

**Environmental Management Framework
For
Bhutan : Improving Resilience to Seismic Risk**

April 12, 2013

Acronyms

BHU	Basic Health Unit
BUDP-II	Bhutan Urban Development Project - II
CA	Competent Authority
DES	Department of Engineering Services
DPR	Detailed Project Report
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EPR	Environmental Protection Rules
RGoB	Royal Government of Bhutan
IRSR	Improving Resilience to Seismic Risk
MoWHS	Ministry of Works and Human Settlement

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1 Background : The Bhutan – Improving Resilience to Seismic Risk Project.

The Royal Government of Bhutan proposes to implement a Project, “Improving Resilience to Seismic Risk in Bhutan. The Project would be funded by a PHRD Grant in the amount of US\$ 1.2855 million. The project’s goal is to improve Bhutan’s resilience to seismic risk and is aimed at 1) improving the understanding of earthquake hazard in the country; 2) strengthening the capacity to carry out vulnerability assessment of critical buildings and infrastructure; and 3) enhanced capacities to build / repair or retrofit important buildings.

The Project will include the following components.

- Component A: Investigations and mapping for improved understanding of seismic risk (290,000 US\$). The component will help collect and integrate the available information on earthquake hazards and seismic vulnerability of Bhutan in one single platform using the Global Earthquake Model methodology.
- Component B: National vulnerability assessment and retrofitting. (550,000 US\$). Building capacity and providing tools for the Bhutanese Engineering community to improve seismic resilience of engineered buildings (as opposed to traditional, non-engineered, type of constructions).
- Component C: Improving seismic resilience of Bhutanese traditional buildings (US\$ 200,000). Improve general understanding of the existing construction technologies for traditional buildings and pilot strategies for improving the seismic resilience of traditional buildings.
- Component D: Development of emergency structural assessment capacity (US\$ 50,000). Development of a structural assessment format suitable to the various typologies of buildings in Bhutan and capacity building of local engineers to carry out the task.
- Component E. Project management, Monitoring and Evaluation (US\$ 195,500)

The project will be carried out in Bhutan. Physical works are envisaged in Component B: National vulnerability assessment and retrofitting. These would consist in seismic retrofitting of up to five existing public buildings (e.g. schools or health centers).

The present Environment Management Framework discusses the existing institutional and legal framework and the specific arrangements proposed to manage the potential impact of the works mentioned above.

2 Relevant legislations, rules and regulations

2.1 Environmental Management

2.1.1 Environmental Assessment Act 2000 (EAA).

The Environmental Assessment Act 2000 establishes procedures for the assessment of potential effects on the environment from strategic plan, policies, programs, and projects; and for the determination of policies and measures to reduce potential adverse effects and to promote environmental benefits. The Act makes Environmental Clearance (EC) from Competent Authority a pre-requisite for a project, and EC set out environmental terms for the project (article

8, 9 and 10). The Act also requires the RGoB to ensure that environmental concerns are fully taken into account when formulating, renewing, modifying, and implementing any policy, plan, or program as per regulation that may be adopted within EAA provisions. The Act outlines: general procedures for environmental assessment including assessment steps, requirements for EC issuance, consultation; information disclosure; functions and powers of the agencies charged with implementing EAA; monitoring and control of offenses and penalties; and appeals and dispute resolution procedures under EAA. Regulations and guidelines supporting the EA Act include the Regulation for the Environmental Clearance of Projects, Regulation on strategic Environmental Assessment, Application for Environmental Clearance Guidelines, and Environmental Codes of Practices.

2.1.2 Regulation for Strategic Environmental Assessment 2002.

The purpose of the regulation is to ensure that environmental concerns as well as cumulative and large-scale environmental effects are taken into account while formulating, reviewing, modifying, or implementing any policy, plan, or programme. The regulations aims to complement project-specific environmental reviews and to encourage early identification of environmental objectives and impacts; to promote design of environmentally sustainable proposals that encourage the use of renewable resources and clean technologies and practices of all government; and to promote and encourage the development of comprehensive natural resource and land use plans at the local, district and national levels.

