



NEPAL NATIONAL BUILDING CODE

NBC 114 : 1994



CONSTRUCTION SAFETY

His Majesty's Government of Nepal
 Ministry of Physical Planning and Works
Department of Urban Development and Building Construction
 Babar Mahal, Kathmandu, NEPAL
 2060



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This publication represents a standard of good practice and therefore takes the form of recommendations. Compliance with it does not confer immunity from relevant legal requirements, including bylaws

श्री ५ को सरकार (मन्त्रिपरिषद्) को मिति २०६०।४।१२ को निर्णयानुसार स्वीकृत

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Preface

This Nepal Standard was prepared during 1993 as part of a project to prepare a draft National Building Code for Nepal.

In 1988 the Ministry of Housing and Physical Planning (MHPP), conscious of the growing needs of Nepal's urban and shelter sectors, requested technical assistance from the United Nations Development Programme and their executing agency, United Nations Centre for Human Settlements (UNCHS).

A programme of Policy and Technical Support was set up within the Ministry (UNDP Project NEP/88/054) and a number of activities have been undertaken within this framework.

The 1988 earthquake in Nepal, and the resulting deaths and damage to both housing and schools, again drew attention to the need for changes and improvement in current building construction and design methods.

Until now, Nepal has not had any regulations or documents of its own setting out either requirements or good practice for achieving satisfactory strength in buildings.

In late 1991 the MHPP and UNCHS requested proposals for the development of such regulations and documents from international organisations in response to terms of reference prepared by a panel of experts.

This document has been prepared by the subcontractor's team working within the Department of Building, the team including members of the Department and the MHPP. As part of the proposed management and implementation strategy, it has been prepared so as to conform with the general presentation requirements of the Nepal Bureau of Standards and Metrology.

The subproject has been undertaken under the aegis of an Advisory Panel to the MHPP.

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Member

Member-Secretary

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TABLE OF CONTENTS

Preface	i
0 Foreword	iv
1 Scope	1
1.1 Construction Practice	1
1.2 Planning Prior to Construction	1
1.3 Control	1
2 Interpretation	1
2.1 General	1
2.2 Terminology	1
3 Material Handling	2
4 First Aid Facility and Health	3
5 Fire Fighting	3
6 Site Preparation	3
7 Earthworks in Excavation	4
8 Construction of Foundations	4
9 Construction of Walls	5
10 Construction of Roofs	5
11 Electrical Works	6
12 Temporary Works	6
13 Demolition of Structures	7
14 Miscellaneous Requirements during Demolition	8
15 Use of Explosives	8
16 Labour Welfare	9
17 Miscellaneous Recommendations	9

0 Foreword

The purpose of this standard is to provide a reasonable degree of safety to construction-related personnel in building and civil construction works. Provisions of this Standard shall not be considered as contradictory to the provisions in the laws, by-laws and any other statutory requirements enforced by the appropriate authorities in Nepal. The provisions in this standard are the minimum requirements that are to be adopted during building and other civil construction or demolition work.

- 0.1** The requirement for compliance with this Standard should be incorporated in all construction contracts.
- 0.2** In this Standard, references to material storage also include material handling operations. Other important construction operations such as the erection of foundations, walls, roofs and framed structures, and the erection and use of temporary structures have also been addressed. Provisions to be observed during demolition work are also included.
- 0.3** Specific safety requirements for the use of explosives in construction and demolition work, for electrical works and for insurance for health and safety have been considered very strictly in this standard. The correct use of ladders, staged platforms, etc, are also covered.
- 0.4** Depending upon the nature, of the site conditions and, more specifically, the size and volume of the work, the provisions of this standard may not be sufficient. In such a situation, the appropriate requirements for safety should be investigated in detail and incorporated in the design, specification of works and other contractual documents.
- 0.5** The basic concepts used in deriving this Standard are based on those of the National Building Code of India and the relevant Indian safety standards therein, and the Health and Safety at Work Act of the United Kingdom.

1 Scope

1.1 Construction Practice

This standard covers provisions for the health and safety of workers in building construction and demolition work.

1.2 Planning Prior to Construction

Adequate planning shall be done before starting any construction or demolition work. Such a plan shall be approved by the designated engineer. Planning for fire protection, and any use of special materials such as chemicals and blasting materials shall be included in such a plan.

1.3 Control

In construction works where a formal contract exists between the employer and the contractor, the engineer or engineers' representative shall be responsible for compliance verification. On owner-built construction sites, the requirements of this code shall be taken as advisory.

2 Interpretation

2.1 General

2.1.1 In this standard the word "shall" indicates a requirement that is to be adopted in order to comply with the Standard, while the word "should" indicates recommended practice.

