and vehicles are inspected at least once in a week by responsible persons and in case any defect is noticed in such equipment or vehicle, it is immediately taken out of service.
 - (ii) Safe gangways are provided for to and fro movement of building workers engaged in loading and unloading of lorries, trucks, trailers and wagons.
 - (iii) All earth moving equipment, vehicles or other transport equipment be operated only by such persons who are adequately trained and possess such skills as required for safe operation of vehicles or other transport equipment.
 - (iv) Trucks and other equipment are not loaded beyond their safe carrying capacity, which should be clearly marked on such trucks and other equipment.
 - (v) No unauthorised person rides the transport equipment employed in such work.
- (o) It should be ensured at a construction site of a building or other construction work that:
 - (i) A shovel or an excavator whether operated by steam or electric or by internal combustion used for such work is constructed, installed, operated, tested and examined as required under any law for the time being in force and the relevant national standards.
 - (ii) Buckets or grabs of power shovels are propped to restrict the movement of such bucket or grabs while being repaired or while the teeth of such bucket or grabs are being changed.
- (p) It should be ensured at a construction site of a building or other construction work that:
 - (i) An operator of a bulldozer before leaving – applies the brakes, lowers the blade and ripper and puts the shift lever into neutral.
 - (ii) A bulldozer is parked on level ground at the close of the work.
 - (iii) The blade of a bulldozer is kept low when such bulldozer is moving uphill.

- (iv) Bulldozer blades are not used as brakes except in an emergency.
- (q) It should be ensured at a construction site of a building or other construction work that:
 - (i) A tractor and a scraper are joined safely at the time of its operation
 - (ii) The scraper bowls are propped while blades of such scraper are being replaced.
 - (iii) A scraper moving downhill is driven in low gear.
- (r) It should be ensured at a construction site of a building or other construction work that:
 - (i) Before a road roller is used on the ground, such ground is examined for its bearing capacity and general safety, especially at the edges of slopes such as embankments on such grounds.
 - (ii) A roller is not moved down hill with the engine out of gear.
- (s) Vehicle carrying excavated material should have proper cover over the driver's cabin.

4.4 Safe Means of Access/Platforms

- (a) Adequate safe means of access and exit should be provided for all work places, at all elevations.
- (b) Suitable scaffolds should be provided for workmen for all works that cannot be done safely from the ground, or from solid platform except such short duration work that can be done safely from ladders. Bamboo/wooden scaffolding should not be permitted.
- (c) Where the platform for working is more than 3.5 m above ground, the width of the platform should be minimum 1 m.
- (d) Ladder should be of rigid construction having sufficient strength for the intended loads. Wooden/bamboo/rope ladders should not be permitted. All ladders should be maintained in good condition. The ladders should be fixed to the ground or rigid platforms. An additional person should be engaged for holding the ladder, if ladder is not securely fixed. Ladder shall be extended from floor to at least one meter above the platform.
- (e) A portable ladder should be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical). Ladders should not be used for climbing while carrying materials in hands. While climbing both the hands should be free.

- (f) Any working platform on scaffolding or staging more than 3.5 m above the ground or floor should have a guard rail attached, bolted, braced at least 1 m high above the floor or platform of such scaffolding or staging along with mid-rail.
- (g) The planks used for any working platform should not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks should be rigidly fixed at both ends to prevent sliding, slipping or tilting. The thickness of the planks should be adequate to take load of men and materials and should not collapse. Plywood or packing wood should not be used as planks.
- (h) The guardrail should extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing should have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging should be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder should conform to IS 3696 (Part 1): 1987 and (Part II): 1996.
- (i) Working platforms of scaffolds should have toe boards at least 15 cm in height to prevent materials from falling down.
- (j) A sketch of the scaffolding proposed to be used should be prepared and approval by the engineer-in-charge obtained prior to start of erection of scaffolding. All scaffolds should be examined by engineer-in-charge before use.
- (k) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level. They should have adequate width for easy movement of persons and materials and should be suitably guarded.
- (l) No single portable ladder should be used for access to a height of more than 4.5 m. For ladders up to 3m in length the width between styles (side bars)/width in the ladder should in no case be less than 300 mm. For longer ladders this width should be increased by at least 20 mm for each additional meter of length. Step/rungs spacing should be uniform and should not exceed 300 mm. Portable ladder should be used only for access to work place. In case work place is higher than 4.5 meters, pre-fabricated steel staircase should be used.

4.5 Work at Height

- (a) Person to work at height should be medically fit and should have height pass issued by safety section. (Appendix A Part A, B and C). Safety training should be imparted before working at height.

- (b) Safety work-permit system for working at height should be obtained from industrial safety section.
- (c) At elevated places, secure access and foothold should be provided. Adequate and safe means of access and exit should be provided at all work places for all elevations. Means of access may be portable or fixed ladder, ramp or a stairway. The use of crosses, braces or framework, as a means of access to the working platform should not be permitted.
- (d) Linear movement at height should be reduced to minimum. In case of such movement provision for anchoring the safety belt should be made.
- (e) Where barricades cannot be installed, a safety net of adequate strength should be installed close to the level at which there is a danger of fall of personnel/fall of objects.
- (f) In case where 'work at height' is on asbestos roof, crawling board, roof ladder should be used to walk across the asbestos roof.

4.6 Electrical Safety

- (a) All electrical installations shall comply with the appropriate statutory requirements given below and shall be subject to approval of the electrical engineer and safety officer.
 - (i) The Electricity Act, 2003
 - (ii) The Indian Electricity Rules 1956 (as amended in 2000)
 - (iii) The National Electricity Code 2008
 - (iv) Atomic Energy (Factories) Rules, 1996
 - (v) Other relevant rules of statutory bodies and power supply authority
 - (vi) Relevant standards of BIS

In addition to the above statutory provisions, the clauses indicated in this document shall also be complied.

- (b) It shall be the responsibility of the user seeking temporary power supply to indicate in writing, if any of the clauses (requirements noted in above regulations and in this document) are conflicting with each other and for which the user cannot decide the course of action regarding safe installation, commissioning, operation, maintenance and decommissioning of the electrical installations.

- (c) The electrical engineer and safety officer of the facility providing temporary power supply shall interpret the concerned conflicting clauses and approve in writing the safe course of action.
- (d) The Application Form-1 (Form-1A, 1B and 1C) as mentioned in Appendix-B should be submitted by the user for getting the temporary power supply.
- (e) After installation of temporary electrical panels, wiring works by the user, certificates as per Form-1D (Appendix-B) should be submitted to the provider.
- (f) Certificate of safety officer and authorisation of electrical engineer for energisation of temporary power supply should be filled as per Form-1E (Appendix-B).

4.7 Material Handling and Lifting Machines and Tackles

- (a) It should be made compulsory to supervise jobs like lifting/placing/loading/unloading/carrying/transporting etc. of heavy material by qualified supervisor having knowledge about hazards involved and precautions to be taken for such job.
- (b) The line managers should ensure that the material handling equipment used is adequate to handle the load.
- (c) Manual pulling of heavy equipment and trolley loaded with heavy material is not to be permitted.
- (d) Stacking and handling of heavy materials should be done on a firm ground to prevent settlement.
- (e) No lifting machine and no chain, rope or lifting tackle, except a fiber rope or fiber rope sling, shall be taken into use in any factory for the first time in that factory unless it has been tested and all parts have been thoroughly examined by a competent person. A certificate of such a test and examination specifying the safe working load or loads and signed by the person making the test and the examination has been obtained and is kept available for inspection.
- (f) Use of lifting machines and tackles should conform to relevant BIS requirements [IS 13367 (Part 1): 1992 Reaffirmed 2003, IS 4573: 1982 (Reaffirmed 2000) and IS 13834 (Part 1): 1994 Reaffirmed 2003 etc. The accessories and the attachments, anchorages and supports etc. should be ensured in healthy conditions by regular inspections at defined frequencies.
- (g) Every rope used in hoisting or lowering materials or as a means of suspension should be of good quality and adequate strength and free

from any defect. This should be ensured by regular inspection as per IS 2762: 1982- Specification for wire rope slings and sling legs (first revision).

- (h) Every crane operator or lifting appliance operator should be authorised. No person under the age of 18 years should be in charge of any hoisting machine or give signal to an operator of such machine.
- (i) In case of every lifting machine (and of every chain, ring, hook, shackle, swivel and pulley block used in hoisting or as a means of suspension) the safe working load should 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 should be clearly indicated. No part of any machine should be loaded beyond the safe working load except for the purpose of testing. This should be approved by the engineer-in-charge and head, industrial safety.
- (j) In case of facilities machines, the safe working load should be notified by the engineer-in-charge. As regards the contractor's machines, the contractor should declare the safe working load of the machine to the engineer-in-charge whenever he brings any machinery to site of work and get it verified by the engineer-in-charge, supported by a valid test certificate by the competent person.
- (k) Thorough inspection and load testing of lifting machines and tackles should be done in the presence of competent person at least once in every 12 months and records of such inspections and testing should be maintained.
- (l) No mobile crane should be allowed to move under live high-tension power transmission line.
- (m) While lifting loads, cranes should be located on level ground.
- (n) A thorough load analysis should be carried out before using cranes in tandem.
- (o) Motors, gear transmission, couplings, belts, chain drives and other moving parts of hoisting appliances should be provided with adequate safeguards. Hoisting appliances should be provided with such means, which will reduce the risk of any part of a suspended load becoming accidentally displaced or lowered.
- (p) It should be ensured that the cabin of the lifting machine in outdoor service:
 - (i) is made of fire resistant material,

- (ii) has a suitable seat, a footrest and protection from vibration,
- (iii) affords the operator an adequate view of the area of operation,
- (iv) affords the operator adequate protection against the weather, and
- (v) is provided with fire extinguisher.

4.8 Welding and Gas Cutting

- (a) Welding and gas cutting operations should be done by qualified and authorized persons only.
- (b) Safety work permit should be obtained (wherever necessary like presence of flammable or combustible material etc.) before flame cutting/welding is taken up.
- (c) Welding and gas cutting should not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures. In case the requirement cannot be avoided, specific approval and procedure should be ensured and adequate precautions should be taken.
- (d) Welding and gas cutting equipment including hoses and cables should be maintained in good condition.
- (e) Barriers should be erected to protect other persons from harmful rays from the work. When welding or gas cutting is done in elevated positions, precautions should be taken to prevent sparks or hot metal falling below on persons or combustible materials.
- (f) Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons should be provided to workers as protection from heat and hot metal splashes. Face shields with filter glasses of appropriate shade should be worn.
- (g) Adequate ventilation should be provided while welding, brazing and cutting the metals like zinc, brass, bronze, galvanised or lead coated material.
- (h) Welding and gas cutting on drums, barrels, tanks or other containers should be taken up only after ascertaining that they have been emptied, cleaned thoroughly and made free of flammable material.
- (i) Fire safety measures should be available as required near the location of welding/cutting operations.
- (j) Flash back arrestor should be provided with gas cutting and gas welding sets.

- (k) For electric (Arc) welding the following additional safety precautions should be taken:
 - (i) When electrical welding is undertaken the return lead of welding machine should be directly connected to the job invariably.
 - (ii) Provision must be in place in electric welding machine to prevent physical contact with live parts.
 - (iii) The welding cables and power cables should be routed separately to avoid entanglement.
 - (iv) The electric welding set should have suitable earth connections. There should be an electrical isolation device in the input power supply side on the welding machine.
- (l) Double gauges should be used for all gas cylinders used for cutting/welding. Pressure gauges/regulators should be in healthy condition.

4.9 Rotary Cutters/Grinders

- (a) All portable cutter/grinders should be provided with the wheel guard in position.
- (b) Grinding wheels of specified diameter only should be used on all grinders in order to limit the prescribed peripheral speed.
- (c) In pedestal grinder, the gap between tool rest and grinding wheel should be maintained less than 3 mm.
- (d) Goggle/face shield should be used during grinding operation.
- (e) No grinding wheel should be used after its expiry date.
- (f) Ear muff/ear plug should be used during the welding/cutting jobs.
- (g) Portable appliances, which are powered by single phase AC supply, shall be provided with three-core cable and three pin plug, otherwise the whole body should be double insulated.
- (h) Safety work permit should be obtained (wherever necessary like presence of flammable or combustible material etc.) before grinding is taken up.
- (i) Fire safety measures should be available as required near the location of grinding operations.

4.10 Concrete Mixing Equipment

- (a) Cement bags should be stacked on wooden planks in dry and leak proof area, 150 mm to 200 mm from the floor and 450 mm away

from walls. Height of the stack should not be more than 15 bags or 1.5 meters whichever is lower. Width of the stack should not be more than 4 bags or 3 meters. Lateral loading of the walls of the storage room by stacking should not be permitted. Stacking of the bags should not be used as a working platform.

- (b) Shuttering and supporting structures should be of adequate strength and approved by engineer-in-charge. This should be ensured before concrete is poured.
- (c) If the mixer has a charging skip the operator should ensure that the workmen are out of danger before the skip is lowered.
- (d) Adequate walking platforms (as per the AERB directives) are to be provided in the reinforcement area to ensure safe walking for pouring concrete on the roof.
- (e) When workmen are working/cleaning the inside of the drum of mixer, the power of the mixer should be switched off and “Do not operate” tag should be provided. The plant operation and cleaning of mixing pan should be carried out as per equipment supplier’s instructions.
- (f) Interlocks between the cover and the mixer rotor shall be established to ensure that the agitator does not start when the cover is in open condition.
- (g) It should be ensured that moving parts of the elevators, hoists, screens, bunkers, chutes and grouting equipment used for concrete work and of other equipment used for storing and transporting of ingredients of concrete are securely fenced to avoid contact of workers with such moving parts.
- (h) It should be ensured that screw conveyors used for cement, lime and other dusty material are completely enclosed.
- (i) Workers engaged for handling bulk cement in a confined place should be provided with tight fitting goggles, approved respirators and protective clothing, which will fit snugly around the neck, wrist and ankles.
- (j) The following should be ensured for every pipe carrying pumped concrete:
 - (i) The scaffolding carrying a pipe for pumped concrete should be strong enough to support such pipe at a time when such pipe is filled with concrete or water or any other liquid and to bear safely all the building workers who may be on such scaffold at such time.

- (ii) Securely anchored at its end point and each curve on it.
 - (iii) Provided with an air release valve near the top of such pipe; and securely attached to a pump nozzle by a bolted collar or other adequate means.
- (k) The following should be ensured while using the electric vibrators in concreting work at a construction site of a building or other construction work such that:
- (i) Such vibrators are earthed.
 - (ii) The leads of such vibrators are heavily insulated.
 - (iii) The current is switched off when such vibrators are not in use.
- (l) For obtaining a clearance for first pour of concrete and regular operation of ready mix concrete (RMC) plant, checklist given in Appendix-C shall be submitted to AERB along with the application for clearance.