2.1.3 Environmental Codes of Practice (ECOP).

Under article 39 of EAA, the competent authority is mandated to attach environmental terms to the development consent which may contain applicable codes of best practices. NECS has prepared environmental codes of practices (ECOP), such as ECOP for Storm water Drainage Systems, ECOP for Installation of Underground and Overhead Utilities, ECOP for Hazardous Waste management as well as Environmental Discharge Standards. Environmental Clearance (EC), according to the EA Act (Article 8, 9 and 10) is pre-requisite for any development project. The EC includes terms and conditions which the applicant or holder of the EC must abide by. As a standard operating procedure, relevant ECOP is attached with the EC as environmental terms and conditions, and requires that the ECOP is attached to the Contract Document as a part of the Contract Clause and to be used in conjunction with other requirements of the RGoB and Municipal Authority. In general ECOPs are applied to all stages of project for incorporation of environmental aspects, such as during preparatory phase (planning, survey, design), during construction phase, and during post-construction (operation & maintenance, as well as) phase.

2.2 Environmental Monitoring

Under the EA Act Article 34.2, 35.4, and 39.3 and Chapter IV, NECS and / or CA is mandated to carry out environmental monitoring, and enforce and control compliance. The terms of environmental clearance including ECOP form basis for monitoring and compliance checks, and the environmental clearance issuing agency is responsible for monitoring compliance. Under the mandate, CA and/ or NECS can monitor as well as control and enforce the terms of the environmental clearance, including ordering sanctions and compensation for environmental damage. The CA and / or NECS has right to enter project sites with or without prior notification in order to ensure compliance with the terms of an environmental clearance; to make visual inspections and spot checks; to interview employees, occupants, or other persons on site; to collect samples, inspect, and take copies of relevant data or documents; and to take all other

control measures necessary to protect the environment. Legislation requires CA and NECS to report annually. The EA Act also has provisions for spot checks and unannounced visits.

2.3 Occupational Health and Safety

2.3.1 Regulations on Occupational Health, Safety and Welfare (MoLHR)

This regulation was framed under the Labour and Employment Act, 2007. It prescribes standards and procedures on occupational health, safety and welfare for workplaces, instruments, vessels, appliances, apparatuses, tools, devices, electrical safety and other hazardous conditions. The objective of this regulation is to ensure safety, health and welfare for employees as well as other persons at workplaces, from work related risks to their health, safety and well being.

2.3.2 Regulations on Occupational Health and Safety for Construction Industry (MoLHR)

Regulation on Occupational Health and Safety for the Construction Industry was framed under the Labour and Employment Act, 2007. This regulation establishes occupational health and safety standards and procedures on construction safety. It aims to ensure safety and health for employees, as well as other persons at the construction sites, from work related risks to their health, safety, and well being. It also prescribes the roles and responsibilities of the workers and employers in ensuring health and safety at the site.

3 Environmental Management Framework

The Royal Government of Bhutan recognizes the need to raise the living standards of the present population without compromising the country's cultural integrity, historical heritage or the quality of life for future generations and especially not at the expense of its natural resources.

3.1 Review of existing literatures including the following:

- a. Environment Assessment Act, 2000, National Environment Commission, Royal Government of Bhutan
- b. Regulations for Environmental Clearance of Projects, National Environment Commission Secretariat
- c. Labour and Employment Act of Bhutan, 2007
- d. General Rules and Regulations on Occupational Health And Safety (OHS) in Construction, Manufacturing, Mining and Service Industries, 2006
- e. Plan, policies, and programs of DES. MoE, MoH related to the improvement of school and basic health unit physical facilities
- f. National Action Plan for Earthquake Safety of Health Facilities, January, 2013, Ministry of Health
- g. National Action Plan for School Earthquake Safety, January, 2013, Ministry of Education
- h. Standard drawings public buildings produced by the respective agencies.
- i. Consultations were carried out with respective stakeholders at the central level of the Government with regard to environmental considerations to be included.