2.1.2 Commentary clauses are prefaced by the letter C and the number of the appropriate clause subject to comment.

2.1.3 Words implying the singular only also include the plural and vice versa where the context requires it.

2.2 Terminology

For the purpose of this standard, the following definitions shall apply, unless inconsistent with the context :

CONSTRUCTION EQUIPMENT means all equipment machinery, tools and similar equipment, including safety equipment.

FLOOR OPENING means an opening measuring 30 cm or more in its least dimension through which a person may fall.

GUARD RAILING means a barrier erected along an exposed edge to prevent the fall of persons.

PLATFORM means a working space elevated above the surrounding floor or ground, such as a balcony or platform for the operation of a machine or for persons.

SCAFFOLD means a temporary structure made of timber, metal or any other material to support and provide working space for men and materials.

SAFETY BELT means a belt to be worn by workers required to work at a height in order to protect them against falling from such places. These are specially-designed belts whose webbing is normally superior to leather. It includes any belt that may be required to take impact loads (ie, the stopping of a worker's body after falling a short distance). The strength of belt shall be at least three to four times the weight of the person using it.

THOROUGHFARE means a public path, walk way, footpath, side walk, etc, through which anybody is allowed to walk.

ENGINEER means the person designated by the employer to take responsibility for the supervision of the construction or demolition of the building and services. This person is the one responsible for implementing and enforcing this Standard at the work place. Such person could be an architect, an Civil Engineer's representative, the person in charge of construction works, or the client himself whoever takes the responsibility for implementing the project.

CATCH-ROPES means those ropes fastened to secure points and placed freely over the roof slope so that they could be used by the workers to prevent slipping and fear of accidents.

3 Material Handling

- 3.1 When materials are stored, they shall be segregated as to kind, size, and length such that they are safe against falling. Piles higher than one metre shall be stepped properly and they shall be arranged such that they allow a passage way at least one metre wide. All passage ways shall be kept clear at all times.
- 3.2 If the material storage yard is near a public place, it shall be fenced and shall have suitable warning signs.
- 3.3 In any case, stair ways, gangways and passages shall not be obstructed by the materials.
- 3.4 All flammable liquids like petrol, thinners, etc, shall be stored in conformity with the relevant regulations.
- 3.5 Explosives such as detonators, gun powder, gelatins, etc, shall be stored in conformity with current regulations for the storage and handling of explosives.

- 3.6** All glass shall be stored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.
- 3.7** Hot bitumen shall be transported in a container with strong handles. Hand gloves and safety boots shall be provided for the persons handling and using hot bitumen.
- 3.8** Before dumping the materials from mechanical equipment (eg, vehicle, crane etc.) the operator/driver shall ensure the safety of persons and properties.

4 First Aid Facility and Health

- 4.1** A first aid facility shall be maintained during execution of all types of construction and demolition works.
- 4.2** An appropriate first aid facility, including an adequate number of stretchers, shall be maintained at all building demolition sites.
- 4.3** For all the construction contracts undertaken the contractor shall make arrangement of a medical attendant who is at least a para-medical health worker to examine and advise on workers' health regularly once a month.

5 Fire Fighting

- 5.1** Adequate fire fighting equipment shall be provided on building construction and demolition sites. The composition and number of pieces of such equipment shall be determined by the Engineer.
- 5.2** All electric power lines shall be disconnected before the dismantling of a building is started.
- 5.3** The number of fire escapes required by the Nepal Fire Safety Standard shall be provided at all times during the construction period. These may be either permanent or temporary ones. In any case, a minimum of one fire escape must be provided, except that structures over four storeys shall have two alternative fire escapes, and any building under construction having more than 500 square metres of plinth area shall have one additional fire escape for each 500 square metres.

6 Site Preparation

- 6.1** When the work is to be performed in an area where falling objects are encountered, each worker shall be provided with a suitable hard hat.
- 6.2** When workers have to work in dusty areas, especially where there are flying particles, safety goggles and mask shall be provided.

- 6.3** Where the workers have to work in areas where piercing objects or heavy falling objects are encountered, safety boots shall be provided.
- 6.4** When a worker has to work at a height greater than six metres, a safety belt shall be provided.
- 6.5** A first aid facility shall be maintained on the site at all times during the period of the contract.

