

CONSTRUCTIONAL RESPONSIBILITIES AND PRACTICES

1.1 INTRODUCTION

This part of the Code provides the minimum requirements for safe constructional operations, constructional planning, management and practices in buildings; as well as for storage, stacking and handling of materials and resources used in buildings. It describes precautionary measures to be adopted to ensure the safety of public, environment & infrastructure, property, workmen, materials, services, plant and equipment. It also covers guidelines relating to maintenance management, repairs, retrofitting and strengthening of buildings.

1.2 SCOPE

The regulations stated in this part cover the constructional responsibilities and practices in building sites; safe storing, stacking and handling of materials, equipments and other resources; and safety of personnel during construction operations. The provisions of this part shall apply to all construction operations viz. erection, alteration, repair, removal or demolition of buildings and structures.

Nothing herein contained shall be construed to nullify any rules, regulations, safety standards or those contained in the various act of the Government of Bangladesh, statutes governing the protection of the public or workers from any hazard involved in manufacturing, mining and other processes and operations which generate toxic gases, dust or other elements dangerous to the respiratory system, eye sight or health.

1.3 TERMINOLOGY

This section provides an alphabetical list of the terms used in and applicable to this part of the Code. In case of any conflict or contradiction between a definition given in this section and that in any other part, without prejudice to provisions arising from laws, statutes and recourses provided under such laws, statutes and covenants of GOB and trade bodies. The meaning provided in this part shall govern for interpretation of the provisions of this part. References shall be made to other part of this Code for terms not defined in this section.

AUTHORITY: The Authority which has been created by a statute and which, for the purpose of administering this Code or part thereof, may authorize a committee or an official to act on its behalf. (This definition of Authority shall apply to all appearances of the term in this Code written with a capital A).

EMPLOYER: The Employer is the party named who employs the Consultant and/or Contractor to carry out the Works

CONSULTANT: The “Consultant” is the organisation/person whose proposal to perform the Services like design, supervision or other technical and/or management services has been accepted by the Owner/Client and has a Contract Agreement to execute the service.

PROFESSIONALS: “Professionals” means technical personnel and support staff provided by the Consultant or by any Sub-Consultant and assigned for supervising the execution and completion of the Works and administering the Contract

CONTRACTORS: Contractor means the natural person, private or government enterprise, or a combination of the above, whose Tender to carry out the Works has been accepted by the Employer and is named as such in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.

WORKMEN/ LABOURERS: Workmen means any natural person, who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

AUTHORIZED OFFICER: An officer appointed by the Government by notification in the Official Gazette to exercise in any area the functions of an Authorized Officer.

BLAST AREA: The area in which danger may arise during or prior to demolition including the potential area affected by preparation, handling and use of explosives.

BLASTING: The operation of disintegrating rock, structure etc. by firing an explosive charge.

CARTRIDGE: A wrapped or otherwise protected cylinder of defined size of a homogeneous explosive material.

CONSTRUCTION EQUIPMENT: All equipment, machineries, tools and temporary retaining structures and working platforms, such as derricks, concrete pump, staging, scaffolds, runways, ladders and all material handling equipment including safety devices.

DETONATOR: An instantaneous or delay initiator for explosive materials and containing a charge of high explosive fired by means of a flame, spark or electric current.

EXPLOSIVE: Any substance, whether or not contained in a device, used or manufactured with a view to producing an effect by explosion.

FLOOR HOLE : An opening in any floor, platform, pavement, or yard, measuring less than 300 mm but more than 25 mm in its least dimension, through which materials but not persons may fall; e.g. a belt hole, pipe opening or slot opening.

FLOOR OPENING : An opening in any floor, platform, pavement or yard bigger than a floor hole measuring 300 mm or more in its least dimension, through which a person may fall; e.g. hatchway, stair or ladder opening, hopper mouth pit or large manhole.

GUARD RAILING: A barrier erected along exposed edges of an open side, floor opening, wall opening, ramp, platform or catwalk or balcony, etc. to prevent the fall of persons.