3.2 An Overview of Environmental Steps

The EMF has been developed by the DES under the MoWHS, RGoB for the retrofitting activity under the IRSR in Bhutan in order to ensure due diligence and to avoid any environmental degradation issues. The purpose of this framework includes assisting the implementing agency DES in screening all the sub-projects for their environmental impacts, identifying suitable mitigation measures and implementation of these measures through an environmental management plan.

The selection of buildings (up to 5) for retrofit will depend on the findings from the inventory and vulnerability assessment. The selected buildings will include schools, basic health units and other government owned public buildings.

The retrofit work would include only strengthening of an individual structure which is already existing and there will be minimal or no disturbance to its surrounding.

The detailed project report (DPR) will be prepared by the DES. The DES shall convene the selection committee including all relevant stakeholders (Engineering, Planning) of the concerned Ministries, which will finalise the buildings to be taken up for retrofitting.

3.3 Environmental Assessment (EAs)

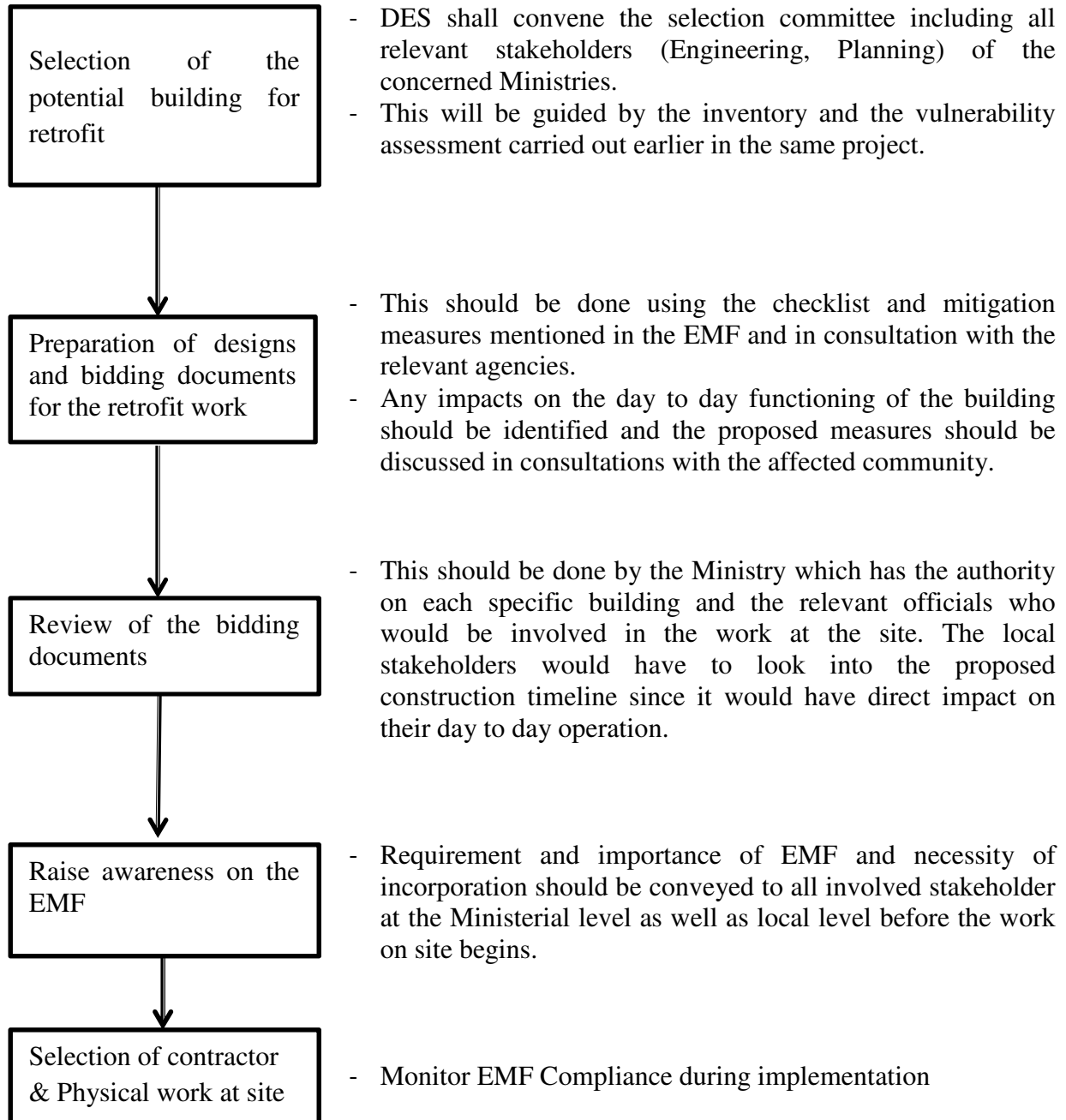
Considering the nature and magnitude of potential environmental impacts from limited¹ renovation, refurbishing and strengthening construction work, the proposed operation is to be classified as category “C”.