7 Earthworks in Excavation

- 7.1** When the excavation trench is deeper than one metre at least one, an escape route shall be provided at every 20 m of trench.
- 7.2** When the excavation trench is deeper than one metre, adequate and appropriate precautions shall be taken against collapse of the walls of the trench.
- 7.3** Oxygen masks shall be provided for all types of excavation works under water and does underground.
- 7.4** Adequate measures shall be taken to protect services lines likely to be encountered during excavation.
- 7.5** Adequate barriers and physical guards shall be provided around excavations being made with mechanised equipment.
- 7.6** No loose materials shall be left in the cut slope.

8 Construction of Foundations

- 8.1** The type and the design of the foundation adopted shall be such as to allow safe construction practices and the protection of neighbouring properties.
- 8.2** The method of construction of a foundation shall be such that it does not harm the health of workers and those residing in adjoining properties.
- 8.3** For mechanical foundation construction activities such as pile-driving, the required measures for reinforcing the adjoining properties safety during each activity shall be undertaken.
- 8.4** While works are undertaken in deep excavations, adequate measures shall be taken against collapse of the walls of the excavation (e.g. shoring).

9 Construction of Walls

- 9.1** Materials shall be lifted and handled carefully so as to prevent accidents.
- 9.2** Working platforms shall be designed adequately and shall not be over loaded with construction materials.
- 9.3** If pre-cast elements are to be fixed on walls, they shall be positioned properly and fastened with guys until they are permanently secured in their positions.
- 9.4** When the height of a wall is above five metres, scaffolding shall include sufficiently strong horizontal members at heights (100 cm above the working platform) suitable to prevent the accidental fall of persons.
- 9.5** Walking on top of a freshly-laid wall shall be prohibited.
- 9.6** Door and window frames shall be temporarily secured during construction of walls by at least two guy ropes or other similar devices on each side.
- 9.7** When a construction site is adjoining a public thoroughfare, a canvas-covered guard shall be provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.

10 Construction of Roofs

- 10.1** When the slope of the roof is more than 30 degrees to the horizontal, workers shall be provided with catch-ropes and belt.
- 10.2** When roofs are to be covered with corrugated iron sheet or asbestos cement sheet, or similar each joist shall be fixed securely so as to prevent slippage during construction.
- 10.3** Workers shall not be allowed to walk directly on asbestos cement sheet.
- 10.4** Loose tiles shall not be kept on a roof during the tile-laying operation. All loose tiles shall be kept on the working platform or scaffolding.
- 10.5** During the wet season, the Engineer or his representative shall inspect a sloping roof and satisfy himself as to its safety before allowing any worker to go on to it.
- 10.6** During the construction of reinforced concrete roofs, workers shall not be allowed to walk over the reinforcement. A walking platform shall be provided where necessary.
- 10.7** Railing or other protective guarding shall be provided on all roof edges to prevent workmen falling.

- 10.8 When concrete is poured with the assistance of a crane or material is handled with a crane during the construction of a roof, each of the workers in the area shall be provided with a hard hat.
- 10.9 Workers undertaking the mixing, lifting, transporting, laying and compacting of cement concrete shall be provided with safety boots and protective gloves.

11 Electrical Works

- 11.1 Bare wires shall not be used for any type of electrical connection.
- 11.2 All electric wires laid over a floor during construction shall be covered to protect them from moving machinery and personnel.
- 11.3 Overhead wires shall be so installed that they leave minimum 45 cm headroom over the construction site.
- 11.4 All electrical circuits other than those required for work or illumination of the works at night shall be switched off after the day's work.
- 11.5 No loose material, clothing or other combustible substance shall be placed or kept over the electric switch board.
- 11.6 One 4.5 kg CO₂ extinguisher or one 5 kg dry powder extinguisher as a minimum shall at all times be kept near the switch board.
- 11.7 All permanent electrical lines and all other wiring shall be installed by a competent and qualified electrician under the strict supervision of the Engineer. **When construction is being undertaken close to exposed high or low tension lines, all such cables shall be covered with insulating materials so as to avoid possibility electrocution of workers.**
- 11.8 No cables or electrical equipment shall be placed over wet floor.

12 Temporary Works

- 12.1 Temporary works shall be designed to take at least one and half times their expected load. They shall be approved by the Engineer or his representative.
- 12.2 All falsework and formwork shall be securely tied to the permanent structure.
- 12.3 All ladders shall be secured at both ends.
- 12.4 The height or length of a ladder shall be at least one metre more than the height it is intended to serve.
- 12.5 A guard- or hand-rail shall be provided at the sides of the ladder.