4.11 Painting

- (a) Appropriate breathing air respirators should be provided for use by the workers when paint is applied in the form of spray, or a surface having lead paint is dry rubbed or scraped.
- (b) Only the quantity of paint, thinner and polish required for the day's work should be kept at the work spot. Excess storage should not be permitted at the work spot.
- (c) Smoking, open flames or sources of ignition should not be allowed in places where paints, varnish, thinner and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national language and regional language, 'SMOKING - STRICTLY PROHIBITED' should be displayed in the vicinity where painting is in progress or where paints are stored. Symbols should also be used on caution boards.
- (d) All electrical equipment of paint storage room should be of explosion proof design. Suitable fire extinguishers/sand buckets should be kept available at places where flammable paints are stored, handled or used.
- (e) When painting work/hot resin mix is done in a closed room or in a confined space, adequate ventilation should be provided and ensured. In addition, suitable respirators should be provided. No portable electric light or any other electric appliance of voltage exceeding

24 volts should be permitted for use inside any confined space. Walkie-talkie or other means of communication should be provided. Rescue arrangement like full body harness with lifeline, tripod with pulley and extra BA sets should be available.

- (f) The workers should use PVC gloves and/or suitable barrier creams to prevent the skin contact with Epoxy resins and their formulations used for painting.

4.12 Demolition

- (a) Before any demolition work is commenced and also during the progress of the work, all roads and open area adjacent to the work site should either be closed or suitably cordoned. Appropriate warning signs should be displayed for cautioning approaching persons/vehicles.
- (b) Before demolition operations begin, it should be ensured that all the service lines are de-energized.
- (c) Persons handling demolition operations shall use appropriate PPE.
- (d) All demolition operations should be carried out with safe and duly approved procedures which shall include following but not limited to:
 - (i) No masonry/material should be permitted to fall in such masses or volume or weight so as to endanger the structural stability of any floor or structural support.
 - (ii) No wall, chimney or other structure or part of a structure is left unguarded in such a condition that it may fall, collapse or weaken due to wind pressure or vibration.
 - (iii) No floor, roof or other part of the building should be overloaded with debris or materials as to render it unsafe.
- (e) After the demolition, the debris and other materials collected should be disposed safely and not permitted to be dropped freely.
- (f) Entries to the demolition area shall be restricted to authorised persons wearing safety helmets and safety shoes.

4.13 Traffic

- (a) All the vehicles moving at sites should conform and comply with the requirements of Motor Vehicles Act, 1988 and the Rules made there under. All the drivers/operators of vehicles should possess valid driving license as per Motor Vehicles Act, 1988 or its latest amendment.

- (b) The facility should conduct operations so as to interfere as little as possible with the use of existing roads at or near locations where the work is being performed. When interference to traffic is inevitable such as road cutting or transit unloading of heavy equipment etc. notice of such interference should be given to the engineer-in-charge and safety officer well in advance with the details of start of the work and time required.
- (c) A cleaner/assistant must be available for all heavy vehicles whenever vehicles move forward as well as in the reverse direction. All vehicles should be fitted with proper reverse horns, back view mirrors and indicator signals.
- (d) Facility should ensure that the assessment of the driver's visual ability is carried out as per Rule 55 of the Atomic Energy (Factories) Rules, 1996/guidelines of advisory committee on occupational health (ACOH), AERB or as per the latest amendments in statutes.
- (e) Effective speed breakers with yellow stripes on the roads to regulate the speed at the vulnerable points should be installed. Effective barricading with adequate caution signs should be placed to warn the vehicle drivers whenever the jobs are carried out on the road.
- (f) All vehicles moving at the site should have roadworthiness certificate issued by the concerned authority.
- (g) Special limit boards and caution boards indicating turns should be installed wherever necessary.
- (h) In general, the following maximum speed limits should be specified and implemented. Vehicles speed limits should be as per Motor Vehicle Act or 20 Km/h. Extra precautions and care should be exercised particularly during heavy material/equipment movements.
- (i) Safety awareness programmes should be conducted for all the drivers of the light, medium and heavy vehicles.

4.14 Work in Radiation Area

The facility should follow the stipulated procedure under Atomic Energy Radiation Protection Rules, 2004 and AERB safety manual on 'Radiation Protection for Nuclear Facilities' (AERB/NF/SM/O-2) regarding work in the radiation area and other works related with radiography.

4.15 Work in and Around Water Bodies

- (a) When work is done at a place where there is risk of drowning, all necessary rescue equipment such as life buoys and life jackets should be provided and kept ready for use.

- (b) All necessary steps shall be taken for prompt rescue of any person in danger and adequate provision should be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work. Proper record of entry/exit to and from water bodies shall be maintained on shift basis and search operation shall be conducted as soon as any person is detected to be missing.
- (c) Caisson Work
 - (i) Safe means of access should be provided to the place of work in the caisson and adequate means should be provided to safely reach the top of caisson in the event of inrush of water
 - (ii) The work relating to construction, positioning, modification or dismantling of caisson shall be done under the supervision of a responsible person

4.16 Fire Safety

- (a) All provisions for fire safety shall be complied as per AERB safety standard on 'Fire Protection Systems for Nuclear Facilities' [AERB/NF/SS/FPS (Rev. 1)].
- (b) All necessary precautions should be taken to prevent outbreak of fires at the construction site. It should be ensured that all hot work is carried out under valid work permit.
- (c) Combustible materials such as wood, cotton waste, oil, coal, paints, chemicals etc., should be segregated and kept to the required bare minimum quantity at work place.
- (d) Containers of paints, thinners and allied materials should be stored in a separate room which should be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint should be kept covered or properly fitted with lid and should not be kept open except while using.
- (e) Adequate number of trained persons from approved fire training centre required to extend fire safety coverage should be ensured.
- (f) Fire extinguishers as approved by the engineer-in-charge/in-charge of fire station/safety-in-charge should be located at the construction site at appropriate places.
- (g) Adequate number of trained workmen in fire fighting who can operate fire extinguishers should be ensured.
- (h) Portable fire extinguishers with periodic inspection, maintenance and re-filling complying with the mandatory requirements should be ensured.

- (i) Availability of adequate water for fire fighting should be ensured.
- (j) Implementation of the provisions of various statutory licenses for storing gas cylinders, petroleum products, explosives etc. as per the relevant acts and rules should be ensured wherever required.

4.17 Environmental Safety

Relevant provisions of the state/central statutory authority regarding environment protection should be adhered to.

4.18 Public Protection

The Facility should make necessary provisions to protect the public. He should be bound to bear the expenses in defense of every action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of any precaution required to be taken to protect the public. He should pay for the any such damage and cost which may be awarded in any such suit, action or proceedings to any such person, or the amount, which may be fixed as a compromise by any such person.

4.19 Safety of Visitors

- (a) Visitors for the project shall be given health and safety induction before they are allowed in to the construction project. It shall include the minimum PPE to be used, hazards and risks at the work area, restricted areas of entry, emergency response arrangements, etc.
- (b) Visitors shall always be accompanied by one of the employees of the project site.
- (c) Visitors shall not be allowed in the hazardous areas unless they are competent and trained to work in such areas.

4.20 Housekeeping

- (a) It should be recognised that a proper place for everything and everything in its place is maintained for a good housekeeping.
- (b) The material required for immediate use only should be brought to the designated workplace and stacked properly and labeled suitably.
- (c) All work spots, site office and surroundings should all times be kept clean and free from debris, scrap, concrete muck, surplus materials and unwanted tools and equipment. A day-to-day collection and disposal of scraps/debris should be done safely at designated place.
- (d) Electrical cables, leads and hoses should be so routed as to allow safe traffic by all concerned. Cable should be preferably supported on the brackets fixed along the wall to maintain safe access. Wherever

routing on the floor cannot be avoided, care should be taken to ensure mechanical protection of these cables and safe access is not disturbed.

- (e) No material on any work place should be so stacked or placed or disposed off as to cause danger, inconvenience or damage to any person or environment.
- (f) All unused scaffoldings, surplus/scrap materials and equipment/ systems like temporary electrical panels etc. should not be allowed to accumulate and shall be removed from the premises at the earliest.
- (g) Accumulation of water/oil spillages on the floor or any other workplace should be avoided.
- (h) Proper aisle space marking should be provided in all workplaces.

4.21 Other Statutory Provisions

Notwithstanding the clauses in the above subsections, there is nothing in these clauses to exempt the Facility from the provisions of any other act or rules in force in the Republic of India. In particular, all operations involving the transport, handling, storage and use of explosives should be as per the standing instructions and conform to the Indian Explosives Act, 1884 and the Explosives Rules, 1983. Handling, transport, storage and use of compressed gas cylinders and pressure vessels should conform to the Gas Cylinder Rules 2004 and Static and Mobile Pressure Vessels (Unfired) Rules 1981. In addition, The Indian Electricity Act 2003 and Indian Electricity Rules 2005, the Atomic Energy Act, 1962, the Radiation Protection Rules, 2004, the Atomic Energy (Factories) Rules, 1996 and AERB safety manual on 'Radiation Protection for Nuclear Facilities' (AERB/NF/SM/O-2) should be complied with.

5. PERSONAL PROTECTIVE EQUIPMENT

5.1 General

Although the primary approach in any safety effort is that the hazard to the workmen should be eliminated or controlled by engineering methods rather than protecting the workman through use of personal protective equipment (PPE). Engineering methods could include design change, substitution, ventilation, mechanical handling, atomisation etc. Under those situations when it is not possible to introduce any effective engineering methods for controlling hazards, it is necessary that workman use appropriate type of PPE. For example, in construction work there is the possibility of a hand tool, a bolt, or some loose material to fall from an elevated level and striking the head of workman working below. It is therefore necessary that construction worker wear a safety helmet. It is for such situations, both the Factories Act 1948 and the Atomic Energy (Factories) Rules, 1996 have provisions for use of appropriate type of PPE.

It is thus recognised that use of PPE is an important and necessary consideration in the development of a safety programme. Once the safety professional decides that PPE is to be used by workmen, it is essential to select right type of PPE and management should ensure that workman uses it and also PPE is correctly maintained.

5.2 Personal Protective Equipment (PPE)

- (a) All personal protective equipment as considered necessary should be made available for the use of the persons employed on the site and maintained in a condition suitable for immediate use. Also adequate steps should be taken by engineer-in-charge to ensure proper use of PPE.
- (b) All the PPEs in use should be as per relevant IS standards as referred in the AERB safety guidelines on 'Personal Protective Equipment' (AERB/SG/IS-3).
- (c) All persons employed at the construction site should use safety helmets. Safety helmet should be with BIS mark and should have its headband with back support and chin strap.
- (d) Workers employed on mixing asphaltic materials, cement and lime mortars should use protective goggles, protective foot wears, hand gloves and respirators as required.
- (e) Persons engaged in welding and gas-cutting works should use suitable welding face shields. The persons who assist the welders should use suitable goggles. Protective goggles should be worn while chipping and grinding.

- (f) Stonebreakers should use protective goggles. They should be seated at sufficiently safe distances from one another.
- (g) Safety goggles should be of shatterproof type and with zero power.
- (h) Persons engaged in or assisting in shot blasting operations and cleaning the blasting chamber should use suitable gauntlets, overalls, shatterproof and dust-proof goggles and self contained breathing apparatus set.
- (i) All persons working at heights more than 3.5 m above ground or floor and exposed to risk of falling down should use full body harness safety belts, unless otherwise protected by cages, guard railings, etc. In places where the use of safety belts is not feasible, suitable net of adequate strength fastened to substantial supports should be used.
- (j) When workers are employed in sewers and inside manholes that are in use, it should be ensured that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the space should be checked for the presence of any toxic gas or oxygen deficiency by a competent person and recorded in the register before the workers are allowed to get into the manholes. A pilot team should enter the area donning self contained breathing apparatus (SCBA). The manholes opened should be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There should be proper illumination in the night. Depending upon the work situation, the facility should provide PPE including the SCBA as recommended by Head, industrial safety.

6. MEDICAL MANAGEMENT

6.1 General

- (a) The facility management/contractor shall make arrangements for the first aid and medical services for the injured or ill persons for prompt attention or aid.
- (b) The arrangement can be made by the contractor or an agreement can be in vogue with the facility .
- (c) The medical facilities at first-aid centre shall be adequate to immediately cater to the injured based on the hazard potential and probable severe injuries.
- (d) The first aid centre shall be provided with the adequate equipment and medicines for catering to the site requirements. The first aid centre shall be manned depending on the working hours/on round the clock shift basis. The services of at least one qualified medical practitioner (medical officer) shall be made available by the Facility management/contractor.

6.2 Medical Facilities

- (a) Medical facilities conforming to the provisions of the Atomic Energy (Factories) Rules, 1996 should be provided at all work sites.
- (b) The requisite medical facilities in the form of a well-equipped first aid centre manned by qualified nursing personnel should be provided at all work sites. Contractor may avail this facility as per terms and conditions of the contract.
- (c) In addition, well-maintained first aid boxes should be kept at each location of the work by the Facility/contractor and availability of the personnel trained in first aid should be ensured.
- (d) A manned and equipped ambulance should be available at work site during the working hours/on round-the-clock shift basis.
- (e) It should be ensured by the occupier that occupational health monitoring of contract workers is carried out as per provisions of the Factories Act 1948 as per the latest amendment and the stipulations/directions given by Atomic Energy Regulatory Board from time to time.
- (f) Display of emergency contact numbers of important persons and hospitals and route map of site shall be maintained at designated places.

6.3 Medical Management of Serious Injuries

- (a) In case of serious injuries, the injured should be shifted to the nearest first-aid centre at site immediately. The opinion of medical officer/certifying surgeon should be sought immediately for medical management.
- (b) After providing the first aid treatment the injured should be shifted to designated medical facility of the site/hospital for further medical assistance, in an ambulance along with a nursing attendant.
- (c) The doctor at the medical facility of the site/hospital attending the case shall assess the extent of injuries and render immediate medical aid. If the situation warrants trauma/special care the injured shall be shifted to the referral hospital, having all the requisite facilities for specialised treatment in ambulance along with a medical attendant.
- (d) A list of such referral hospitals for specialised medical management facilities for the injured persons should be available with the project management/Head, industrial safety and Head, medical services of the site for ready reference.

APPENDIX-A

APPLICATION FOR HEIGHT PASS

PART- A

Group/Section: _____

Agency: _____

1. Applicant's Name : _____
2. Facility 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 required for work at _____ m. Height
10. Description of present job : _____
11. Previous experience of working at height :

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

12. Does the applicant suffer from any of the following ailments? (If yes details to be given):
 - (a) Blood pressure _____ (b) Epilepsy _____
 - (c) Flat foot _____
 - (d) Frequent headache or reeling sensation _____
 - (e) Mental depression _____ (f) Limping gait _____
 - (g) Aerofobia _____

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 m 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 and signature or loss time injury (L.T.I) incase he cannot sign. In case of LTI an authorised person shall explain each point/item to the individual and certify on that 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)

Countersigned by:

Section Head (Facility)

PART- B

MEDICAL FITNESS CERTIFICATE

Certified that I, Dr. _____ have examined Shri _____
_____ aged _____ on (date) _____ 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 eye sight is normal
with/without glasses. In my opinion, Shri _____ is physically
and mentally fit for working at height.

Details of examinations are given below:

Personal attributes:

1. Height: _____
2. Chest: _____
3. Weight: _____
4. Hearing: _____
5. Sight: _____
6. Skin: _____
7. Heart beating: _____

Medical aspects:

1. Urine: _____
2. Blood pressure: _____
3. Epilepsy: _____
4. Flat foot: _____
5. Frequent headache
or reeling sensation: _____
6. Mental depression: _____
7. Limping gait: _____
8. Aerophobia: _____

Name:

Sign :

Rubber Stamp of
Medical Practitioner
with Reg. No.