The retrofit works are not likely to present any perceived environmental risks and potential adverse impacts in its area of influence. The nature of this activity doesn't trigger any national or international extensive environmental requirements. Hence, as per the EAA of Bhutan the proposed activities do not require any environmental clearance. However, in order to manage the minor and localized impacts, DES has suggested developing a generic screening and preparation of EMP for selected buildings. The proposed EMF suggests the following steps;

¹ As a standard rule, retrofitting of any given building will be recommended only if the cost of the retrofitting is around or below 25% of the replacement cost of the same building.

1. Prepare generic environmental screening of activities

The main activities and the stakeholders involved in the generic screening has been tailored as below:



2. Integration of EMF in Retrofit of Buildings

The primary objective of the environmental management and monitoring is to record environmental impacts resulting from retrofit of buildings and to ensure implementation of the “mitigation measures” identified in order to reduce adverse impacts and enhance positive impacts from specific activities. Having identified the potential impacts of the relevant activities through screening, the next step is the identification and development of mitigation measures to eliminate, or reduce impacts to levels that are environmentally acceptable during implementation and operation of the work through the preparation and implementation of an Environmental Management/Mitigation. EMF provides an essential link between the impacts predicted and mitigation measures specified.

The EMF includes the following components: i) concise description of the environmental risks/ concerns relevant to the public buildings and ii) proposed potential solution to the risks/ problems identified.

3.4 Mitigation

The EMF identifies site-specific, cost-effective and detailed measures that will reduce the identified adverse environmental impacts to acceptable levels. The plan should include compensatory measures if mitigation measures are not feasible, are not cost-effective, or are insufficient. Examples of the environmental mitigation measures that may be appropriate to the retrofit of buildings are shown in table below. The specific EMP must have its own mitigation measures that are appropriate to the issues/ risks/ difficulties identified through the process of screening.

Environmental Mitigation Measures

Category	Potential Problem	Appropriate Mitigation Measures
Slope stability	Landslide or other forms of mass instability on the slopes	Geological/geomorphologic considerations shall be incorporated in design Civil engineering structures and bio-engineering measures used. Measures taken to avoid undercutting of slope toes.
	Development of erosion or gulying in school premises	Check dams and bio-engineering measures used as necessary
Spoil disposal	Small volume of spoil	Every attempt will be made to minimize spoil and reuse construction materials
Plants	Trees being removed in school premises	Felled trees replaced, using the same species if appropriate.
		Suitable native tree species planted at appropriate

Category	Potential Problem	Appropriate Mitigation Measures
		locations where land is available.
Stacking of construction materials	Safety risk for residents	<p>Adequate fencing to construction materials especially dangerous materials such as steel and stone.</p> <p>Signage on site informing residents, passer byes, workers of care to be taken while passing through or handling material</p> <p>Time to time notifications will be provided to the residents to be careful while in the construction premises.</p>
	Dirtying of the compound	Construction materials will be stacked in proper manner and the site will be cleaned up as necessary.
Social issues	Local people excluded from project activities	<p>Local communities will be informed of the project through public consultations before the starting of the project</p> <p>Designs incorporate methods within the skills of local people.</p> <p>Contractors encouraged to use local labor wherever possible.</p> <p>Local artisans encouraged to participate to enhance their capacity</p>
School Safety	Theft, burglary, damage of physical facilities	<p>Adequate fencing of schools is required. The windows of classrooms should be secured by “grill” for any kind of trespassing by students and outsiders.</p> <p>Appointment of a watchman to ensure safety if needed</p>
Safety during construction	Damages to school properties and possible human casualties of different scale	<p>Ensure safety measures during design of physical works</p> <p>Signage on site informing residents, passer byes, workers of care to be taken while passing through or handling material</p> <p>Ensure use of protective equipment gear while working at construction site.</p>
Noise pollution	Noise during retrofit works of public buildings	Plan the work schedule so as to create minimum disturbance to the day to day functioning of the building.