HOISTS: A platform, bucket or similar enclosure made of steel frames, struts and timber planks used for the lifting or lowering of construction material and workmen, the hoists being operated from a point outside the conveyance.

MAGAZINE: Any building or structure used for the storage of explosives with approval of the Authority.

PILE RIG: The complete pile driving equipment comprising piling frame, leader, hammer, extractor, winch and power unit. Complete pile driving rig may be mounted on rafts or pontoon or rails. Pile rig may also be a mobile unit mounted on trailers or trucks, or a special full revolving rig for raking piles.

PLATFORM: A working space for persons, elevated above the surrounding floor or ground, e.g. balcony or platform for the operation of machinery and equipment.

PRIMER: A cartridge cord or container of explosive into which a detonator or detonating cord is inserted or attached and is designed to initiate a larger charge.

SALVAGE: An act of saving and utilization of reusable scrap materials conforming to the requirements of this Code.

SCAFFOLD: A temporary erection of timber or metal work used to support or to allow the hoisting and lowering of workmen, tools and materials during construction, alteration or demolition of a building

SHOTFIRER: The person in immediate control of the use of explosives.

TOE BOARD: A vertical barrier erected along exposed edge of a floor opening, wall opening, platform, catwalk or ramp at floor level to prevent fall of materials or persons.

WALL HOLE: An opening in any wall or partition having a height of more than 25 mm to less than 750 mm and having no restriction in width.

WALL OPENING: An opening in any wall or partition having a height of at least 750 mm and a width of at least 450 mm.

1.4 PLANNING

Construction planning aspects aim to identify and develop various stages of project execution on site which shall be consistent with the management considerations. Planning aspects evolve out of the objectives of project and requirements of the final completed constructed facility. These objectives can relate to the final constraints, cost considerations, quality standards, safety standards as well as both environmental and health considerations. Construction practices shall, then have to satisfy these objectives during construction phase of the project. Having established objectives of the construction phase, planning determines processes, resources (including materials, equipments, human and environmental) and monitoring system to ensure that the practices are appropriately aligned. Adequate knowledge about pre-construction phase evolution of project, especially related to customer's requirements, is an essential prerequisite for construction planning.

1.4.1 Responsibilities

In a construction or demolition work, the terms of contract between the owner and the contractor, and between a consultant and the owner, shall be clearly defined and put in writing. These, however, will not absolve the owner from any of his responsibilities under the various provisions of this Code, and other applicable regulations and bye-laws.

The terms of contract between the owner and the contractor will determine the responsibilities and liabilities of either party in the concerned matters, within the provisions of the relevant acts and codes (e.g. the Employer's Liability Act 1938, the Factories Act 1965, the Fatal Accident Act 1955 and Workmen's Compensation Act 1923).

The owner, or the professional appointed by him to supervise the work, shall ensure the quality of materials used, soundness of the work and observance of all precautionary measures.

1.4.2 First Aid Attendant

Depending on the scope and nature of the work, at least one person trained in first aid for every 100 workers shall be available at work site to render and direct first aid to casualties. The first aid attendant shall have a refresher course every five years and certificates renewed.

A telephone shall be made available to first aid assistant with emergency telephone numbers prominently displayed. Record/reports of all accidents and actions taken thereon shall be kept by the first aid attendant and forwarded to appropriate authorities when asked.

1.4.3 Temporary Construction

Plan, layout, design and specification of all temporary constructions, e.g. workers' shed, toilet, site store, site office, runway, trestle, foot bridge, guard shed etc., which are likely to interfere with right-of-way or utility services provided by various agencies, shall be submitted to the respective authorities for approval before commencement of any construction operation.

Temporary structures shall be constructed from inflammable materials, but they shall be so located as not to cause any fire hazard to adjoining structures or works and neighboring properties.

1.4.4 Preconstruction Phase

Besides the design aspects, preconstruction phase should also address all the issues related to the implementation of the design at the site through suitable construction strategy. During the design stage, the site conditions should be fully understood with anticipated difficulties and avoid the risk of subsequent delays and changes after the construction has started.