Signature of workman:

PART-C

INDUSTRIAL SAFETY SECTION

(Considering the above medical certificate, the applicant has appeared on the following practical tests conducted by industrial safety section and the results are given below (strike off whichever is in-applicable)

- (a) Wearing a safety belt and tying the rope knot : Pass/fail
- (b) Walking over a horizontal structure at 3 m. height wearing a safety belt : Pass/fail
- (c) General physique (OK/Not OK)

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

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

Date:

Name:

Sign.:
Scientific Assistant (Safety)

Safety Officer

APPENDIX-B

FORM - 1

APPLICATION FOR TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION [Prescribed under clause 4.6(d)]

1.	Name and address of user.	
2.	Reference of tender or work order (if applicable)	:
3.	Name & designation of tender/work order issuing authority.	:
4.	Power supply application number [†]	:
5.	Name and designation of tender/work order/work supervising authority (engineer-in-charge).	:
6.	Expected date of commencement of temporary supply	:
7.	Expected date of decommissioning of temporary supply	:
8.	Voltage level (LV/MV/HV)	
9.	Type of connection (1Ph/3Ph)	
10.	Connected load (Kw)	
11.	Maximum demand (KVA)/Power factor	
12.	Single line diagram* of proposed power distribution scheme along with equipment data sheet (downstream installation after point of connection).	Enclosed (Form-1A)/Not enclosed
13.	Name of overall supervisor and available qualified Staff	Enclosed (Form-1B)/Not enclosed
14.	Auxiliary equipment data sheet (meters, fire extinguisher, first aid box etc)	Enclosed (Form-1C)/Not enclosed
15.	Name and designation of provider's representative to whom the application is addressed.	:
16.	Name and designation of authorized signatory of user, who had submitted this application	:

[†] Power supply application number shall be different for same user with multiple applications for temporary supply

* All the drawings and tables shall be signed by user's representative indicated against 16 above.

Signature of authorised signatory of user

Signed endorsement of work order
supervising authority indicated
against 5 above.

**EQUIPMENT DATA SHEET FOR OBTAINING TEMPORARY POWER
SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING
CONSTRUCTION**

(Prescribed against item-12 of form-1)

Name and address of user:

Power supply application

Number:

Amendment No:-

References:- Single line diagram (SLD) of the power distribution scheme with all equipment details (Attach the SLD)

1. Identity	2. Type	3. Make & model	4. Manufacturer's S.No	5. Fixed/ Portable	6. Size	7. Last used date	8. Last test date	9. Latest test data	10. Rating

Signature of authorised signatory of user

Explanation of column headers:

1. Identity:- Identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/CB/MCB/MCCB/ELCB/transformer/lightning arrestor/earthing station/earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- Equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative e.g. length for cables or all dimensions if heavy equipment like transformer.
7. Last used date. date of last use else NEW
8. Last test date. latest test date by user or by manufacturer if NEW
9. Latest test data:- IR, HV, resistance, functional test data depending upon the type of equipment as desired by provider's representative.
10. Rating:- name plate rating of equipment like voltage, current, power (apparent, active, reactive), IP of enclosure, size(cable cross section) etc. depending upon the type of equipment and as desired by provider's representative.

FORM - 1B

**STAFF DATA SHEET FOR OBTAINING TEMPORARY POWER SUPPLY
AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION
(Prescribed against item-13 of form-1)**

Name and address of user:

**Power supply application
Number:
Amendment No:-**

1. Name	2. Address	3. Tel.No.	4. Responsibility	5. Certification detail	6. Resuscitation training	7. Expe- rience	8. Other relevant training	9. Signature

Signature of authorised signatory of user

Explanation of column headers:

1. Name:- Name of agency/person
2. Address:-
3. Tel No:- regular, alternate and emergency telephone numbers
4. Responsibility:- whether responsible for installation, operation, maintenance, overall supervision etc. overall supervisor shall be indicated specifically.
5. Certification detail:- (a) type of certification e.g wire man license, electrical supervisor license, electrical contractor license, diploma in electrical engineering, degree in electrical engineering etc. (b) certifying agency e.g. state PWD, central PWD, CEA, name of college/university etc. (c) certificate/license number with date. (d) valid up to date or next renewal date must for contractor/supervisor license.
6. Artificial resuscitation training:- indicate YES/NO if the staff is trained to apply artificial resuscitation technique.
7. Experience.:- number of years of experience.
8. Other relevant training :- any other training in electrical/safety course. Indicate name of training, duration (days/months), training providing agency.
9. Signature:- original signature of individual.

**AUXILIARY EQUIPMENT DATA SHEET FOR OBTAINING
TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY
AT WORK SITE DURING CONSTRUCTION
(Prescribed against item-14 of form-1)**

Name and address of user:

**Power supply application
Number:
Amendment No:-**

Reference:- Layout drawing No. / _____

1. Identity	2. Type	3. Make and model	4. Manufacturer's S. No	5. Fixed/ Portable	6. Size	7. Last used date

Signature of user's representative

Explanation of column headers:

1. Identity:- identification mark/number/tag of equipment in layout drawing.
2. Type:- earthing rod/megger/multi meter/earth resistance meter/fire extinguisher/s and bucket/first aid box/resuscitation chart/rubber mat etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative.
7. Last used date. NEW for new equipment. NA for passive devices like chart/mat etc.

FORM-1D

[Prescribed under clause 4.6(e)]

Name of user agency

Power supply application number:-

CERTIFICATE BY THE LICENSED ELECTRICAL CONTRACTOR

Certified that subject installations have been carried out by us or checked by us and is in accordance with I.E. Rules. The documents submitted with subject temporary power supply application (Form-1) is verified by us and the complete installation confirms to these documents.

We shall periodically inspect/check the installation so that no unsafe situation arises during use of this temporary power supply system. We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of licensed electrical contractor

Rubber seal of licensed electrical contractor

Date

CERTIFICATE BY THE USER

Certified that my/our installations have been carried out in accordance with the I.E. Rules and that I/We have employed competent agency/staff to handle the installations which is strictly as per the staff data sheet submitted in Form-1B.

We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of user

Name of signatory

Date

FORM -1E

[Prescribed under clause 4.6(f)]

CERTIFICATE BY THE SAFETY OFFICER

Certified that I have inspected the electrical installation referred here in after satisfying myself about the safe condition of the installation, I hereby recommend that the service connection be given to the contractor.

Signature of the safety officer

Name:

Date:

AUTHORISATION BY THE ELECTRICAL ENGINEER

The subject power supply application along with completed installation, necessary certificates (as per Form-1 of Appendix-B) is scrutinised by us. The proposal found to be in order and the installation can be energised on _____ in presence of your designated overall supervisor as indicated in Form-1B. Enclosed herewith the test report data sheet Form-1F. You are requested to carry out the periodic testing of equipment and submit the test report periodically as per this form.

Signature of the electrical engineer
of provider

Name of signatory

Date

FORM - 1F

**TEST/MAINTENANCE REPORT DATA SHEET OF EQUIPMENTS OF
TEMPORARY POWER SUPPLY SYSTEM AT WORK SITE DURING
CONSTRUCTION
(Prescribed against form-1E)**

Name and address of user:

Power supply application

Number:

Amendment No:-

1. Identity	2. Type	3. Last tested date	4. Next due date of any test	5 Frequency of IR test	6 Frequency of HV test	7. Frequency of earth resistance test	8. Other tests

Signature of electrical engineer of provider

Explanation of column headers:

1. Identity:- identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/ CB/ MCB/ MCCB/ ELCB/transformer/lightning arrestor/earthing station/earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Last test date: - latest test date indicated in Form-1A.
4. Next due date of any test:- as worked out by frequency of tests indicated in subsequent columns.
5. Frequency of IR test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
6. Frequency of HV test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
7. Frequency of earth resistance test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
8. Other tests: - name and description of any other essential tests/maintenance activity and required frequency depending upon type of equipment and location of installation. NA if not required after installation.

APPENDIX-C

CHECKLIST FOR OPERATION OF READY MIX CONCRETE (RMC) PLANT

(To be submitted to AERB along with application for construction consent and a copy to be retained by site)

(Verifiable documents like supplementary checklists, work sheets, spread sheets etc. should be maintained for each item of the checklist wherever relevant)

Serial No.	Points to be Checked	Remarks
1.0	Prior to Installation of the RMC Plant	
1.1	Whether acceptance report on healthiness of the pre-identified critical plant equipment like concrete mixer, pumps, programmable logic controllers, conveyors, etc. prior to installation available ?	
1.2	Whether approval for the location of the plant site after evaluation and review by project management available ?	
1.3	Whether review of the vendor documents like operation and maintenance manual, vendor specifications, safety manual, etc. of contractor carried out by project management ?	
1.4	Whether job hazard analysis reports, erection procedures, checklists for critical activities available ? Are the operators aware of it ?	
1.5	Whether adequate number of line managers/supervisors/operators for carrying out the jobs safely are identified and availability is ensured ?	
1.6	Whether safety surveillance requirements of construction activities both by contractor and facilities clearly spelt out?	
1.7	Whether adequate work control measures like construction permit, safety work permit system, height pass system, etc. for safe job performance are available ?	
1.8	Whether any facilities officer is assigned the responsibility of the RMC Plant ?	
2.0	Commissioning/Operation of RMC Plant	
2.1	Whether reports on healthiness of material handling equipment like hoists, belt conveyors, buckets, hoses, including electrical equipment etc. are available ?	

APPENDIX-C (CONTD.)

CHECKLIST FOR OPERATION OF READY MIX CONCRETE (RMC) PLANT

Serial No.	Points to be Checked	Remarks
2.2	Whether machine guards for pulleys, power shafts, rollers, etc. are available ?	
2.3	Whether availability of safe operating procedures, emergency procedures, process diagrams, power supply diagrams, details of interlocks, operation & maintenance manual (provided by supplier/vendor) ensured ?	
2.4	Whether adequate number of qualified, trained and experienced operators for safe operation of the plant including mechanism/method of operational control and command available ?	
2.5	Whether periodic surveillance programme for equipment, logics, interlocks, process parameters, trips, noise and illumination levels, etc. and measures to take corrective actions are available ?	
2.6	Whether periodic checks are carried out to ensure display of all interlocks and warning signals in PLC monitor ?	
2.7	Whether operations control measures like log sheets, work permits, procedures, instruction sheets, by-passing/jumpering trips, etc. are available ?	
2.8	Whether access to medical first-aid box & fire extinguishers, etc. available ?	
3.0	Operating/Working Areas	
3.1	Control Room	
3.1.1	Whether adequate information on process equipment and parameters, logics and control available ?	
3.1.2	Whether clear view of the plant from the control room to check entry of personnel into operating areas is available ?	
3.1.3	Whether availability of distinct window panels to distinguish process parameters, alarms and trips are verified ?	
3.1.4	Whether audio alarm is available in the field to give warning prior to starting of concrete mixer & conveyor belt ?	
3.1.5	Whether relevant operating and maintenance documents available and accessible ?	

APPENDIX-C (CONTD.)

CHECKLIST FOR OPERATION OF READY MIX CONCRETE (RMC) PLANT

Serial No.	Points to be Checked	Remarks
3.1.6	Whether operational controls preventing re-setting of operational parameters, trips by-passing, logic changes, etc. are available in control room ?	
3.1.7	Whether operational data and information logged chronologically indicating the status of equipment running & shutdown, maintenance works planned and taken up.	
3.1.8	Whether means of communication between operator and control room are available ?	
3.2	Aggregates Storage/Handling Areas	
3.2.1	Whether aggregates/materials stored separately in suitable weatherproof enclosures ?	
3.2.2	Whether routes for movement of vehicles clearly defined ?	
3.2.3	Whether reverse horns, rear view mirror, etc. on all dumpers/trailers/trucks are provided ?	
3.2.4	Whether machine guards for rotating/moving/conveying machines available in place ?	
3.2.5	Whether engineered noise control measures available in the crushing areas ?	
3.2.6	Whether usage of ear muffs for ear protection in noisy areas enforced ?	
3.2.7	Whether trip/emergency stop switch/pull cord mechanisms, etc. to the moving/rotating equipment like belt conveyors, crushers etc. are available and healthy ?	
3.2.8	Whether adequate dust control measures in working areas available ?	
3.2.9	Whether adequate illumination is provided in the working areas ?	
3.2.10	Whether safety/warning sign boards available to prevent persons approaching operating crushers/belt conveyors etc ?	
3.3	Storage Hoppers/Silos	
3.3.1	Whether suitable access with handrails to reach to the top of hoppers/silos provided ?	

APPENDIX-C (CONTD.)

CHECKLIST FOR OPERATION OF READY MIX CONCRETE (RMC) PLANT

Serial No.	Points to be Checked	Remarks
3.3.2	Whether proper walk ways with guard railing to access to different storage areas available ?	
3.3.3	Whether measures to prevent clogging of equipment like air fluidiser, etc. are available ?	
3.3.4	Whether controls and safety measures for feeders like belt conveyors to the silos/hoppers, etc. is available ?	
3.3.5	Whether dust suppression and noise control measures are in place ?	
3.3.6	Whether safety measures to enter into silos/hoppers for operation/maintenance requirements.	
3.3.7	Whether safe access for sampling locations/areas and procedure for collecting the samples are available ?	
3.4	Concrete Mixer Areas	
3.4.1	Whether safe access and working platform in mixing area provided ?	
3.4.2	Whether safe condition of the mixers, pumps, etc. used in the areas is ensured ?	
3.4.3	Whether proper identification tags for equipment, pipelines etc. are available ?	
3.4.4	Whether safe condition of the electrical equipment like local push buttons, panels, cables etc. ensured ?	
3.4.5	Whether adequate illumination in the working areas is ensured ?	
3.4.6	Whether interlocks of Mixers are in healthy state ?	
3.4.7	Whether sand bin is provided with electro-mechanical vibrator for easy material flow ?	
3.4.8	Whether warning signals to prevent persons approaching operating mixers in place ?	
3.4.9	Whether proper storage of admixtures to prevent freezing and availability of material safety data sheets for admixtures and other chemicals are ensured ?	
3.4.10	Whether collection trays have been provided under overhead conveyor belt to prevent fall of material ?	

APPENDIX-C (CONTD.)