Category	Potential Problem	Appropriate Mitigation Measures
Continuity of Service	Disturbance in the day to day functioning of the public building Dislocation of the residents	Preparation of a plan for continuation of regular activities for each building to be disturbed by retrofit work in consultation with the affected people and project stakeholders Physical work taken up part by part in a building, minimizing disturbance of building activities. Provide temporary shelter in the vicinity of site at a suitable location so as to serve as a convenient alternative facility for the regular activities. Use tents erected close to existing site to carry on activities. Renting an alternative facility in the vicinity to carry on regular activities In case of schools, where possible and where other arrangements not possible, relocation of students to the nearest school and providing transportation

3.5 Implementation of Mitigation Measures

a) Program Design: The mitigation measures should be integrated in the design of the program itself. Such a step will enhance the mitigation measures in terms of specific mitigation design, cost estimation of the mitigation measure, and specific implementation criteria. The integration of mitigation measures in the design phase will also help in strengthening the benefits and sustainability of the program.

b) Implementation Modality: The actual physical construction works will be done by the labourers hired by the contractor and local craftsman attending the retrofit onsite work (rehabilitation of old buildings). The overall work will be monitored by an Engineer from the DES in coordination with the local stakeholders such as the District Engineer and the Head of the institute / office of that building.

The relevant stakeholders both from the DES and the local offices should ensure that monitoring and mitigation components as spelled out in EMF are properly carried out. The retrofitting works when tendered out by DES, the project contractor should be bound by the parameters identified in the environmental and social assessment pertaining to specific mitigation measures in the contract.

c) Bill of Quantities: The tender instruction to bidders should explicitly mention the site specific mitigation measures to be performed, the materials to be used, waste disposal areas, as well other site specific environmental requirements as per the EMF.

d) Supervision and Monitoring: The purpose of supervision is to make sure that specific mitigation parameters identified in the environmental assessment and as bound by the contract is satisfactorily implemented. In addition, monitoring is necessary such that the mitigation measures are actually put into practice.

Environmental monitoring during project implementation should include systematic assessment of key environmental indicators that determine the degree of environmental impacts of the project and effectiveness of mitigation measures. Such information enables to evaluate the success of mitigation described in the EMF as part of project supervision.

Monitoring activities for project are divided in three types

1. Pre Construction Monitoring
2. Construction Phase Monitoring
3. Operation Phase Monitoring

Pre Construction Monitoring

S.N.	Indicators of Monitoring	Types of Monitoring/ Method of Monitoring	Monitoring Frequency	Responsibility
1.	Printing, & Distribution of EMF to All Stakeholders	Direct Observation	Once	DES
2.	Full-time Environmental Officer in place at MoWHS	Evidence	Once	MoWHS
3.	Incorporation EMF in Design, Tender Document	Direct Observation	Once	DES

Construction Phase Monitoring

S.N.	Indicators of Monitoring	Types of Monitoring/ Method of Monitoring	Monitoring Frequency	Responsibility
1.	Transportation of construction materials and safe loading & unloading of construction materials.	CM/Direct Observation	Regular during construction	Contractor
1.	Water sprinkling in dusty construction area & access earthen roads	CM/Direct Observation	Every Day	Contractor
2.	Stockpiling of spoil	CM/Direct	Everyday	Contractor

S.N.	Indicators of Monitoring	Types of Monitoring/ Method of Monitoring	Monitoring Frequency	Responsibility
		Observation		
3.	Reuse of construction materials	CM/Direct Observation	Everyday	DES