13 Demolition of Structures

- 13.1 A careful and detailed study shall be undertaken during the making of a plan for demolition. This plan shall be approved by the Engineer.
- 13.2 Any variation in the planned sequence of activities shall not be allowed unless it is required for the safety of workers or adjoining properties.
- 13.3 Posters displaying possible hazards during demolition shall be displayed at the work site. The type, size, number and display location of posters shall be as decided by the Engineer.
- 13.4 If the structure to be demolished has hidden damage caused by fire, flood or earthquake, necessary measures such as bracing or shoring shall be taken so as to prevent accidental collapse.
- 13.5 All electrical connections and water mains shall be disconnected before demolition work is begun.
- 13.6 Walls shall be demolished part by part so as to reduce their height evenly. Large portions shall not be allowed to fall, thereby endangering adjoining properties.
- 13.7 Workers should not be allowed to walk along a wall if the width of the wall is less than one and half bricks. Instead, staging shall be provided for this purpose.
- 13.8 The safe distance to be kept by the public to ensure their safety shall be clearly marked and prominently sign-posted.
- 13.9 Every side walk or road adjacent to the work shall be closed or protected.
- 13.10 Dust shall be controlled by spraying water on the surface to be demolished.
- 13.11 Stairs with railings, ladders and passage ways shall be left in place as long as possible and maintained in a safe condition.
- 13.12 As far as possible, no material shall be dropped. It shall be lowered by containers, ropes, tackles or chutes.
- 13.13 Debris shall be removed and handled in such a way that a sufficient safe working area is maintained.
- 13.14 When machinery is used in demolition, the area shall be fenced or guarded. **When a machine is in operation, no person shall be allowed to enter the building being demolished.**

14 Miscellaneous Requirements during Demolition

- 14.1** No demolition should be carried out at night, especially when the structure is in an inhabited area.
- 14.2** If demolition is to be done at night, adequate lighting shall be provided.
- 14.3** Warning signs shall be installed in the area to warn workers of possible danger.
- 14.4** Safety helmets (hard hats), goggles, gloves and safety boots shall be provided to the workmen on the site.
- 14.5** Safety belts or ropes shall be used by personnel working above six metres in height. **Explosives shall not be used for demolition unless they are specifically approved by the Engineer.**

15 Use of Explosives

- 15.1** Use of explosives shall be discouraged as far as possible.
- 15.2** Explosives shall be used only after obtaining the necessary approvals from the appropriate authorities.
- 15.3** Blasting areas shall be properly marked and guarded during blasting.
- 15.4** Appropriate audible signals should be sounded before initiating each blast.
- 15.5** All people and animals shall be removed from the effective area of blasting before blasting operations are begun.
- 15.6** If small, controlled blasting has to be carried out in a confined area, it shall be carried out only after appropriate strong mesh or steel sheet protection has been put in place.
- 15.7** The adequate safety of adjoining property shall be ensured before conducting any blasting operation.
- 15.8** All blasting shall be done under the strict supervision of an authorised blaster.
- 15.9** Written accounts of the charge used in each blasting and records of all blasting operations shall be maintained by the blaster.
- 15.10** Unused blasting charges and detonators shall not be left at the site.

16 Labour Welfare

- 16.1 Labour shall be provided with drinking water at all construction sites and labour camp.
- 16.2 Adequate and safe shelter for employed labour shall be provided at or near construction sites, outside the danger zone.
- 16.3 Adequate toilet facilities shall be provided for the workmen within easy access of the work place. The number of toilets shall be one for every 30 workers.
- 16.4 An adequate number and type of fire extinguishers should be placed at work sites and labour camps.
- 16.5 Access to fire fighting equipment shall be kept unobstructed.
- 16.6 Adequate safety clothing and equipment shall be provided depending upon the nature of the job and as required and approved by the Engineer.
- 16.7 Highly combustible material shall be kept away from any labour settlement area.
- 16.8 Storage for blasting materials shall be appropriately isolated and made according to the requirements for the type being stored.
- 16.9 **All workers shall be insured by their employer against accidents in the workplace. The minimum cover for accidental death shall be two hundred thousand Nepalese Rupees per worker. For other accidents, the minimum cover shall be as that currently determined by the National Insurance Company of Nepal.**
- 16.10 Insurance coverage shall either be placed with a Nepalese insurance company or, in the case where it is to be placed with a foreign company; it shall be first endorsed by a Nepalese insurance company.

17 Safety Requirements

- 17.1 All construction / transportation equipment should be moved in a manner which will ensure the safety of life and property.
- 17.2 Proper support structures should be provided when erecting pre-fabricated structure or components to cope with erection loads and falling of structures.
- 17.3 When undertaking construction or demolition of any structure more than 8 m high, a vertical safety net cover shall be installed around the structure.
- 17.4 Any third person entering to the site should be controlled and restricted.