CHECKLIST FOR OPERATION OF READY MIX CONCRETE (RMC) PLANT

Serial No.	Points to be Checked	Remarks
3.4.11	Whether the mixing cylinder/drum has emergency manual discharge facility ?	
4.0	Electrical Safety	
4.1	Whether proper isolating switches/isolators are provided for all equipment in the field as well as in control room ?	
4.2	Whether proper grounding/earthing arrangement for all electrical installations metallic structures and panel boards provided and recording of earth pit resistance values planned ?	
4.3	Whether fuses of adequate rating are available to limit overloading of circuits ?	
4.4	Whether earth leakage circuit breakers in all circuits are provided and tested periodically to ensure their healthiness ?	
5.0	Particulate Emissions	
5.1	Whether provisions of measurement of particulate emissions are available ?	
5.2	Whether actions to be taken in case of more visual emissions are available ?	
5.3	Whether methods to prevent/control spread of dust in working areas available ?	
6.0	General Requirements	
6.1	Whether emergency services like fire station, first aid, hospital etc accessible ?	
6.2	Whether specific line staff/supervisors for carrying out routine, special and emergency works with certain instructions and communications identified and trained ?	
6.3	Whether do's and don'ts while handling refrigerants like ammonia and admixtures used in concrete mixing displayed promptly ?	
6.4	Whether the use of personal protective equipment like helmet, safety belt, self contained breathing apparatus/canister, hand gloves, apron, face shield, safety shoes, gumboots etc. has been ensured ?	

APPENDIX-C (CONTD.)

**CHECKLIST FOR OPERATION OF READY MIX CONCRETE
(RMC) PLANT**

Serial No.	Points to be Checked	Remarks
6.5	Whether emergency procedures to be followed during ammonia leaks, fires, etc. are available ?	
6.6	Whether fire extinguishers are available at various critical locations ?	

PART-B
CONTROL OF WORKS
(CONTRACTORS)

7. INTRODUCTION

7.1 General

The Department of Atomic Energy (DAE) through its constituent units execute various site works either by their own manpower or by manpower of various outside agencies. The nature of contracts with outside agencies can be works contracts, engineering procurement contracts, purchase contracts, minor fabrication contracts etc. These site works involve entire gamut of conventional industrial activities like excavation, rock blasting, earth handling, construction, material handling, fabrication, installation, operation, maintenance etc. of nuclear or conventional plants/facilities. This is a challenging responsibility for the contractor due to the complexity of problems like quality of workforce (which may be unskilled, illiterate, migratory) available for labor-intensive jobs, lack of coordination among agencies at site, lack of safety awareness among concerned authorities, time schedules of project etc. As a principal employer, facility management shall be responsible to ensure health and safety of all personnel engaged for the work. In this process, the contractor through his established measures shall ensure that the guidelines are implemented. However the facility management shall monitor the compliance with the provisions outlined in the guidelines through periodic supervision and review. Any accidental injury or loss of life is detrimental to the facility as well as the society. This 'guidelines' covers the safety organisation and the safety management system requirements in sections two and three. The work specific safety precautions are covered in section four. The requirements relating to personal protective equipment and medical management are covered in sections 5 and 6.

7.2 Objective

This 'guidelines' has a basic framework of industrial safety organisation, safety management systems, safe work procedures to maintain a safe working environment for all personnel and to prevent any unsafe condition/act endangering the life of personnel engaged for industrial activities. The major objectives of this 'guidelines' are:

- (i) To create awareness among workers about industrial hazards and safe working procedures.
- (ii) To lay down safe work procedures and systems to be followed for different type of industrial activities.
- (iii) To establish a robust safety management system.
- (iv) To protect the health and ensure the safety of the workers from industrial activities.

7.3 Scope

This 'guidelines' is essential for implementation and assurance of conventional safety in areas such as industrial, chemical, electrical, fire, environmental and is applicable for all works executed through contracts, like engineering procurement contract, minor fabrication contract etc. Where the execution of work is envisaged in radiation controlled area or involves handling and fabrication of any nuclear material, additional precautions noted in relevant AERB safety documents on radiation protection shall also be applicable.

8. SAFETY ORGANISATION

8.1 General

- (a) Construction projects have significant health and safety hazards, which need to be managed systematically since the project inception stage to achieve incident-free completion of jobs. Contractor should have well-defined safety organisation which helps in effective implementation of safety management systems and ensures health and safety of workers.
- (b) The top management of contractor should assure that all the provisions of relevant Acts & Rules are conformed to.
- (c) Safety organisation should carry out safety surveillance, safety training, safety enforcement measures, safety audit etc. related to all works to fulfill the overall safety requirements of this 'guidelines'.
- (d) Safety functionaries should be exclusively assigned with the work related to protection of health and safety of workers.
- (e) IS: 18001: 2007 gives detailed requirements of health and safety management system requirements. IS: 15793 gives requirements of good practices for managing environment, occupational health and safety legal compliance. This 'guidelines' prescribes requirements in addition to IS: 18001:2007 and IS: 15793 and gives guidelines on implementing these specific to a construction project.
- (f) The requirements prescribed in various central and state regulations including *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996* and rules framed thereunder with respect to managing health and safety in construction projects, shall be complied with.

8.2 Organisational Structure for Safety Management

- (a) The Contractor shall deploy qualified and experienced line management personnel for supervising the jobs to be carried out safely by workers. In order to oversee the industrial and fire safety aspects during execution of hazardous jobs (listed out in para 9.11) by the contractors, at least one safety supervisor with the qualifications and experience mentioned in Table -2 shall be in place irrespective of the man power deployed by the contractor.
- (b) The qualification, experience and the minimum number of safety professionals to be deployed by contractor shall be as per the following table:

TABLE-2 : QUALIFICATION, EXPERIENCE AND NUMBER OF SAFETY PROFESSIONALS FOR CONSTRUCTION PROJECTS

Category of safety person	Mandatory requirement	Qualification
Safety officer	<p>One in each shift (minimum) up to 1000 workers.</p> <p>If number of workers in a shift (including contractor's workers) exceeds 1000, additionally one safety officer should be deployed for every 1000 workers or part thereof.</p>	<p>Degree in engineering/ technology and diploma in industrial safety with minimum two years of experience</p> <p>or</p> <p>Diploma in engineering with diploma in industrial safety with minimum 6 years experience</p> <p>or</p> <p>A recognised degree in physics or chemistry and has practical experience of working in a factory in a supervisory capacity for a period of not less than 5 years.</p> <p>Notwithstanding the provision contained in the above criteria any person who</p> <p>(i) possesses a recognised degree or diploma in engineering or technology and has had experience of not less than five years in a department of the central or state government which deals with the administration of the Factories Act, 1948 or the Dock Workers (safety, health and welfare) Act, 1986 (54 of 1986)</p> <p>or</p> <p>(ii) Possesses a recognised degree or diploma in engineering or technology and has had experience of not less than 5 years, fulltime on training, education, consultancy, or research in the field of accident prevention in industry or in any institution, shall also be eligible for appointment as a safety officer:</p>

TABLE-2 : QUALIFICATION, EXPERIENCE AND NUMBER OF SAFETY PROFESSIONALS FOR CONSTRUCTION PROJECTS (CONTD.)

Category of safety person	Mandatory requirement	Qualification
		Provided that competent authority may, subject to such condition as it may specify, grant exemption from the requirement of this sub rule if in its opinion, a suitable person possessing the necessary qualification and experience is not available for appointment.
Safety supervisor	<p>One in each shift (minimum) up to 500 workers</p> <p>or</p> <p>One Supervisor for any hazardous job (listed in para 9.11) if, carried out by Contractor irrespective of number of workers.</p> <p>If number of persons working in a shift (including the contractors' workers) exceeds 500, additionally one safety supervisor should be deployed for every 500 workers or part thereof.</p>	Diploma in engineering and diploma in industrial safety

9. SAFETY MANAGEMENT

9.1 General

The construction agencies (contractors) shall be asked to submit a project specific health and safety plan (construction safety management plan) proposing the methodology for managing health and safety and their capability in completing the project in a safe manner.

9.2 Safety Policy

- (a) The facility and the construction agency jointly or separately shall have a written statement prescribing the health and safety policy of the organisation. The health and safety policy conveys the management commitment and intent of the organisation towards health and safety, its organisation and arrangements to ensure that the set objectives are met. It also provides a framework for establishing, maintaining and periodically reviewing health and safety objectives and targets.
- (b) Health and safety policy shall meet the requirements of *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996* and IS 18001.
- (c) The policy shall be communicated to all stakeholders through display and other means. The policy shall be displayed in local language(s) which may be understood by majority of the workmen.

9.3 Safety Plan

- (a) A project specific health and safety plan shall be developed by the contractor and approved by the facility. On approval by the facility, health and safety plan shall be reference document for implementation, control and monitoring of health and safety aspects of the project by the Contractor.
- (b) Project health and safety plan shall describe how the project specific health and safety objectives and targets shall be achieved. It shall define the road map for achieving the standards that an organisation lays down for itself so that efforts can be coordinated, synergized and monitored.
- (c) Health and safety plan shall explain the means of establishing a positive health and safety culture at the project site. Health and safety plan shall identify and enumerate the control measures to mitigate the risks to the project completion arising out of health and safety issues so that the project is allowed to proceed without interruption and executed as per schedule.

Salient aspects that may be covered in the project health and safety plan are:

- (i) Project specific health and safety objectives, targets and programmes in line with health and safety policy.
- (ii) Hazard identification and risk assessment
- (iii) Meeting legal and other requirements
- (iv) Health and safety organisation
- (v) Resources, roles, responsibility and authority
- (vi) General health and safety rules
- (vii) Health and safety requirements to be followed by sub-contractors
- (viii) Operation control procedure
- (ix) Activities requiring work permit system and its procedure
- (x) Management of traffic safety inside the project
- (xi) Access control of employees
- (xii) Safety of visitors
- (xiii) Management of critical activities such as work at height, material handling, working with plant and machinery, etc.
- (xiv) Safe handling of chemicals, explosives, gas cylinders, electrical equipment etc.
- (xv) Ensuring the competency and awareness of the workmen
- (xvi) Fire prevention and fire fighting plan
- (xvii) Emergency preparedness and response plan
- (xviii) Traffic management plan
- (xix) Training matrix
- (xx) Personal protective equipment matrix
- (xxi) Health and safety performance monitoring measures such as inspection and audit
- (xxii) Incident reporting and investigation procedure
- (xxiii) Proactive and reactive indicators of health and safety
- (xxiv) Reward and reprimand for health and safety performance
- (xxv) Checklist and formats.
- (xxvi) Health monitoring plan for employees/workers exposed to hazardous jobs.

- (d) The risk control measures identified shall meet the provisions of *Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996*, other legislations and provisions of various safety related standards.
- (e) Procedures shall be established for timely recording and reporting of information required for continual improvement of health and safety performance.

Internal reporting procedures shall cover:

- (i) Incident reporting
- (ii) Non-conformance reporting
- (iii) Health and safety performance reporting
- (iv) Hazard identification reporting

External reporting shall cover

- (i) Statutory reporting requirements

The recording of reporting of health and safety performance shall be clearly documented in the health and safety plan.

9.4 Roles, Responsibility and Authority

- (a) Contractor shall define, document and communicate the roles, responsibilities and authorities of all personnel who manage, perform and verify activities having an effect on health and safety risks. It shall also include subcontractors and visitors.
- (b) The line management personnel who are responsible for execution of activities are directly responsible for health and safety in the work under their control.
- (c) Health and safety group and health and safety officers are responsible for guiding the top management of their own organisation on health and safety issues and facilitating the implementation of health and safety in the project site. For duties and responsibilities of health and safety officers refer Atomic Energy (Factories) Rules-1996.
- (d) Health and safety supervisors shall be engaged to assist the health and safety officers in performing their duties.
- (e) Management shall provide adequate resources essential to effectively manage the health and safety management system requirements of the project.

9.5 Design and Engineering

- (a) Design drawings, construction methodology and plans shall be reviewed to determine whether any additional risks may arise during the construction due to the features in the design or methodology.

Attention shall be paid to:

- (i) Providing permanent hooks and loops for tying safety slings of workers
 - (ii) Providing holes or such arrangements to the structure to which safe working platforms and safety nets can be connected
 - (iii) Laying permanent slings, grab rails/bars to be used by the workers
 - (iv) Permanent provision for attaching railings
 - (v) Provision for alternative access to the trapped or distressed workers
 - (vi) Provision for communication
 - (vii) Design facilitating barricading of the area around work site without causing hindrance to building functional activities
 - (viii) Durability of such safety related permanent design integrated elements
 - (ix) Other safety practices required for the type of works involved
 - (x) Significant risks from construction materials, which cannot be avoided in the design.
- (b) Analysis of design and integration of safety measures, as described above, should be undertaken as value engineering through multi-stakeholder consultation, necessarily involving designers, owner/client, operation/maintenance management and construction agency.
- (c) While need for special work methodology and enabling infrastructure is considered to make conditions safe for construction, attention shall also be drawn to the safety during maintenance operations (including inspections which may be necessary before project commissioning as well as maintenance).
- (d) It shall also be ascertained whether it would be feasible (within the time and cost considerations) to erect necessary temporary enabling infrastructure. If, in the due assessment by the project manager, it is established that the design, as proposed, would continue to be unsafe during construction and maintenance operations unless special enabling infrastructure is created and work procedures specifically drawn, the design shall be reviewed.

9.6 Construction Planning

- (a) Prior to the start of construction work, detailed planning shall be carried out which may include:
 - (i) Identifying aspects of design that have bearing on health and safety during construction stage.
 - (ii) While scheduling the various activities of the construction, allowing adequate time to carry work in accordance with health and safety requirements.
 - (iii) Reviewing the proposed work method of various activities, identifying health and safety hazards of activities in the project and assessment of the risk level.
 - (iv) When the risk level is unacceptable, taking additional control measures including revision of the work methodology so that identified risk is at ALARP (As Low as Reasonably Practicable) level.
 - (v) Planning and establishing the facilities for implementation of health and safety such as workmen training facility, health centre for medical check-up and first aid, access control of employees, etc.
 - (vi) Ensuring that the temporary establishments at project site such as site offices, workmen camps, toilets, canteens and rest sheds, etc. are created meeting the requirements of the relevant statutes and standards.
- (b) Facility shall ensure that the construction agency has understood the challenges and has planned to meet the project specific health and safety requirement through appropriate competencies.
- (c) Health and safety measures need proper coordination by the construction agency and such efforts of the construction agency shall be reviewed, monitored and appropriately guided by the facility.
- (d) In respect of sub-contractors, project manager of the construction agency shall ensure that the sub-contractors meet the health and safety requirements of the project. Health and safety control and monitoring shall be established specific to the needs of the project.

9.7 Safety Communication

- (a) Procedures shall be established to communicate significant hazards and risks to and from employees and other interested parties. The health and safety hazards and risks may be communicated in the following ways:

- (i) Sharing of accidents case studies which occurred in the project site as well in other similar projects
 - (ii) Safety induction and orientation training
 - (iii) Health and safety posters and displays
 - (iv) Health and safety campaigns and competition involving the employees
 - (v) Sharing of results of the audits, inspections and other monitoring systems
 - (vi) Establishing a system for collecting feedback on health and safety from employees and other interested parties
 - (vii) Tool box meeting
 - (vii) Safety signage.
- (b) Health and safety communications addressed to workmen shall preferably be in local language(s) understandable by majority of the workmen.
- (c) The facility and construction agency shall jointly endeavour to promote a positive health and safety culture at the project. Top management of the organisations should exhibit a visible management commitment and felt leadership towards health and safety. This shall be achieved by participating in health and safety programmes such as:
- (i) Project health and safety committee meeting
 - (ii) Health and safety walk down
 - (iii) Including health and safety in all performance review meetings
 - (iv) Exhibiting a safe behaviour while at site.
- (d) The top management should clearly communicate that it considers safety as core value and it shall not allow it to get compromised. Such messages when it reaches down the level in the organisation enable to create a positive health and safety culture.