The selection of construction methods, building systems and materials, components, manpower and equipments and techniques are best done in the preconstruction phase. Such selection is influenced by the local conditions like terrain, climate, vulnerability for disasters, etc.

Construction in busy localities of cities needs special considerations and meticulous planning due to restricted space, adjoining structures, underground utilities, traffic restrictions, noise and other environmental pollution and other specific site constraints,

The constructability aspects of the proposed construction methods needs to be carefully evaluated at the planning stage to ensure ease of construction besides optimizing the construction schedule and achieving quality, reliability and maintainability of the constructed facilities.

Constructional practices in hilly regions needs to take into considerations the problem of landslides, slope stability, drainage, etc, besides ensuring no adverse impact on the fragile environmental conditions.

Durability of constructions in corrosive atmospheric conditions like coastal regions and aggressive ground situations with high chlorides and sulphates should also be taken care of with appropriate constructional practices.

Constructional practices in disaster prone areas need specific planning. The type of construction, use of materials, construction techniques require special considerations in such areas.

Adverse weather conditions have strong bearing on construction phase. Situations wherein constructions are to be carried out in adverse weather conditions, such as heavy and continuous rain fall, extreme hot or cold weather, dust storms, etc, the practices have to address the relevant aspects. Accordingly, suitable design and field operations should be adapted or redefined in anticipation of these aspects. Some of these aspects are:

- a) Site layout which enables accessibility in adverse weather.
- b) Adequate protected storage for weather sensitive materials/equipments.
- c) Protections to personnel from extreme hot/control conditions.
- d) Scheduling to allow maximization of outdoor activities during fair weather conditions.
- e) Special design and construction provisions for activities in extreme temperature conditions like hot or cold weather concreting, staple of false work in extreme wind conditions (gusts).
- f) Adequate lighting for shorter days in winter/night work.
- g) Design for early enclosure.
- h) Adjacent historically important structure shall be given highest care against any damage during construction process.

All sanitary facilities shall be kept in a hygienic condition. Temporary toilets shall be enclosed, screened and weather proofed and shall be installed and maintained in accordance with the relevant part of the Code.

1.4.5 Construction Phase

1.4.5.1 Organizational structure

The site management should be carried out through suitable site organization structure with roles and responsibilities assigned to the construction personnel for various construction related functions. Safety management is one of the important components of site management.

1.4.5.2 Site layout

The layout of the construction site shall be carefully planned keeping in view the various requirements to construction activities and the specific constraints in terms of its size, shape, topography, traffic and other restrictions, in public interest. The site layout shall take into considerations the following factors:

- a) Easy access and exit, with proper parking of vehicle and equipments during construction.
- b) Properly located material stores for easy handling and storage
- c) Adequate stack areas for bulk construction materials.
- d) Optimum location of plants and equipments (batching plants, etc).
- e) Layout of temporary services (water, power, power suppression unit, hoists, cranes, elevators, etc).
- f) Adequate yard lighting and lighting for night shifts.
- g) Temporary buildings; site office and shelter for workforce with use of non-combustible materials as far as possible including emergency medical aids
- h) Roads for vehicular movement with effective drainage plan.
- i) Construction safety with emergency access and evacuations and security measures.
- j) Fabrication yards for reinforcement assembly, concrete casting and shattering materials.
- k) Fencing, barricades and signage.

1.4.5.3 Access for firefighting equipment vehicles

Access for firefighting equipment shall be provided to the construction site at the start of construction and maintained until all construction work is completed.

Free access from the street to fire hydrants/static water tanks, where available, shall be provided and maintained at all times.

No materials for construction shall be placed within 3m of hydrants/static water tanks.

During building operations, free access to permanent, temporary or portable first-aid firefighting equipment shall be maintained at all times.

In all buildings over two stories high, at least one stairway shall be provided in usable condition at all times. This stairway shall be extended upward as each floor is completed. There shall be a handrail on the staircase.

1.4.5.4 Construction strategy and construction sequence

Construction strategy and construction methods are to be evolved at the planning and design stage specific to the conditions and constraints of the project site and implemented by the site management personnel to ensure ease of construction and smooth flow of construction activities.