Operation Phase Monitoring

S.N.	Indicators of Monitoring	Types of Monitoring/ Method of Monitoring	Monitoring Frequency	Responsibility
1.	Preparation of monitoring reports	Records/Documents	Monthly	DES
2.	Impact audit	Compliance with EMF	Annual	DES

3.6 Capacity Development

Environmental capacity is generally weak at implementation levels. Therefore, capacity needs to be strengthened so that they can take up the responsibilities assigned to them. The Environment Person in the MoWHS will assist the teams to plan, coordinate, implement and monitor the physical works at the site. A thorough briefing of the EMF will be provided to all the stakeholders who will be involved in the retrofit work including the contractor and the labour force.

In future, capacity strengthening of the stakeholders should be given importance as and when resources are available.

In order to implement the EMF, following is the minimum capacity building necessary.

The capacity development program is designed based on the existing capacity need assessment of the retrofit works implementing partners/entities.

Capacity Development and Training Program for EMF in IRSR

Sl. No.	Particular of Activities	Remarks
1.	EMF Printing	
2.	Technical Strengthening of DES	
	2.1 Designation of full-time Environmental Officer	In order to safeguard environmental concerns, MoWHS will designate an environmental officer for the retrofit works.

Sl. No.	Particular of Activities	Remarks
3.	<ul style="list-style-type: none"> • Capacity Building Program for all involved agencies and individuals • Monitoring & Supervision Arrangements for DES 	<p>Thorough explanation of the EMF</p> <p>Effective monitoring during implementation</p>

3.7 Integration of EMF into regular programs:

The EMF should be site specific and detailed in its description of individual mitigation and monitoring measures and its assignment of institutional responsibilities. It must be integrated into program's overall planning, design, budget, and implementation. The EMF must be prepared if IRSR sub component has to be carried out through tendering.

3.8 Disclosure

The EMF will be shared by the DES with concerned stakeholders. After the final approval, it will be printed and distributed to relevant stakeholders. The EMF will be posted in official web site of DES.

The report will be translated into local language (Dzongkha) and disclosed.

Annex 1- Applicable Minimum Safety Standards for the Construction Industry

All construction activities carried out under the project will comply with the General Rules and Regulation on Occupational Health and Safety (OHS) in Construction, Manufacturing, Mining and Service Industries, promulgated in 2006 by the Ministry of Labour and Human Resources, Royal Government of Bhutan.

Reproduced below is the Annexure II of the Rules and Regulations mentioned above, which details the Minimum Safety Standards for the Construction Industry

Annexure II of the General Rules and Regulation on Occupational Health and Safety (OHS) in Construction, Manufacturing, Mining and Service Industries

For any construction, renovation/alteration, painting (including traditional painting) of structures, the employer is responsible for health and safety of the employees. The employer shall initiate and maintain this standard to provide good working environments in their construction site.

The Standards contained in this part shall apply with respect to employments preformed in a workplace/construction site in Bhutan.

1. Personal protective and lifesaving equipment:

The employer shall be responsible for providing suitable personal protective equipment or clothing, based on the type of work and risk, without cost to workers.

- (a) **Helmet** shall be provided to all workers, or visitors visiting the site for protection of head against impact or penetration of falling or flying objects.
- (b) **Safety belt** shall be provided to workers working in heights (more than 20ft) such as roofing, painting and plastering.
- (c) **Safety boots** shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
- (d) **Ear protecting devices** shall be provided to all workers and to be used during the occurrence of extensive noise.
- (e) **Eye and face protection equipments** shall be provided to all welders to protect against sparks of fire.
- (f) **Respiratory protection devices** shall be provided to all workers during occurrence of fumes, dusts, or toxin gas/vapor.
- (g) **Safety nets** shall be provided when workplaces are more than 25 feet (7.5m) above the ground or other surfaces where the uses of ladders, scaffolds, catch platforms, temporary floor or safety belts is impractical.
- (h) **First aid** kits shall be made available at all times throughout the entire construction period. Arrangement shall be made to ensure medical attention for workers who have met with an accident or sudden illness at any time during the construction period.