9.8 Safety Monitoring Programme

- (a) The objective of the safety surveillance programme should address assurance of effective implementation of safety measures in execution of works. Following surveillance programme should be in place at sites. The safety organisation should monitor, maintain record and follow up for corrective actions.

- (b) The surveillance programme should consist of identification of safety related deficiencies and status of corrections thereof, the implementation of protective measures, the safe work practices, human behavior etc.
- (c) Specific surveillance should be ensured with respect to testing of equipment, portable power tools, electrical equipment and tools, hand tools, surveillance of material handling equipment, transport equipment, earth moving equipment, gas cylinders, stores, etc. to comply with various statutory requirements.
- (d) Surveillance on safety awareness and training compliance including induction training, on the job training and refresher training, job specific pre-job briefing, job hazard analysis, etc. as per facility's guidelines should be ensured.
- (e) Safety related deficiencies (SRDs) shall be detected by any employees/worker of construction agency and communicated to the line manager for corrective actions. The corrective action shall be monitored and records shall be maintained.
- (f) Systematic updating of SRDs attended and pending should be made available by the contractor for verification of facility.
- (g) The health and safety performance monitoring and measurement procedures shall provide for:
 - (i) Both qualitative and quantitative measures appropriate to the project
 - (ii) Monitoring the extent to which project health and safety objectives are met
 - (iii) Proactive measures of compliance that measures compliance with health and safety plan, operational control procedures and legislation
 - (iv) Reactive measures of performance to monitor accidents, ill health, near misses and non-conformances
 - (v) Monitoring dangerous occurrences
 - (vi) Fire occurrences
 - (vii) First aid injuries.
- (h) Health and safety inspections shall be preferably conducted by a team of the concerned engineer, health and safety officer and area in-charge of the contractor.

- (i) The type of inspections that shall be carried out and the frequency shall be decided during the planning stage and documented in the project health and safety plan. The health and safety inspections should include:
 - (i) General site health and safety inspection
 - (ii) Electrical safety inspection
 - (iii) Plant and machinery inspection
 - (iv) Health and hygiene inspection
 - (v) Scaffolding safety inspection.
 - (vi) Portable tools and tackles
 - (vii) Lifting tools and tackles
 - (viii) Fire equipment inspections
 - (ix) Illumination level and noise level monitoring
- (j) Status of health and safety implementation shall be measured and monitored by several proactive indicators which include the following:
 - (i) Compliance level of project health and safety plan
 - (ii) Compliance level of health and safety observations with in the target date
 - (iii) Implementation status of training plan
 - (iv) Implementation status of corrective and preventive actions
 - (v) Compliance level of pre-employment medical checks and periodic medical checkups
 - (vi) Compliance level of legal and other requirements
 - (vii) Percentage of activities for which detailed project specific risk assessment is conducted.
- (k) Procedures shall be established to report, investigate and analyze incidents. The procedures shall involve:
 - (i) Members of the incident investigation team
 - (ii) Agencies to be reported in case of incidents
 - (iii) Time period within which incidents need to be reported
 - (iv) Methodology for investigation and determining the root cause of accidents.

These procedures shall form a part of the project health and safety plan and monitored on a regular basis for its effectiveness.

- (l) All incidents including near miss cases, accidents and dangerous occurrences shall be thoroughly investigated, direct and root causes determined and corrective action planned. Incidents may be analysed covering the following ways to prepare and implement an effective prevention plan:
 - (i) Body part injured
 - (ii) Age of the victims
 - (iii) Time of accidents
 - (iv) Causes of accidents
 - (v) Nature of injury.

For detailed guidelines on analysis of incidents and computation of injury rate refer IS 3786.

- (m) The following reactive health and safety indicators should be used to measure and monitor the health and safety performance of the project site:
 - (i) Number of near miss cases
 - (ii) Number of first aid cases
 - (iii) Lost time injury frequency rate
 - (iv) Lost time injury severity rate.
- (n) The health and safety performance of subcontractors shall be monitored on a regular basis and necessary directive and support shall be given to achieve the set health and safety objectives and targets.
- (o) All accidents leading to property damage/personnel injuries/fatal accident/near miss and dangerous occurrence should be reported to the facility's engineer-in-charge immediately
- (p) All 'near-miss' accidents should also be recorded/reported and investigated and recommendations arising out should be implemented on priority.

9.9 Training/Orientation

- (a) It shall be ensured that all employees are competent to perform the assigned work safely on the basis of appropriate education, training or experience. The competency requirements of different categories of employees shall be mapped and procedures shall be implemented to ensure that those deployed meet the competence requirements.

- (b) The objective of health and safety training shall be to equip the employee with necessary knowledge and skill to perform the work assigned to him in a safe manner, to foster continual improvement and to imbibe safety culture.
- (c) Preferably, the training should be carried out away from the working place of the participants to ensure focused attention on the training for both trainer as well as trainees.
- (d) After completion of training due procedure shall be followed for obtaining the feedback from the participants on the effectiveness of the training. Effectiveness of training imparted shall be monitored for continual improvement and necessary corrections in implementation.
- (e) The training/orientation programme should be implemented to meet the mandatory requirements. [Rule 43(2) (m) of the Atomic Energy (Factories) Rules 1996]. The training should be phased as follows:
- (f) Induction cum orientation training should include the overall safety aspects of the work and give a general overview of the various hazards, the particular activities and the do's and don'ts. As a part of training, workers should also be given demonstrations on use of personal protective equipment, first aid and fire-fighting equipment, fire mock drills, other emergency preparedness etc.
- (g) The line manager along with the safety representative should conduct pre-job briefing on day-to-day basis prior to specific hazardous jobs. This will make the workers aware of the hazards and the precautions to be taken.
- (h) Refresher training should be imparted to each worker at least once in a year.
- (i) A training schedule should be prepared by the construction agency and communicated to facility for concurrence.
- (j) Records of training, demonstration and pep talk should be maintained.

9.10 Permit to Work System

- (a) Activities requiring permit to work shall be decided before starting the construction and shall be suitably documented in the project health and safety plan. Some of the activities which shall require permit to work are:
 - (i) Excavation
 - (ii) Entry into confined spaces
 - (iii) Electrical work (HV/LV)

- (iv) Opening manholes, covers and grills
- (v) Blasting operation
- (vi) Hot work
- (vii) Work on plant and machinery and other power driven equipment
- (viii) Working at height
- (ix) Working at night
- (b) The contractor should establish a permit to work system for any other hazardous activity, which it feels necessary to be controlled administratively for safe execution.
- (c) Contractor should obtain valid safety work permit before carrying out any hazardous job and shall maintain a copy of it with him through out the period of his work. Record of safety work permit should be maintained in a systematic manner. All the safety conditions and requirements stipulated in the safety work permit should be ensured strictly.
- (d) Contractor should ensure that only authorized personnel are deployed for hazardous works/jobs (refer item 3.11 for hazardous job) and provide facilities for the same.

9.11 Job Hazard Analysis

- (a) It should be ensured by contractor that a safe work procedure exists for all the hazardous jobs as mentioned hereunder and the requirements of the safety procedures are ensured at the work sites. Job hazard analysis (JHA) should form a part of such safe work procedures. A checklist based on JHA should be prepared. This checklist should be crosschecked by the line managers and verified by safety officer.

Typical list of jobs requiring job hazard analysis (This list is illustrative only and not exhaustive) is as follows:

- (i) Excavation
 - (a) Blasting including under water blasting
 - (b) Earth and stone removal/backfilling/dumping of earth/stones
 - (c) Any excavation more than 1.8 m depth.
- (ii) Work at height (working beyond 3.5 meters above ground)
 - (a) Erection and dismantling of scaffolding, platforms, shuttering/de-shuttering work

- (b) Dome work, rod bending, construction of chimney and cooling towers
- (c) Working on tower crane.
- (iii) Materials and material handling
 - (A) Critical equipment handling e.g.
 - (a) Calandria
 - (b) Steam generators
 - (c) Turbine generator components
 - (d) Diesel generator set
 - (e) Generator stator
 - (f) End shields
 - (g) Fuelling machines components
 - (h) Heat transport pumps etc.
 - (B) Hazardous chemical handling e.g.
 - (a) Acids and alkalis
 - (b) Ammonia
 - (c) Chlorine
 - (d) Freon
 - (e) Hydrazine
 - (f) Hydrogen sulphide
 - (g) LPG
 - (h) Morpholine
 - (C) Movement of heavy material by crane
 - (D) Movement of tractor trolley on slopes
 - (E) Manual lifting of heavy material to height
 - (F) Erection of heavy machinery, equipment.
- (iv) Electrical connection
 - (a) Field connection for electrical installation
 - (b) Installation of lighting fixtures
 - (c) Charging of electrical system
 - (d) Charging of transformer, switch yard, switch gears
 - (e) Working near high voltage lines
 - (f) Use of portable electrical tools.

- (v) Equipment/structural erection work
 - (a) Material handling
 - (b) Loading and unloading
 - (c) Transportation of material from one place to other
 - (d) Steel fabrication and erection
 - (e) Cleaning and maintenance of batching plant equipment.
- (vi) Finishing/painting work
 - (a) Painting at height
 - (b) Painting in confined space.
- (viii) Other specific work
 - (a) Work with pneumatic tools/compressed air
 - (b) Work on pressure vessels/lines
 - (c) Work in the vicinity of steam lines
 - (d) Work in high enthalpy area
 - (e) Work in high noise area
 - (f) Work in confined space including tunnels and trenches
 - (g) Work in isolated area (away from main site)
 - (h) Radiography work
 - (i) Work related to welding, gas cutting, grinding
 - (j) Working near conveyor, rotating machine
 - (k) Leak detection testing.

9.12 Reward

- (a) To motivate the employees and organisation to work safely measures can be implemented based on the suitability. Selection and rewarding for the following categories may be considered on regular basis:
 - (i) Safest workmen
 - (ii) Safest supervisor
 - (iii) Safest area
 - (iv) Safest sub-contractor, etc.
 - (v) Sub-contractors and employees may be rewarded when the project achieves significant million man-hours without any lost time injury.

10. WORK SPECIFIC SAFETY MEASURES

10.1 General

- (a) The contractor should ensure that safety precautions are taken during the execution of awarded work and work areas are maintained safe at all times. At the end of each shift and at all times when the work is suspended, it should be ensured that the work area is left safe in such a way that no materials and equipment that can cause damage to existing property, personal injury or interfere with the other works of the project or station are left in an unsafe manner.
- (b) The contractor should ensure to provide and maintain all lights, guards, fencing, warning signs, caution boards and other safety measures and provide for vigilance as and when necessary for the protection of workers and for the safety of others. The caution boards should also have appropriate symbols.
- (c) Adequate lighting facilities such as floodlights, hand lights and area lighting should be provided at the site of work, storage area of materials and equipment and temporary access roads within the working area.
- (d) All works should be planned so as to avoid interference with other facilities, works of other contractors or sub-contractors at the site. In case of any interference, necessary coordination should be ensured for safe and smooth working.
- (e) It should be ensured that the instructions given by the safety officer or his designated nominee regarding safety precautions, protective measures, housekeeping requirements, etc. are complied with. The safety officer with due intimation to line manager should have the right to stop the work, if in his opinion, proceeding with the work will lead to an unsafe and dangerous condition. Line manager should arrange to get the unsafe condition rectified and/or provide appropriate protective equipment.
- (f) Contractor should ensure that each job with a hazard whether small or big is intimated to the Head, industrial safety of the facility well before it is taken up.
- (g) The contractor should be fully responsible for non-compliance of any of the safety measures or requirements, implications, injuries, fatalities, dangerous occurrences and compensation arising out of such situations or incidents.

- (h) Maximum duty hours of an individual should be as per the Factories Act 1948 or its latest amendment.
- (i) Illumination levels should be as per the statutory requirements.

10.2 Rock Blasting

- (a) All blasting operations should be carried out on the basis of procedures approved by Head, industrial safety and engineer-in-charge. All works in this connection should be carried out as per BIS specification/code (IS 4081: 1986. Title:- Safety code for blasting and related drilling operations (First Revision)). Barricades, warning signs etc. should be placed on the roads/open area.
- (b) Blasting permit should be obtained from Head, Industrial Safety at least one day before the blasting operation and precautions mentioned there in shall be ensured by the engineer-in-charge before blasting operation.
- (c) The blaster should have a licence from competent authority under Explosive Rules, 1983 for blasting work. It should also be ensured that he knows about the risks involved.
- (d) Blasting should be done under the supervision of competent engineer/supervisor.
- (e) Blasting in the open site should only be carried out during fixed hours every day/fixed day in the week between sunrise and sunset. Residents of adjacent area should be informed in advance about the blasting schedule.
- (f) No blasting should be undertaken during thunderstorm.
- (g) Necessary precaution should be taken to ensure the stability/integrity/safety of the adjacent structure by limiting the peak particle velocity.
- (h) No loose material, such as tools, drilling equipment, etc. should be left on the surface to be blasted. Proper muffling arrangement of the blasting area should be ensured to avoid flying of blasted material.
- (i) Authorized blaster should personally ensure that all the personnel/equipment has been removed from the blasting area before the blasting operations.
- (j) Blasting area should be free of detonating gas, inflammable objects, sparking or damaged wiring system, stray currents and static electricity.
- (k) All electrical lines in blasting area should be de-energised.
- (l) Entry of unauthorized personnel should be prevented by displaying warning signs.

- (m) In case of misfire, no person should be allowed to approach the blasting site unless it is inspected and cleared by a competent engineer/supervisor.
- (n) Explosives and blasting material should be stored only in clean, dry, well-ventilated, suitably constructed bullet/magazine which should be fire resistant and securely locked. Stock book should be kept accurate and maintained. Licence should be obtained for storage of explosive as per the Explosives Act, 1884.
- (o) Blasting caps, electric blasting caps or primers and detonators should not be stored in the same box, container or room with other explosives.
- (p) Precautions against lightning should be provided in accordance with Indian Electricity Rules, 1956 (amended in 2000).
- (q) The explosives should be transported in specially designed vehicles bearing a special sign or inscription entitled 'DANGER-EXPLOSIVES'. Also detonators separated from other explosive should be transported in a separate compartment.

10.3 Excavation, Trenching and Earth Removal

- (a) Before taking up excavation work, necessary permission should be obtained from the engineer-in-charge with reference to existing underground services.
- (b) The Line manager of the works should exercise full care to ensure that no damage is caused by him or his workmen, during the operation/excavation etc., to the existing water supply, sewerages, power or telecommunication lines or any other services or works. He should provide and erect before construction, substantial barricades, guardrails, and warning signs around the work area. He should also furnish, place and maintain adequate warning lights, display board, signals etc., as required.
- (c) All trenches 1.2 m or more in depth should at all times be supplied with at least one ladder for every 30 m along the trench. Ladders shall extend from bottom of the trench to at least 1 m above the surface of the ground.
- (d) The sides of the trench/pit in soil, which are 1.2 m or more in depth should be stepped back to give suitable slope (angle of repose) or securely held by timber bracing or appropriate shoring/support, to avoid the danger of soil slides from collapsing. The excavated material should not be placed within 1.5 m or half of the depth of the pit whichever is more from edges of the trench/pit. Cutting should

be done from top to bottom. Under no circumstances mining or under-cutting should be done.