Sites of high water table conditions with aggressive chemical contents of subsoil needs special design considerations. Buildings with basement in sites of high water table should be planned with dewatering scheme with appropriate construction sequence, Duration of dewatering shall continue till sufficient dead loads are achieved to stabilize the buoyancy loads with adequate factor of safety. The construction sequence should be planned taking into consideration the following aspects:

- a) Availability of resources (men, material and equipment);
- b) Construction methods employed including prefabrication;
- c) Planned construction time;
- d) Design requirements and load transfer mechanism;
- e) Stability of ground like in hilly terrain;
- f) Ensuring slope stability with retaining structure before the main construction;
- g) Installation and movement of heavy equipments like cranes and piling equipments;
- h) Effect of weather; and
- i) Minimum time to be spent below ground level working.
- j) Protection against ground water seepage.

1.5 CONSTRUCTION CONTROL

1.5.1 General

All construction including extension, alteration and demolition shall require a permit from the Authority. Permits shall also be obtained from relevant organizations for service connections and other facilities. The construction work shall conform to the plan approved by the Authority.

The owner shall make arrangements for obtaining the required approvals.

All new work or alteration shall be planned, designed, supervised and executed by competent professionals of relevant discipline.

1.5.2 Professional Services and Responsibilities

The responsibility of professionals with regard to planning designing and supervision of building construction work, etc and that of the owner shall be in accordance with the relevant part of the Code and professional practice. Employment of trained workers shall be encouraged for building construction activity.

1.5.3 Construction of all Elements

Construction of all elements of a building shall be in accordance with good practice. It shall also be ensured that the elements of structure satisfy the appropriate fire resistance requirements as specified in Part 4 'Fire Protection', and quality of building materials/components used shall be in accordance with Part 5 'Building Materials'.

1.5.4 Construction Using Bamboo

Bamboo being a versatile resource characterized by high strength, low mass and ease of working with simple tools, it is desirable to increasingly make appropriate use of this material. Design of structures using bamboo shall be done in accordance with Part 6 'Structural Design', Section 4 'Bamboo', Chapter 11 'Timber'.

For construction using bamboo, some of the important constructional provisions given below shall be followed.

Bamboo can be cut and split easily with very simple hand tools. Immature bamboos are soft, pliable and can be molded to desired shape. It takes polish and paint well.

While it is possible to work with bamboo simply using a machete, a few basic tools, such as, machete, hack saw, axe, hatchet, sharpening tools, adze, chisel (20 mm), chill, wood rasps, steel rod, and pliers, will greatly increase the effectiveness of the construction process.

For providing safety to the structure against fire, bamboo may be given fire retardant treatment using following chemicals; a few drops of concentrated HCL shall be added to the solution to dissolve the precipitated salts:

Ammonium phosphate	3 parts
Boric acid	3 parts
Copper sulphate	1 part
Zinc chloride	5 parts
Sodium dichromate	3 parts
Water	100 parts

Bamboo indirect contact with ground, bamboo on rock or preformed concrete footing, bamboo incorporated into concrete or bamboo piles may form the foundation structure.

The floor of bamboo may be at ground level with covering of bamboo matting, etc. In elevated floors, bamboo members become an integral part of structural framework of building. The floor will comprise structural bamboo elements and bamboo decking.

The jointing techniques in construction using bamboo shall be in accordance with Part 6 'Structural Design', Section 4 'Bamboo', Chapter 11 'Timber'.

1.5.5 Low Income Housing

For low income housing, appropriate planning and selection of building materials and techniques of construction have to be judiciously done and applied in practice. Requirements of low income housing specified in Part 3 'General Building Requirements', shall be followed. However, all requirements regarding structural safety, health safety and fire safety shall be in accordance with this Code.

1.5.6 Site Preparation

While preparing the site for construction, bush and other wood, debris, etc, shall be removed and promptly disposed of so as to minimize the attendant hazards. Temporary buildings for construction offices and storage shall be so located as to cause the minimum fire hazards and shall be constructed from noncombustible materials as far as possible.