2. **Fire protection:** the employer shall be responsible for a fire protection and prevention throughout all phases of the construction or demolishing works.
3. **Hand and power tools:** Conditions of all hand and power tools like belts, gears, shafts, pulleys, sprockets, spindles, chains or other reciprocating, rotating or moving parts of equipments shall be maintained by the employer in a safe condition to prevent any accidents.
4. **Signs, signals and barricades:** Appropriate signs and symbols shall be required to be put up at work places. Barricades shall be put up all around the construction site at all times during construction or demolishing period to deter the passage of vehicles or persons to the construction site.

5. Material handling, storage, use and disposal

- (a) All materials stored in shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling or collapse.
- (b) Aisles and passageways shall be kept clear to provide for free and safe movement of material handling equipment and workers. Material if stored/stacked at roadside must not hinder free movement of vehicles and persons.
- (c) The areas used for construction shall be kept in good repair to ensure safe movement of vehicle or person.
- (d) Maximum safe load limits of floors within buildings and structures shall be conspicuously posted in all storage areas.
- (e) Materials shall not be stored on scaffold.
- (f) Brick stacks shall not be more than 7 feet in height and for concrete blocks they shall not be more than 6 feet high.
- (g) All scrap timber, waste material, and rubbish must be removed from the immediate work area as the work progresses.

6. Scaffolds

- (a) Each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it.
- (b) In case of direct connection of adjustable suspended scaffolds to roof or floor for balance, it shall be capable of resisting at least 4 times the tipping movement imposed. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope.
- (c) Pole scaffolds over 60feet (5.6m) in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design.
- (d) The platform/scaffold plank shall be at least 15 inches (46cm) wide and 1.5 inches thick.
- (e) The ends of platform, unless wedged, shall extend over the centerline of its supports at least 6 inches (15cm) for fully decked platform. For 10 feet or less platforms the extension should be designed and installed so that the cantilevered portion of the platform is able to support workers without tripping. Guardrails must be constructed to block the access to cantilever ends.

- (f) The front edge of all platforms shall not be more than 14 inch (36cm) from the face of the work.
- (g) For fully decked platform the lapped (minimum of 12inch and nailed) or abutted should be supported with separate support surface.
- (h) Platform should not deflect more than 1/60 of the span when loaded.
- (i) Ramp or walkway should be at least 6feet (1.8m) wide having slip resistance threads and must not be inclined more than a slope of 1 vertical and 3 horizontal.
- (j) A rail consisting of a top and middle bar shall be provided on open sides of the ramp scaffolds and should provide adequate handhold for employees grasping them to avoid falling.
- (k) Workers should not be made to work on scaffolds covered with snow, ice or other slippery materials except as necessary for removal of such materials.
- (l) Workers should not be made to work on the scaffolds during storm or high wind.
- (m) Makeshifts devices and ladders shall not be used on tope of scaffolds to increase the working level height for workers.
- (n) While working on roof, roofing brackets shall be constructed to fit the pitch of a roof. A catch platform shall be installed below the working area of roof where the height is more than 16 feet above the ground level and the roof slops is more than 4/12. The worker shall wear the safety belt all the time while working on truss/roof.
- (o) The rope used to securing brackets and scaffolds or as an anchorage shall be damage free and strong.

7. Excavations

- (a) Excavated earth must be stacked away (at least 2 feet) from the pit to avoid from falling back or rolling into the excavation and burring the workers or injuring the workers from rolling loose rock unless a protective barricades/retaining devices is provided to prevent falling earth.
- (b) When the adjoining building/structure is endangered by excavation operation, support systems such as shoring, bracing or underpinning shall be provided to ensure the stability of such structures.

8. Electrical works

- (a) All Electrical equipment and installation shall be constructed, installed and maintained by a competent person, and so used as to guard against risk of electrical shocks and electrocution.
- (b) Adequate steps shall be taken to ascertain the present of and to guard against dangers to workers from any live electrical cable, which may be under, on or above the construction site.

9. Sanitation and Hygiene

- (a) Facilities such as toilets, drinking water, and waste bins shall be adequately installed at the workplace.