- (e) Workers should not be exposed to the danger of being buried by excavated material or collapse of shoring. Measures to prevent dislodgment of loose or unstable earth, rock or other material from falling into the excavation by proper shoring shall be ensured.
- (f) The stability and safety of the excavation, adjacent structures, services and other works should be ensured.
- (g) All excavated area should be fenced off by suitable railing and installation of caution board to warn the persons from slipping or falling into the excavation pit/ mound.
- (h) All excavated areas shall have an illumination level of at least 20 lux for night work and a red danger light shall be displayed at prominent place near the excavation site to warn approaching traffic and men.
- (i) For removal of earth from an earth mound/excavated heap a written permission should be obtained from the engineer-in-charge of the work. As far as practical, earth should be removed mechanically. Wherever manual removal of earth is involved, earth should be removed from the top by maintaining a slope equal to the angle of re-POSE of the earth. Such work should be constantly supervised to ensure that no under-cutting is done and to ensure that no person is trapped.
- (j) Dumping of excavated soil should be done at a specified area under proper supervision with respect to signaling, illumination and safety clearance.
- (k) It should be ensured that at a construction site of a building or other construction work, every vehicle or earth moving equipment is equipped with (a) silencers, (b) tail lights, (c) power and hand brakes, (d) reversing alarm (e) search light for forward and backward movement, which are required for the safe operation of such vehicle or earth moving equipment and (f) the cab of the vehicle or earth moving equipment is kept at least one meter from the adjacent face of a ground being excavated. (g) indicator etc.
- (l) It should be ensured that when a crane or shovel is traveling, the boom of such crane or shovel is in the direction of such travel and the bucket or scoop attached to such crane or shovel is raised and without load, except when it is traveling downhill.
- (m) Before loading or unloading power trucks or trailers attached to tractors, the brakes should be applied and if vehicle is on a sloping

ground, the wheels should be blocked. Handcart should not be used for the transfer of construction/erection materials in the construction area. However if the exigency demands urgent transfer of light materials a small handcart may be permitted with the prior approval of the Engineer-in-charge.

- (n) It should be ensured that at a construction site of a building or other construction work:
 - (i) All transport or earth moving equipment and vehicles are inspected at least once in a week by responsible persons and in case any defect is noticed in such equipment or vehicle, it is immediately taken out of service.
 - (ii) Safe gangways are provided for to and fro movement of building workers engaged in loading and unloading of lorries, trucks, trailers and wagons.
 - (iii) All earth moving equipment, vehicles or other transport equipment be operated only by such persons who are adequately trained and possess such skills as required for safe operation of vehicles or other transport equipment.
 - (iv) Trucks and other equipment are not loaded beyond their safe carrying capacity, which should be clearly marked on such trucks and other equipment.
 - (v) No unauthorised person rides the transport equipment employed in such work.
- (o) It should be ensured at a construction site of a building or other construction work that:
 - (i) A shovel or an excavator whether operated by steam or electric or by internal combustion used for such work is constructed, installed, operated, tested and examined as required under any law for the time being in force and the relevant national standards.
 - (ii) Buckets or grabs of power shovels are propped to restrict the movement of such bucket or grabs while being repaired or while the teeth of such bucket or grabs are being changed.
- (p) It should be ensured at a construction site of a building or other construction work that:
 - (i) An operator of a bulldozer before leaving - applies the brakes, lowers the blade and ripper and puts the shift lever into neutral.
 - (ii) A bulldozer is parked on level ground at the close of the work.

- (iii) The blade of a bulldozer is kept low when such bulldozer is moving uphill.
- (iv) Bulldozer blades are not used as brakes except in an emergency.
- (q) It should be ensured at a construction site of a building or other construction work that:
 - (i) A tractor and a scraper are joined safely at the time of its operation
 - (ii) The scraper bowls are propped while blades of such scraper are being replaced.
 - (iii) A scraper moving downhill is driven in low gear.
- (r) It should be ensured at a construction site of a building or other construction work that:
 - (i) Before a road roller is used on the ground, such ground is examined for its bearing capacity and general safety, especially at the edges of slopes such as embankments on such grounds.
 - (ii) A roller is not moved down hill with the engine out of gear.
- (s) Vehicle carrying excavated material should have proper cover over the driver's cabin.

10.4 Safe Means of Access/Platforms

- (a) Adequate safe means of access and exit should be provided for all work places, at all elevations.
- (b) Suitable scaffolds should be provided for workmen for all works that cannot be done safely from the ground, or from solid platform except such short duration work that can be done safely from ladders. Bamboo/wooden scaffolding should not be permitted.
- (c) Where the platform for working is more than 3.5 m above ground, the width of the platform should be minimum 1 m.
- (d) Ladder should be of rigid construction having sufficient strength for the intended loads. Wooden/bamboo/rope ladders should not be permitted. All ladders should be maintained in good condition. The ladders should be fixed to the ground or rigid platforms. An additional person should be engaged for holding the ladder, if ladder is not securely fixed. Ladder shall be extended from floor to at least one meter above the platform.

- (e) A portable ladder should be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical). Ladders should not be used for climbing while carrying materials in hands. While climbing both the hands should be free.
- (f) Any working platform on scaffolding or staging more than 3.5 m above the ground or floor should have a guard rail attached, bolted, braced at least 1.0 m high above the floor or platform of such scaffolding or staging along with mid-rail.
- (g) The planks used for any working platform should not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks should be rigidly fixed at both ends to prevent sliding, slipping or tilting. The thickness of the planks should be adequate to take load of men and materials and should not collapse. Plywood or packing wood should not be used as planks.
- (h) The guardrail should extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing should have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging should be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder should conform to IS 3696 (Part I): 1987 and (Part II): 1996.
- (i) Working platforms of scaffolds should have toe boards at least 15 cm in height to prevent materials from falling down.
- (j) A sketch of the scaffolding proposed to be used should be prepared and approval by the engineer-in-charge obtained prior to start of erection of scaffolding. All scaffolds should be examined by engineer-in-charge before use.
- (k) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level, they should have adequate width for easy movement of persons and materials and should be suitably guarded.
- (l) No single portable ladder should be used for access to a height of more than 4.5 m. For ladders up to 3m in length the width between styles (side bars)/width in the ladder should in no case be less than 300 mm. For longer ladders this width should be increased by at least 20 mm for each additional meter of length. Step/rungs spacing should be uniform and should not exceed 300 mm. Portable ladder should be used only for access to work place. In case work place is higher than 4.5 meters, pre-fabricated steel staircase should be used.

10.5 Work at Height

- (a) Person to work at height should be medically fit and should have height pass issued by safety section. (Appendix-D Part A, B and C). Safety training should be imparted before working at height.
- (b) Safety work-permit system for working at height should be obtained from industrial safety section.
- (c) At elevated places, secure access and foothold should be provided. Adequate and safe means of access and exit should be provided at all work places for all elevations. Means of access may be portable or fixed ladder, ramp or a stairway. The use of crosses, braces or framework, as a means of access to the working platform should not be permitted.
- (d) Linear movement at height should be reduced to minimum. In case of such movement provision for anchoring the safety belt should be made.
- (e) Where barricades cannot be installed, a safety net of adequate strength should be installed close to the level at which there is a danger of fall of personnel/fall of objects.
- (f) In case where 'work at height' is on asbestos roof, crawling board/ roof ladder should be used to walk across the asbestos roof.

10.6 Electrical Safety

- (a) All electrical installations shall comply with the appropriate statutory requirements given below and shall be subject to approval of the Electrical Engineer and Safety Officer.
 - (i) The Electricity Act, 2003
 - (ii) The Indian Electricity Rules 1956 (as amended in 2000)
 - (iii) The National Electricity Code 2008
 - (iv) Atomic Energy (Factories) Rules, 1996
 - (v) Other relevant rules of Statutory Bodies and power supply authority
 - (vi) Relevant standards of BIS

In addition to the above statutory provisions, the clauses indicated in this document shall also be complied.

- (b) It shall be the responsibility of the user seeking temporary power supply to indicate in writing, if any of the clauses (requirements

noted in above regulations and in this document) are conflicting with each other and for which the user cannot decide the course of action regarding safe installation, commissioning, operation, maintenance and decommissioning of the electrical installations.

- (c) The electrical engineer and safety officer of the agency providing temporary power supply shall interpret the concerned conflicting clauses and approve in writing the safe course of action.
- (d) The application Form-1 (Form-1A, 1B and 1C) as mentioned in Appendix-E should be submitted by the user for getting the temporary power supply.
- (e) After installation of temporary electrical panels, wiring works by the user, Certificates as per Form-1D (Appendix-E) should be submitted to the provider.
- (f) Certificate of safety officer and authorization of electrical engineer for energisation of temporary power supply should be filled as per Form-1E (Appendix-E).

10.7 Material Handling and Lifting Machines and Tackles

- (a) It should be made compulsory to supervise jobs like lifting/placing/loading/unloading/carrying/transporting etc. of heavy material by qualified supervisor having knowledge about hazards involved and precautions to be taken for such job.
- (b) The line managers should ensure that the material handling equipment used is adequate to handle the load.
- (c) Manual pulling of heavy equipment and trolley loaded with heavy material is not to be permitted.
- (d) Stacking and handling of heavy materials should be done on a firm ground to prevent settlement.
- (e) No lifting machine and no chain, rope or lifting tackle, except a fiber rope or fiber rope sling, shall be taken into use for the first time in that factory unless it has been tested and all parts have been thoroughly examined by a competent person. A certificate of such a test and examination specifying the safe working load or loads and signed by the person making the test and the examination has been obtained and is kept available for inspection.
- (f) Use of lifting machines and tackles should conform to relevant BIS requirements [IS 13367 (Part 1): 1992 Reaffirmed 2003, IS 4573: 1982 (Reaffirmed 2000) and IS 13834 (Part 1): 1994 Reaffirmed 2003 etc. The accessories and the attachments, anchorages and

supports etc. should be ensured in healthy conditions by regular inspections at defined frequencies.

- (g) Every rope used in hoisting or lowering materials or as a means of suspension should be of good quality and adequate strength and free from any defect. This should be ensured by regular inspection as per IS 2762: 1982- Specification for wire rope slings and sling legs (first revision).
- (h) Every crane operator or lifting appliance operator should be authorized. No person under the age of 18 years should be in charge of any hoisting machine or give signal to an operator of such machine.
- (i) In case of every lifting machine (and of every chain, ring, hook, shackle, swivel and pulley block used in hoisting or as a means of suspension) the safe working load should 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 should be clearly indicated. No part of any machine should be loaded beyond the safe working load except for the purpose of testing. This should be approved by the engineer-in-charge and Head, Industrial Safety.
- (j) In case of facilities machines, the safety of the machines shall be ensured by the Engineer-in-charge. As regards the Contractor's machines, the contractor should declare the safety of the machine to the Engineer-in-charge whenever he brings any machinery to site of work and get it verified by the engineer-in-charge, supported by a valid test certificate by the competent person.
- (k) Thorough inspection and load testing of lifting machines and tackles should be done in the presence of competent person at least once in every 12 months and records of such inspections and testing should be maintained.
- (l) No mobile crane should be allowed to move under live high-tension power transmission line.
- (m) While lifting loads, cranes should be located on level ground.
- (n) A thorough load analysis should be carried out before using cranes in tandem.
- (o) Motors, gear transmission, couplings, belts, chain drives and other moving parts of hoisting appliances should be provided with adequate safeguards. Hoisting appliances should be provided with such means, which will reduce the risk of any part of a suspended load becoming accidentally displaced or lowered.

- (p) It should be ensured that the cabin of the lifting machine in outdoor service:
 - (i) is made of fire resistant material,
 - (ii) has a suitable seat, a footrest and protection from vibration,
 - (iii) affords the operator an adequate view of the area of operation,
 - (iv) affords the operator adequate protection against the weather, and
 - (v) is provided with fire extinguisher.

10.8 Welding and Gas Cutting

- (a) Welding and gas cutting operations should be done by qualified and authorized persons only.
- (b) Safety work permit shall be obtained (wherever necessary like presence of flammable or combustible material etc.) before flame cutting/welding is taken up.
- (c) Welding and gas cutting should not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures. In case the requirement cannot be avoided, specific approval and procedure should be ensured and adequate precautions should be taken.
- (d) Welding and gas cutting equipment including hoses and cables should be maintained in good condition.
- (e) Barriers should be erected to protect other persons from harmful rays from the work. When welding or gas cutting is done in elevated positions, precautions should be taken to prevent sparks or hot metal falling below on persons or combustible materials.
- (f) Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons should be provided to workers as protection from heat and hot metal splashes. Face shields with filter glasses of appropriate shade should be worn.
- (g) Adequate ventilation should be provided while welding, brazing and cutting the metals like zinc, brass, bronze, galvanised or lead coated material.
- (h) Welding and gas cutting on drums, barrels, tanks or other containers should be taken up only after ascertaining that they have been emptied, cleaned thoroughly and made free of flammable material.
- (i) Fire safety measures should be available as required near the location of welding/cutting operations.

- (j) Flash back arrestor should be provided with gas cutting and gas welding sets.
- (k) For electric (Arc) welding the following additional safety precautions should be taken:
 - (i) When electrical welding is undertaken the return lead of welding machine should be directly connected to the job invariably.
 - (ii) Provision must be in place in electric welding machine to prevent physical contact with live parts.
 - (iii) The welding cables and power cables should be routed separately to avoid entanglement.
 - (iv) The electric welding set should have suitable earth connections. There should be an electrical isolation device in the input power supply side on the welding machine.
- (l) Double gauges should be used for all gas cylinders used for cutting/welding. Pressure gauges/regulators should be in healthy condition.

10.9 Rotary Cutters/Grinders

- (a) All portable cutter/grinders should be provided with the wheel guard in position.
- (b) Grinding wheels of specified diameter only should be used on all grinders in order to limit the prescribed peripheral speed.
- (c) In pedestal grinder, the gap between tool rest and grinding wheel should be maintained less than 3 mm.
- (d) Goggle/face shield should be used during grinding operation.
- (e) No grinding wheel should be used after its expiry date.
- (f) Ear muff/ear plug should be used during the welding /cutting jobs.
- (g) Portable appliances, which are powered by single phase AC supply, shall be provided with three-core cable and three pin plug, otherwise the whole body should be double insulated.
- (h) Safety work permit should be obtained (wherever necessary like presence of flammable or combustible material etc.) before grinding is taken up.
- (i) Fire safety measures should be available as required near the location of grinding operations.