1.5.7 Use of New /Alternative Construction Techniques

The provisions of this part are not intended to prevent use of any construction techniques including any alternative materials, nonspecifically prescribed by the Code, provided any such alternative has been approved. The Authority may approve any such alternative such as ferrocement construction, row-lock (rat trap) bond in masonry, stretcher bond in filler slab and filler slab provided; that the proposed alternative is satisfactory and conforms to the provisions of relevant parts regarding material, design and construction of this Code. The material or method or work offered as alternative is, for the purpose intended, at least equivalent to that prescribed in the Code in quality, strength, compatibility, effectiveness, fire and water resistance, durability and safety.

1.5.8 Permits

The owner of a building shall obtain permission from the Authority for the work to be undertaken in accordance with the provisions of the relevant part of this Code.

Special permits shall be obtained from relevant authorities before commencement of a particular construction work for the following items and for any other item as decided by the Building Official:

- a) storing materials on roads and sidewalks;
- b) using water, electricity, gas, sewerage or other public utilities;
- c) digging roads or interfering with the drainage system;
- d) storing and handling of explosives; and
- e) affecting any structure having historical association and antiquity.

1.5.9 Tests and Inspections

The Authority shall notify both the owner and the contractor of any unsafe, unlawful or unethical situation discovered during inspection and direct them to take necessary remedial measures to remove the hazard or rectify the violation.

Where the strength or adequacy of any scaffold or other device or construction equipment is in doubt, or where any complaint is lodged, the Authority shall inspect such equipment and shall prohibit its use until tested safe or until all danger is removed.

1.6 CONSTRUCTION MANAGEMENT

Employer and Management shall be responsible for optimizing Construction Planning, resource utilization, and scope, time, quality, health, safety and environment and cost for implementation, monitoring and control for their effectiveness. This may be preferably in line with proven National/International documentation system covering all aspects of monitoring and controls. Various parameters to be managed during construction are as below.

1.6.1 Time Management

The project shall be completed in the defined time schedule to get its fruitful benefits. The system planned shall cover total schedule of completion with one or more construction agencies, number of vendors, identification of total resources, timely availability of all inputs, including critical ones, its processing during construction of a project. The system shall include a periodic review of a project with all parameters as well as catch up plans in case of delay identified for controls and reporting from time to time. The system planned shall preferably be computer friendly and simple to follow for implementation, monitoring and controls and for reporting from time-to-time.

1.6.2 Quality Management

Quality of a project shall be planned for all activities from inception to completion. It is desirable that the system planned gives adequate assurance and controls that it shall meet project quality objectives. The system shall cover review of existing requirements, subcontracting, materials, processes and controls during process, auditing, training of personnel, final inspection and acceptance. All activities shall be planned and controlled. Quality systems approach may be referred for planning, suitable to a particular project for implementation.

1.6.3 Health, Safety and Environment

Each project affects the safety and health of the workmen and surroundings during construction. Various activities having impact on health, safety and environment need to be identified with their likely effect and proposed preventive corrective actions, together with the concerned statutory obligations. The system planned for health, safety and environment shall address and cover the above including use of personnel protective equipments by all concerned and reporting on their monitoring and controls during project implementation.

1.6.4 Cost Management

To keep the project under viable proposition, it is desired that cost of the project during construction are monitored and controlled through a documentation system. The various parameters which may affect the basic cost, escalations, cost due to variation in scope and quantities, etc need to be monitored at a defined frequency. The system planned shall be in line with a proven cost control method or similar in nature and cost incurred vis-a-vis cost sanctioned and cost anticipated to be reported and controlled from time to time.

1.7 PROTECTION OF PUBLIC AND WORKERS

1.7.1 General

Erection, alteration, renovation, remodeling, repairing, removal or demolition of a building or structure shall be conducted in a safe manner. Suitable protection for the general public and workers employed thereon shall be provided according to the various provisions of this Code.

All existing and adjoining public and private property shall be protected from any damage due to construction operations. Whenever requested, site plans, construction details, and specification shall be submitted for review by the concerned agency.

All equipment and safeguard required for the construction work such as temporary stair, ladder, ramp, scaffold, hoist, runway, barricade, chute, lift etc. shall be substantially constructed and erected so as not to create any unsafe situation for the workmen using them or the workmen and general public passing under, on or near them.

Public walkway shall not be occupied to carry out work under a building permit unless the pedestrians are protected as specified in this section. Any material or structure temporarily occupying public property, including fences and walkways, shall be adequately lighted at night.

1.7.2 Adjoining Property

The owner of the building shall preserve all adjoining structures and walls from damage. He shall support the adjoining building or structure by proper foundations to comply with the Code.

Necessary permissions to preserve and protect the adjoining plot, building or structure shall be obtained by the owner of the building to be constructed. Adjoining property shall be completely protected from any damage due to the building operation when the owner of the adjoining property permits free access to the adjoining site and building.

If required, the owner of the adjoining plot, building or structure shall be granted necessary permission to enter the construction site to make his own property safe.

No part of any structure, except signs, shall project beyond the property line of the site. Sidewalk sheds, underpinning and other temporary protective guards and devices may project beyond the property lines if approved by the Authority. Where necessary, the permission of the adjoining property owner shall also be obtained.

Where a construction or demolition is undertaken at a level higher than the adjacent structure, the roof, roof outlets, skylights and other roof structures of adjoining buildings shall be protected against damage. This shall be ensured by the owner of the construction site at his own expense.

Where the grade of the adjoining plot is lower than the site level, a retaining wall shall be erected, if necessary, at the owner's expense and on his site. Design and construction of retaining wall shall conform to the structural

requirements for such walls, and may have a railing or fence at the top to provide a total height of not less than 1 m above the finished grade of the higher plot.

If the owner, lessee or tenant of the adjoining building refuses permission to have the roofs and skylights of the adjoining building protected, the responsibility and expense for the said protection shall transfer to the person refusing such permission.

During any demolition or excavation work, the structure or the wall shall be maintained structurally safe by adequate temporary props and lateral supports.

1.7.3 Protective Fences and Railings

Pedestrian traffic on the adjacent road or footpath, or the walkway constructed shall be protected by a railing or fence. Protective railing or fence shall also be placed adjacent to excavations. Railings shall be at least 1m in height and when adjacent to excavations, shall be provided with a mid-rail.

All construction work within 1.5 m from the road shall be enclosed with a fence not less than 2.4 m high from the grade. If the work is more than 1.5 m away from the road, a fence or other barriers shall be erected at least on the side of the site nearest to the footpath/road. The fence shall extend over the entire length of the side. Openings in fences may have doors which normally shall be kept closed.

All fences shall be of adequate strength to resist wind pressure and other load as specified in relevant part of the Code. All fences shall be well braced. The side of any fence/handrail adjacent to a road or sidewalk shall be kept smooth. Fences, barriers, or temporary structures of any kind located on public roads shall not obstruct vision at the intersection of streets.

1.7.4 Canopies, Overhangs and Platforms

Protective canopy shall have a clear height of 2.4 m over the walkway. Walkways under the canopy shall be not less than 1.2 m wide in the clear. However, the Building Regulatory Authority may instruct differently regarding the clear width in congested areas.

Every canopy shall have a fence built along its entire length on the construction side. If materials are stored or work is done on the roof of the canopy, edges of the canopy roof shall have a tight curb board not less than 200 mm high and a railing not less than 1 m high. The entire structure shall be designed to carry the loads to be imposed.

The posts or other supporting members of any temporary structure on the road side shall be designed for the load due to vibration generated by the street traffic. The framework supporting the covering shall be well braced and designed to support at least 7 kpa. However the top deck shall be designed to carry load not less than 10 kpa.

The roof covering shall be of a width sufficient to cover the entire walkway or side walk and shall be made watertight. Covered walkways shall be provided with adequate lights at all times.

Cantilevered platforms or other substitute protection in lieu of sidewalk sheds shall not be used unless approved by the authority and deemed adequate to insure public safety.