10.10 Concrete Mixing Equipment

- (a) Cement bags should be stacked on wooden planks in dry and leak proof area, 150 mm to 200 mm from the floor and 450 mm away from walls. Height of the stack should not be more than 15 bags or 1.5 meters whichever is lower. Width of the stack should not be more than 4 bags or 3 meters. Lateral loading of the walls of the storage room by stacking should not be permitted. Stacking of the bags should not be used as a working platform.
- (b) Shuttering and supporting structures should be of adequate strength and approved by engineer-in-charge. This should be ensured before concrete is poured.
- (c) If the mixer has a charging skip the operator should ensure that the workmen are out of danger before the skip is lowered.
- (d) Adequate walking platforms are to be provided in the reinforcement area to ensure safe walking for pouring concrete on the roof.
- (e) When workmen are working/cleaning the inside of the drum of mixer, the power of the mixer should be switched off and 'Do not operate' tag should be provided. The plant operation and cleaning of mixing pan should be carried out as per equipment supplier's instructions.
- (f) Interlocks between the cover and the mixer rotor shall be established to ensure that the agitator does not start when the cover is in open condition.
- (g) It should be ensured that moving parts of the elevators, hoists, screens, bunkers, chutes and grouting equipment used for concrete work and of other equipment used for storing and transporting of ingredients of concrete are securely fenced to avoid contact of workers with such moving parts.
- (h) It should be ensured that screw conveyors used for cement, lime and other dusty material are completely enclosed.
- (i) Workers engaged for handling bulk cement in a confined place should be provided with tight fitting goggles, approved respirators and protective clothing, which will fit snugly around the neck, wrist and ankles.
- (j) The following should be ensured for every pipe carrying pumped concrete:
 - (i) The scaffolding carrying a pipe for pumped concrete should be strong enough to support such pipe at a time when such pipe is filled with concrete or water or any other liquid and to bear safely all the building workers who may be on such scaffold at such time.

- (ii) Securely anchored at its end point and each curve on it.
 - (iii) Provided with an air release valve near the top of such pipe; and securely attached to a pump nozzle by a bolted collar or other adequate means.
- (k) The following should be ensured while using the electric vibrators in concreting work at a construction site of a building or other construction work such that:
- (i) Such vibrators are earthed.
 - (ii) The leads of such vibrators are heavily insulated.
 - (iii) The current is switched off when such vibrators are not in use.

10.11 Painting

- (a) Appropriate breathing air respirators should be provided for use by the workers when paint is applied in the form of spray, or a surface having lead paint is dry rubbed or scraped.
- (b) Only the quantity of paint, thinner and polish required for the day's work should be kept at the work spot. Excess storage should not be permitted at the work spot.
- (c) Smoking, open flames or sources of ignition should not be allowed in places where paints, varnish, thinner and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national language and regional language, 'SMOKING - STRICTLY PROHIBITED' should be displayed in the vicinity where painting is in progress or where paints are stored. Symbols should also be used on caution boards.
- (d) All electrical equipment of paint storage room should be of explosion proof design. Suitable fire extinguishers / sand buckets should be kept available at places where flammable paints are stored, handled or used.
- (e) When painting work/hot resin mix is done in a closed room or in a confined space, adequate ventilation should be provided and ensured. In addition, suitable respirators should be provided. No portable electric light or any other electric appliance of voltage exceeding 24 volts should be permitted for use inside any confined space. Walkie-talkie or other means of communication should be provided. Rescue arrangement like full body harness with lifeline, tripod with pulley and extra BA sets should be available.

- (f) The workers should use PVC gloves and/or suitable barrier creams to prevent the skin contact with Epoxy resins and their formulations used for painting.

10.12 Demolition

- (a) Before any demolition work is commenced and also during the progress of the work, all roads and open area adjacent to the work site should either be closed or suitably cordoned. Appropriate warning signs should be displayed for cautioning approaching persons/vehicles.
- (b) Before demolition operations begin, it should be ensured that all the service lines are de-energized.
- (c) Persons handling demolition operations shall use appropriate PPE.
- (d) All demolition operations should be carried out with safe and duly approved procedures which shall include following but not limited to:
 - (i) No masonry/material should be permitted to fall in such masses or volume or weight so as to endanger the structural stability of any floor or structural support.
 - (ii) No wall, chimney or other structure or part of a structure is left unguarded in such a condition that it may fall, collapse or weaken due to wind pressure or vibration.
 - (iii) No floor roof or other part of the building should be overloaded with debris or materials as to render it unsafe.
- (e) After the demolition, the debris and other materials collected should be disposed safely and not permitted to be dropped freely.
- (f) Entries to the demolition area shall be restricted to authorized persons wearing safety helmets and safety shoes.

10.13 Traffic

- (a) All the vehicles moving at sites should conform and comply with the requirements of Motor Vehicles Act, 1988 and the Rules made thereunder. All the drivers /operators of vehicles should possess valid driving license as per Motor Vehicles Act, 1988 or its latest amendment.
- (b) When the construction work causes interference with traffic such as road cutting or transit unloading of heavy equipment etc. notice of such interference should be given to the engineer-in-charge and Head, industrial safety well in advance with the details of start of the work and time required.

- (c) A cleaner/assistant must be available for all heavy vehicles whenever vehicles move forward as well as in the reverse direction. All vehicles should be fitted with proper reverse horns, back view mirrors and indicator signals.
- (d) Facility shall ensure that the assessment of the driver's visual ability is carried out as per Rule 55 of the Atomic Energy (Factories) Rules, 1996/guidelines of advisory committee on occupational health (ACOH), AERB or as per the latest amendments in statutes.
- (e) Effective speed breakers with yellow stripes on the roads to regulate the speed at the vulnerable points should be installed. Effective barricading with adequate caution signs should be placed to warn the vehicle drivers whenever the jobs are carried out on the road.
- (f) All vehicles moving at the site should have roadworthiness certificate issued by the concerned authority.
- (g) Special limit boards and caution boards indicating turns should be installed wherever necessary.
- (h) In general, the following maximum speed limits should be specified and implemented. Vehicles speed limits should be as per Motor Vehicle Act or 20 Km/h. Extra precautions and care should be exercised particularly during heavy material/equipment movements.
- (i) Safety awareness programmes should be conducted for all the drivers of the light, medium and heavy vehicles.

10.14 Work in Radiation Area

The facility shall follow the stipulations under Atomic Energy (Radiation Protection) Rules, 2004 and AERB Safety Manual on 'Radiation Protection for Nuclear Facilities' [AERB/NF/SM/O-2 (Rev.4)] with regard to work in the radiation area and other works related with radiography, etc.

10.15 Work in and Around Water Bodies

- (a) When work is done at a place where there is risk of drowning, all necessary rescue equipment such as life buoys and life jackets should be provided and kept ready for use.
- (b) All necessary steps shall be taken for prompt rescue of any person in danger and adequate provision should be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work. Proper record of entry/exit to and from water bodies shall be maintained on shift basis and search operation shall be conducted as soon as any person is detected to be missing.

- (c) Caisson Work
 - (i) Safe means of access should be provided to the place of work in the caisson and adequate means should be provided to safely reach the top of caisson in the event of inrush of water.
 - (ii) The work relating to construction, positioning, modification or dismantling of caisson shall be done under the supervision of a responsible person.

10.16 Fire Safety

- (a) Provisions prescribed in the AERB safety standard on 'Fire Protection Systems for Nuclear Facilities', [AERB/NF/SS/FPS (Rev. 1)] shall be complied.
- (b) All necessary precautions should be taken to prevent outbreak of fires at the construction site. It should be ensured that all hot works are carried out under valid work permit.
- (c) Combustible materials such as wood, cotton waste, oil, coal, paints, chemicals etc., should be segregated and kept to the required bare minimum quantity at work place.
- (d) Containers of paints, thinners and allied materials should be stored in a separate room which should be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint should be kept covered or properly fitted with lid and should not be kept open except while using.
- (e) Adequate number of trained persons from approved fire training centre required to extend fire safety coverage should be ensured.
- (f) Fire extinguishers as approved by the engineer-in-charge/in-charge of fire station/safety in-charge should be located at the construction site at appropriate places.
- (g) Adequate number of trained workmen in fire fighting who can operate fire extinguishers should be ensured.
- (h) Portable fire extinguishers with periodic inspection, maintenance and re-filling complying with the mandatory requirements should be ensured.
- (i) Availability of adequate water for fire fighting should be ensured.
- (j) Implementation of the provisions of various statutory licenses for storing gas cylinders, petroleum products, explosives etc. as per the relevant Acts and Rules should be ensured wherever required.

10.17 Environmental Safety

Relevant provisions of the state/central statutory authority regarding environment protection should be adhered to.

10.18 Public Protection

The Contractor should make necessary provisions to protect the public. He should be bound to bear the expenses in defense of every action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of any precaution required to be taken to protect the public. He should pay for the any such damage and cost which may be awarded in any such suit, action or proceedings to any such person, or the amount, which may be fixed as a compromise by any such person.

10.19 Safety of Visitors

- (a) Visitors for the project shall be given health and safety induction before they are allowed in to the construction project. It shall include the minimum PPE to be used, hazards and risks at the work area, restricted areas of entry, emergency response arrangements, etc.
- (b) Visitors shall always be accompanied by one of the employees of the project site.
- (c) Visitors shall not be allowed in the hazardous areas unless they are competent and trained to work in such areas.

10.20 Housekeeping

- (a) It should be recognized that a proper place for everything and everything in its place is maintained for a good housekeeping.
- (b) The material required for immediate use only should be brought to the designated workplace and stacked properly and labeled suitably.
- (c) All work spots, site office and surroundings should all times be kept clean and free from debris, scrap, concrete muck, surplus materials and unwanted tools and equipment. A day-to-day collection and disposal of scraps/debris should be done safely at designated place.
- (d) Electrical cables should be so routed as to allow safe traffic by all concerned. Cable should be preferably supported on the brackets fixed along the wall to maintain safe access. Wherever routing on the floor cannot be avoided, care should be taken to ensure mechanical protection of these cables and safe access is not disturbed.
- (e) No material at any work place should be so stacked or placed or disposed off as to cause danger, inconvenience or damage to any person or environment.

- (f) All unused scaffoldings, surplus/scrap materials and equipment/ systems like temporary electrical panels etc. should not be allowed to accumulate and shall be removed from the premises at the earliest.
- (g) Accumulation of water /oil spillages on the floor or any other workplace should be avoided.
- (h) Proper aisle space marking should be provided in all workplaces.

10.21 Other Statutory Provisions

Notwithstanding the clauses in the above subsections, there is nothing in these clauses to exempt the contractor from the provisions of any other Act or Rules in force in the Republic of India. In particular, all operations involving the transport, handling, storage and use of explosives should be as per the standing instructions and conform to the Indian Explosives Act, 1884 and the Explosives Rules, 1983. Handling, transport, storage and use of compressed gas cylinders and pressure vessels should conform to the Gas Cylinder Rules 2004 and Static and Mobile Pressure Vessels (Unfired) Rules 1981. In addition, The Indian Electricity Act 2003 and Indian Electricity Rules 2005, the Atomic Energy Act, 1962, the Radiation Protection Rules, 2004, the Atomic Energy (Factories) Rules, 1996 and AERB safety manual on 'Radiation Protection for Nuclear Facilities' [AERB/NF/SM/O-2 (Rev.4)] should be complied with.

11. PERSONAL PROTECTIVE EQUIPMENT

11.1 General

Although the primary approach in any safety effort is that the hazard to the workmen should be eliminated or controlled by engineering methods rather than protecting the workman through use of personal protective equipment (PPE). Engineering methods could include design change, substitution, ventilation, mechanical handling, atomization etc. Under those situations when it is not possible to introduce any effective engineering methods for controlling hazards, it is necessary that workman use appropriate type of PPE. For example, in construction work there is the possibility of a hand tool, a bolt, or some loose material to fall from an elevated level and striking the head of workman working below. It is therefore necessary that construction worker wear a safety helmet. It is for such situations, both the Factories Act 1948 and the Atomic Energy (Factories) Rules, 1996 have provisions for use of appropriate type of PPE.

It is thus recognized that use of PPE is an important and necessary consideration in the development of a safety programme. Once the safety professional decides that PPE is to be used by workmen, it is essential to select right type of PPE and construction agency should ensure that workman uses it and also PPE is correctly maintained.

11.2 Personal Protective Equipment (PPE)

- (a) All personal protective equipment as considered necessary should be made available for the use of the persons employed on the site and maintained in a condition suitable for immediate use. Also adequate steps should be taken by line manager to ensure proper use of PPE.
- (b) All the PPEs in use should be as per relevant IS standards as referred in the AERB safety guidelines on 'Personal Protective Equipment' (AERB/SG/IS-3).
- (c) All persons employed at the construction site should use safety helmets. Safety helmet should be with BIS mark and should have its headband with back support and chin strap.
- (d) Workers employed on mixing asphaltic materials, cement and lime mortars should use protective goggles, protective foot wears, hand gloves and respirators as required.
- (e) Persons engaged in welding and gas-cutting works should use suitable welding face shields. The persons who assist the welders should use suitable goggles. Protective goggles should be worn while chipping and grinding.

- (f) Stonebreakers should use protective goggles. They should be seated at sufficiently safe distances from one another.
- (g) Safety goggles should be of shatterproof type and with zero power.
- (h) Persons engaged in or assisting in shot blasting operations and cleaning the blasting chamber should use suitable gauntlets, overalls, shatterproof and dust-proof goggles and self contained breathing apparatus set.
- (i) All persons working at heights more than 3.5 m above ground or floor and exposed to risk of falling down should use full body harness safety belts, unless otherwise protected by cages, guard railings, etc. In places where the use of safety belts is not feasible, suitable net of adequate strength fastened to substantial supports should be used.
- (j) When workers are employed in sewers and inside manholes that are in use, it should be ensured that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the space should be checked for the presence of any toxic gas or oxygen deficiency by a competent person and recorded in the register before the workers are allowed to get into the manholes. A pilot team should enter the area donning self contained breathing apparatus (SCBA). The manholes opened should be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There should be proper illumination in the night. Depending upon the work situation, the contractor should provide PPE including the SCBA as recommended by Head, industrial safety.

12. MEDICAL MANAGEMENT

12.1 General

- (a) The contractor shall make arrangements for the first aid and medical services for the injured or ill persons for prompt attention or aid.
- (b) The arrangement can be made by the contractor or an agreement can be in vogue with the facility.
- (c) The medical facilities at first-aid centre shall be adequate to immediately cater to the injured based on the hazard potential and probable severe injuries.
- (d) The first-aid centre shall be provided with the adequate equipment and medicines for catering to the site requirements. The first-aid centre shall be manned depending on the working hours / on round the clock shift basis. The services of at least one qualified medical practitioner (medical officer) shall be made available by the contractor.

12.2 Medical Facilities

- (a) Medical facilities conforming to the provisions of the Atomic Energy (Factories) Rules, 1996 should be provided at all work sites.
- (b) The requisite medical facilities in the form of a well-equipped first aid centre manned by qualified nursing personnel should be provided at all work sites. Contractor may avail this facility as per terms and conditions of the contract.
- (c) In addition, well-maintained first-aid boxes should be kept at each location of the work by the contractor and availability of the personnel trained in first aid should be ensured.
- (d) A manned and equipped ambulance should be available at work site during the working hours/on round-the-clock shift basis.
- (e) It should be ensured by the facility that occupational health monitoring of contract workers is carried out as per provisions of the Factories Act 1948 as per the latest amendment and the stipulations/directives given by Atomic Energy Regulatory Board from time to time.
- (f) Display of emergency contact numbers of important persons and hospitals and route map of site shall be maintained at designated places.