Materials shall not be stored on overhangs unless these are designed for the load. Such storage shall in no case exceed a day's supply. All materials shall be piled in an orderly manner and height to permit removal without endangering the stability of the pile and canopy.

1.7.5 Protection of Utilities

Protective frame and boarding shall be built around and over every street lamp, utility box, fire and police alarm box, fire hydrant, catch basin and manhole that may be damaged by any construction work. The protection shall be maintained while such work is being done; and shall not obstruct the normal functioning of the device.

Building material, fence, shed etc. shall not obstruct free access to any fire hydrant, lamppost, manhole, fire alarm box, or catch basin, or interfere with the drainage of the site. Protective covers shall be provided to such utility fixtures during the progress of the work without obscuring their identity.

Precaution shall be taken during construction to prevent concrete, mortar washing or any other material from entering and blocking a sewer.

1.7.6 Use of Road and Footpath

Road and footpath spaces may be used only temporarily during construction subject to the following conditions:

- a) permissions shall be obtained from relevant authorities for all such uses;
- b) the allocated space or any portion thereof shall be more than 1.5 m away from a railway track;
- c) a walkway shall be constructed in the outer portion of the road space permitted to be occupied in conformity with Sec 1.4.2 and 1.4.3;
- d) an 1 m clear passage shall be maintained along the building site;
- e) person(s) who has been issued a permit to use road and footpath spaces shall furnish a bond with the relevant authority of such type and amount as may be deemed advisable by the authority as protection from all liabilities;
- f) the permittee shall repair any damages done to the adjacent road due to its use for construction work at his own expense; the bond money shall stand forfeited if the permittee fails to comply with this requirement; and
- g) it shall be used in a manner that will not deface it or create a nuisance. The owner, upon the completion of the building, shall immediately remove all temporary walkways, debris and all other obstruction and leave such public property in as good a condition as it was before such work commenced.

1.7.7 Protective Devices

No structure, fire protection or sanitary safeguard or device shall be removed or made inoperative unless instructed by the Authority. Pedestrian protection required by all relevant regulations shall be maintained in place and kept in good order as long as pedestrians may be endangered. Every protection, fence, canopy and other protective devices shall be removed within 7 days after such protection is no longer required.

1.7.8 Notices and Signs

Every walkway adjacent to a construction, demolition or excavation site shall be kept well-lighted at night. The outer edge of the occupied space of the street or footpath shall have red lights placed thereon which shall flash continuously day and night.

Boards with caution signs, along with safety regulations and emergency instructions painted in bright colour, preferably red, shall be erected near the entry and in prominent places of the site. It shall describe appropriate measures for the elimination or control of the danger and the conduct and course of action to be taken. Red caution marks shall also be placed on the building, equipment and utility connections.

1.7.9 Watchman and Auditory Signal

A watchman shall be employed to warn the general public when intermittent hazardous operations are conducted. Audible signal shall be used in case of extreme danger. It shall be such that any person in the reception area can recognize and react to the signal as intended. An auditory emergency evacuation signal shall take precedence concerning recognition over all auditory signals.

1.7.10 Safe Load

No structure, temporary support, scaffolding, sidewalk, footpath and drain covers, shed, other devices and construction equipment shall be loaded in excess of its safe working capacity.

Whenever the structural quality or strength of scaffolding plank or other construction equipment is in doubt, these shall be replaced or be subject to a strength test to two and half times the superimposed live load; the member may be used if it sustains the test load without failure.

Requirements of Sec 3.8 shall be observed regarding design loads in scaffolds.

1.8 ENVIRONMENTAL PROTECTION

The following provisions shall be met during construction for environmental protection.

The construction and operation of the work/project shall comply with relevant national environmental legislation including environmental quality standards. The basic responsibility of the contractor/owner towards the environment shall be:

- a) requires the Contractor/Owner to take all reasonable steps to protect the environment and avoid damage and nuisance arising because of his/her operations.
- b) the Contractor/Owner to comply with all status and regulations concerning the execution of works
- c) the Contractor/Owner shall be responsible for familiarizing himself with all legislation relating to environmental protection that is relevant to his activities. Reference to national environmental quality guidelines shall be made.
- d) the Contractor/Owner shall be responsible for the costs of cleaning up any environmental pollution resulting from his/her activities during construction.

1.8.1 Protection of Existing Drainage Systems and Utilities

During construction work all excavation and/or filling work shall be taken as to ensure safety to the existing underground utility lines and drainage system. The Contractor/Owner shall obtain written permission from the respective authorities before excavation or filling in such areas.

1.8.2 Protection of Soil, Aquifers, and Water Channels against Pollution

Construction activities are likely to generate waste in various forms. This shall be dealt with adequately to avoid pollution. The following measures shall be taken during construction of work:

- a) The Contractor/Owner shall, all times, maintain all sites under his control in a clean and tidy condition and shall provide appropriate and adequate facilities for the temporary storage of all wastes before disposal.
- b) The Contractor/Owner shall be responsible for the safe transportation and disposal of all wastes generated because of his/her activities in such a manner as to not cause environmental pollution or hazards to health in any form. In the event of any third party being employed to dispose of wastes, the Contractor/Owner shall be considered to have discharged his/her responsibilities from the time the wastes leave sites under his/her control, providing that he/she has exercised due diligence in ascertaining that the proposed transport and disposal arrangements are such as to not cause pollution or health hazards.
- c) The Contractor/Owner shall not allow waste oils or other petroleum derived wastes to be used as dust suppressants and that all reasonable precautions shall be taken to prevent accidental spillage of petroleum products, their contact with soil or discharge into water courses.
- d) The Contractor/Owner shall be responsible for the provision of adequate sanitary facilities for the construction workforce (including those employed under subcontracts) at all construction and camp sites. The Contractor/Owner shall not knowingly allow the discharge of any untreated sanitary wastes to ground water or surface water. Before mobilization of the construction workforce, the Contractor/Owner shall provide details of sanitary arrangements. The detail shall include maintenance and operation plans and generally be sufficient to assess whether the proposed facilities are adequate.
- e) where abstraction from a borehole by the Contractor/Owner results in adverse effects on groundwater, which at the time of commencement of the contract was being used by local people, the Contractor/Owner shall arrange supplies of equivalent quality and quantity of water to that previously available.

1.8.3 Protection of Air Quality from Obnoxious Emissions

To cover the unlikely event that dust blow becomes a nuisance, to the following effect shall be taken:

The Contractor/Owner shall take all reasonable measures to minimize dust-blow arising from any sites under his/her control by regular watering of any stockpiles, bare soil, and haul roads. Unsurpassed traffic areas and any sources of fugitive dust, when conditions require dust suppression.

1.8.4 Protection from Sound Pollution

The management shall be responsible for confining all construction and transportation activities in Residential and mixed Residential Areas strictly to normal business hours, so as not to cause emission of such sound and noise which is considered detrimental to human health. Such noisy activities shall not be carried out from 1800 hours in the evening to 0600 hours in the morning and on non-working days and holidays.

Noise nuisance shall be minimized through adequate machine maintenance and good site practices. However, a degree of unavoidable noise nuisance from construction is expected. Control vibration from piling operations is not possible without incurring an unreasonable financial cost.

The following noise control measures shall be taken during construction work:

- a) All vehicles and plant operated by the contractor or (including subcontractors) shall be maintained according to the original manufacturer's specifications and manuals, with particular regard to the control of noise emissions. The Consultant/Authority shall have the right to require the Contractor to replace or rectify any vehicle or plant that he thinks emits excessive noise, within 48 hours of notice in writing.
- b) The contractor shall make every reasonable effort to reduce noise nuisance caused by construction activities, including siting of crusher and ancillary plant in locations where the distance between them and residential areas is such that it results in attenuation of noise at existing residential areas.

1.8.5 Site Reinstatement

The construction sites shall be reinstated to an acceptable level to the following effect shall be included:

Upon completion of construction the contractor/owner shall remove equipment, surplus material, rubbish and temporary works of every kind, and the site in clean condition to the satisfaction of the appropriate authority.