12.3 Medical Management of Serious Injuries

- (a) In case of serious injuries, the injured should be shifted to the nearest first-aid centre at site immediately. The opinion of medical officer/certifying surgeon should be sought immediately for medical management.
- (b) After providing the first aid treatment the injured should be shifted to designated medical facility of the site/hospital for further medical assistance, in an ambulance along with a nursing attendant.
- (c) The doctor at the medical facility of the site/hospital attending the case shall assess the extent of injuries and render immediate medical aid. If the situation warrants trauma/special care the injured shall be shifted to the referral hospital, having all the requisite facilities for specialized treatment in ambulance along with a medical attendant.
- (d) A list of such referral hospitals for specialised medical management facilities for the injured persons should be available with the project management/Head, industrial safety and Head, medical services of the site for ready reference.

APPENDIX-D

APPLICATION FOR HEIGHT PASS

PART- A

Group/Section: _____

Agency: _____

1. Applicant's name : _____
2. Facility 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 required for work at _____ m. Height
10. Description of present job : _____
11. Previous experience of working at height : _____

S.No.	Name of the employer	Duration of employment	Work experience
1.			
2.			

12. Does the applicant suffer from any of the following ailments ?
(If yes details to be given):
 - (a) Blood pressure _____
 - (b) Epilepsy _____
 - (c) Flat foot _____
 - (d) Frequent headache or reeling sensation _____
 - (e) Mental depression _____
 - (f) Limping gait _____
 - (g) Aerofobia _____

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 m 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 and Signature or loss time injury (L.T.I) in case he cannot sign. In case of LTI an authorised person shall explain each point/item to the individual and certify on that 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)

Countersigned by:

Section Head (Facility)

PART-B

MEDICAL FITNESS CERTIFICATE

Certified that I, Dr. _____ have examined Shri. _____
_____ aged _____ on (date) _____ who has signed below in
my presence. General and 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 eye sight is normal with/without glasses.
In my opinion, Shri. _____ is physically and mentally fit for
working at height.

Details of examinations are given below:

Personal attributes:

1. Height : _____
2. Chest : _____
3. Weight : _____
4. Hearing : _____
5. Sight : _____
6. Skin : _____
7. Heart beating: _____

Medical aspects:

1. Urine : _____
2. Blood pressure : _____
3. Epilepsy : _____
4. Flat foot : _____
5. Frequent headache
or reeling sensation: _____
6. Mental depression: _____
7. Limping gait : _____
8. Aerophobia : _____

Name:

Signature and Rubber Stamp of
Medical Practitioner with
Reg. No.

Signature of workman

PART-C

INDUSTRIAL SAFETY SECTION

(Considering the above medical certificate, the applicant has appeared on the following practical tests conducted by industrial safety section and the results are given below (strike off whichever is in-applicable)

- (a) Wearing a safety belt and tying the rope knot : Pass/fail
- (b) Walking over a horizontal structure at 3 m. height wearing a safety belt : Pass/fail
- (c) General physique (OK/Not OK)

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

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

Date:

Name:

Signature

Scientific Assistant (Safety)

Safety Officer

APPENDIX-E

FORM - 1

APPLICATION FOR TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION [Prescribed under clause 10.6(d)]

1.	Name and address of user.	
2.	Reference of tender or work order (if applicable)	:
3.	Name and designation of tender/work order issuing authority.	:
4.	Power supply application number [†]	:
5.	Name and designation of tender/work order/work supervising authority (engineer-in-charge).	:
6.	Expected date of commencement of temporary supply	:
7.	Expected date of decommissioning of temporary supply	:
8.	Voltage level (LV/MV/HV)	
9.	Type of connection (1Ph/3Ph)	
10.	Connected load (Kw)	
11.	Maximum demand(KVA)/Power factor	
12.	Single line diagram* of proposed power distribution scheme along with equipment data sheet (downstream installation after point of connection).	Enclosed (Form-1A)/Not enclosed
13.	Name of overall supervisor and available qualified Staff	Enclosed (Form-1B)/Not enclosed
14.	Auxiliary equipment data sheet (meters, fire extinguisher, first aid box etc)	Enclosed (Form-1C)/Not enclosed
15.	Name and designation of provider's representative to whom the application is addressed.	:
16.	Name and designation of authorised signatory of user, who had submitted this application	:

[†] Power supply application number shall be different for same user with multiple applications for temporary supply

* All the drawings and tables shall be signed by user's representative indicated against 16 above.

Signature of authorised signatory of user

Signed endorsement of work order
supervising authority indicated
against 5 above.

**EQUIPMENT DATA SHEET FOR OBTAINING TEMPORARY POWER
SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING
CONSTRUCTION**

(Prescribed against item-12 of form-1)

Name and address of user:

Power supply application

Number:

Amendment No:

References:- Single line diagram (SLD) of the power distribution scheme with all equipment details (attach the SLD)

1. Identity	2. Type	3. Make and model	4. Manufacturer's S.No	5. Fixed/ Portable	6. Size	7. Last used date	8. Last test date	9. Latest test data	10. Rating

Signature of authorised signatory of user

Explanation of column headers:

1. Identity:- Identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/CB/MCB/MCCB/ELCB/transformer/lightning arrestor/earthing station/earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- Equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative e.g. length for cables or all dimensions if heavy equipment like transformer.
7. Last used date. date of last use else NEW
8. Last test date. latest test date by user or by manufacturer if NEW
9. Latest test data:- IR, HV, resistance, functional test data depending upon the type of equipment as desired by provider's representative.
10. Rating:- name plate rating of equipment like voltage, current, power (apparent, active, reactive), IP of enclosure, size (cable cross section) etc. depending upon the type of equipment and as desired by provider's representative.

FORM - 1B

**STAFF DATA SHEET FOR OBTAINING TEMPORARY POWER SUPPLY
AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION
(Prescribed against item-13 of form-1)**

Name and address of user:

**Power supply application
Number:
Amendment No:-**

1. Name	2. Address	3. Tel.No.	4. Responsibility	5. Certification detail	6. Resuscitation training	7. Expe- rience	8. Other relevant training	9. Signature

Signature of authorised signatory of user

Explanation of column headers:

1. Name:- Name of agency/person
2. Address:-
3. Tel No:- regular, alternate and emergency telephone numbers
4. Responsibility:- whether responsible for installation, operation, maintenance, overall supervision etc. overall supervisor shall be indicated specifically.
5. Certification detail:- (a) type of certification e.g wire man license, electrical supervisor license, electrical contractor license, diploma in electrical engineering, degree in electrical engineering etc. (b) certifying agency e.g. state PWD, central PWD, CEA, name of college/university etc. (c) certificate/license number with date. (d) valid up to date or next renewal date must for contractor/supervisor license.
6. Artificial resuscitation training:- indicate YES/NO if the staff is trained to apply artificial resuscitation technique.
7. Experience.:- number of years of experience.
8. Other relevant training :- any other training in electrical/ safety course. Indicate name of training, duration (days/months), training providing agency.
9. Signature:- original signature of individual.

**AUXILIARY EQUIPMENT DATA SHEET FOR OBTAINING
TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY
AT WORK SITE DURING CONSTRUCTION
(Prescribed against item-14 of form-1)**

Name and address of user:

**Power supply application
Number:
Amendment No:-**

Reference:- Layout drawing No. / _____

1. Identity	2. Type	3. Make and model	4. Manufacturer's S. No	5. Fixed/ Portable	6. Size	7. Last used date

Signature of user's representative

Explanation of column headers:

1. Identity:- identification mark/number/tag of equipment in layout drawing.
2. Type:- earthing rod/megger/multi meter/earth resistance meter/fire extinguisher/s and bucket/first aid box/resuscitation chart/rubber mat etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative.
7. Last used date. NEW for new equipment. NA for passive devices like chart/mat etc.

FORM -1D

(Prescribed under clause 4.6(e)]

Name of user agency

Power supply application number:-

CERTIFICATE BY THE LICENSED ELECTRICAL CONTRACTOR

Certified that subject installations have been carried out by us or checked by us and is in accordance with I.E. Rules. The documents submitted with subject temporary power supply application (Form-1) is verified by us and the complete installation confirms to these documents.

We shall periodically inspect/check the installation so that no unsafe situation arises during use of this temporary power supply system. We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of licensed electrical contractor

Rubber seal of licensed electrical contractor

Date

CERTIFICATE BY THE USER

Certified that my/our installations have been carried out in accordance with the I.E. Rules and that I/We have employed competent agency/staff to handle the installations which is strictly as per the staff data sheet submitted in Form-1B.

We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of user

Name of signatory

Date

FORM -1E

[Prescribed under clause 10.6(f)]

CERTIFICATE BY THE SAFETY OFFICER

Certified that I have inspected the electrical installation referred here in after satisfying myself about the safe condition of the installation, I hereby recommend that the service connection be given to the contractor.

Signature of the safety officer

Name:

Date:

AUTHORISATION BY THE ELECTRICAL ENGINEER

The subject power supply application along with completed installation, necessary certificates (as per Form-1 of Appendix-E) is scrutinised by us. The proposal found to be in order and the installation can be energised on _____ in presence of your designated overall supervisor as indicated in Form-1B. Enclosed herewith the test report data sheet Form-1F. You are requested to carry out the periodic testing of equipment and submit the test report periodically as per this form.

Signature of the electrical engineer
of provider

Name of signatory

Date

FORM - 1F

**TEST/MAINTENANCE REPORT DATA SHEET OF EQUIPMENTS OF
TEMPORARY POWER SUPPLY SYSTEM AT WORK SITE DURING
CONSTRUCTION
(Prescribed against form-1E)**

Name and address of user:

Power supply application

Number:

Amendment No:-

1. Identity	2. Type	3. Last tested date	4. Next due date of any test	5 Frequency of IR test	6 Frequency of HV test	7. Frequency of earth resistance test	8. Other tests

Signature of electrical engineer of provider

Explanation of column headers:

1. Identity:- Identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/CB/MCB/MCCB/ELCB/transformer/lightning arrestor/earthing station/earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Last test date: - latest test date indicated in Form-1A.
4. Next due date of any test:- as worked out by frequency of tests indicated in subsequent columns.
5. Frequency of IR test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
6. Frequency of HV test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
7. Frequency of earth resistance test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
8. Other tests:- name and description of any other essential tests/maintenance activity and required frequency depending upon type of equipment and location of installation. NA if not required after installation.

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15. Indian Standard 5916, Safety code for construction involving use of hot bituminous materials, 1970
16. Indian Standard 7293, Safety code for working with construction machinery, 1974
17. Indian Standard 7969, Safety code for handling and storage of building materials, 1975

18. Indian Standard 8989, Safety code for erection of concrete framed structures, 1978
19. Indian Standard 10067, Material constants in building works, 1982
20. Indian Standard 10291, Safety code for dress divers in civil engineering works, 1982
21. Indian Standard 13415, Code of safety for protective barriers in and around, 1992
22. Indian Standard 13416(Part 1), Recommendations for preventive measures against hazards at workplaces: Part 1 Falling material hazards prevention, 1992
23. Indian Standard 13416(Part 2), Recommendations for preventive measures against hazards at workplaces: Part 2 Fall prevention, 1992
24. Indian Standard 13416(Part 3), Recommendations for preventive measures against hazards at workplaces: Part 3 Disposal of debris, 1994
25. Indian Standard 13416(Part 4), Recommendations for preventive measures against hazards at workplaces: Part 4 Timber structure, 1994
26. Indian Standard 13416(Part 5), Recommendations for preventive measures against hazards at workplaces: Part 5 Fire protection, 1994
27. Indian Standard 13430, Code of practice for safety during additional construction and alteration to existing buildings, 1992

LIST OF PARTICIPANTS

EXPERT COMMITTEE FOR REVIEW OF 'GUIDELINES' ON CONTROL OF WORKS

Dates of meeting:	July 9, 2007	July 23, 2007
	September 3, 2007	October 3, 2007
	October 17, 2007	February 22, 2008
	April 4, 2008	April 23, 2008
	May 6, 2008	May 13, 2008
	June 18 & 19, 2008	August 4, 2008
	May 12, 2010	

Members of Sub Committee:

Shri P.B. Kulkarni (Chairman)	:	BARC (Former)
Shri Sushil Kumar	:	DGFASLI
Shri D.K. Jain	:	NPCIL
Shri N. Nagaich	:	NPCIL
Shri P. Lahiri	:	BARC
Shri N. Prasad	:	NPCIL
Shri K. Ramprasad	:	AERB
Shri A.K. Tandle	:	BARC
Shri T.V. Sudhikumar	:	NPCIL
Shri S.R. Bhave (Member Secretary)	:	AERB

Invitees:

Dr. P.K. Sinha	:	NPCIL (Former)
Shri D. Das	:	AERB

Contributors:

Shri R. Bhattacharya	:	AERB
Shri.S. Sounderajan	:	BARC
Shri.S.R. Bhave	:	AERB
Shri S. Chockalingam	:	AERB

**ADVISORY COMMITTEE ON INDUSTRIAL AND
FIRE SAFETY (ACIFS)**

Dates of meeting : July 6, 2009
August 4, 2009
November 30, 2009
February 22, 2010
March 26, 2010
April 29, 2010
July 30, 2010
September 21, 2010

Member ACIFS:

Shri S.K. Mukherjee (Chairman) : HPCL, Mumbai (Former)
Shri R.K. Gupta : HPCL, Mumbai
Shri M.P. Mahajan : HWB (Former)
Shri H.S. Ahluwalia : NFC (Former)
Shri S.K. Ghosh : BARC
Shri S.E. Kannan : AERB (Former)
Shri N.K. Agarwal : NPCIL (Former)
Shri P.K. Ghosh : AERB (Former)
Shri R. Bhattacharya : AERB
Shri K. Ramprasad (Member-Secretary) : AERB

**PROVISIONAL LIST OF REGULATORY DOCUMENTS ON
INDUSTRIAL AND FIRE SAFETY**

Reference No.	Title	Year of Publication
AERB/NF/FPS (Rev. 1)	Fire Protection Systems for Nuclear Facilities	2010
AERB/NRF/SG/ IS-1 (Rev. 1)	Control of Works	2012
AERB/SG/IS-2	Preparation of Safety Report of Industrial Plants other than Nuclear Power Plants in the Department of Atomic Energy	2001
AERB/SG/IS-3	Personal Protective Equipment	004
AERB/SG/IS-4	Guidelines for Pre-employment Medical Examination and fitness for Special Assignment	2005
AERB/SG/EP-3	Preparation of Site Emergency Preparedness Plans for Non-nuclear Installations.	2000
AERB/SG/EP-4	Preparation of Off-site Emergency Preparedness Plans for Non-nuclear Installations.	2000
AERB/SG/D-4	Fire Protection in Pressurised Heavy Water Reactor Based Nuclear Power Plants	1999
AERB/SM/IS-1	Manual on Database Management for Accidents/ Diseases Happening due to Occupation and Implementation of the same in the Department of Atomic Energy	1991

AERB SAFETY GUIDELINES NO. AERB/NRF/SG/IS-1 (Rev. 1)

Published by : Atomic Energy Regulatory Board
Niyamak Bhavan, Anushaktinagar
Mumbai - 400 094
INDIA.

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