

BNBC 2015 FINAL DRAFT
BANGLADESH NATIONAL
BUILDING CODE

Volume 1 of 3

(Part 1 to Part 5)

FINAL DRAFT
2015

Housing and Building Research Institute

Volume 1

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PART 3 ADMINISTRATION AND ENFORCEMENT

PART 4 GENERAL BUILDING REQUIREMENTS, CONTROL AND

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FIRE PROTECTION

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PREFACE TO BNBC 2015

In order to provide safe and healthy habitat, all activities BNBC 2015 FINAL DRAFT housing sector turned out to be a profitable business. As a related to building construction such as planning, design result building construction activities were taken up by and construction needs to be regulated properly. real-estate developers following which new trends Technological and socio-economic developments in recent developed in building planning and construction. Some times have led to remarkable increase in demand for more real-estate developers engaged professional people such and more sophistication in buildings resulting in ever as Architects, Engineers, Planners to make their buildings increasing complexity. Buildings are products of a multi- more attractive to the buyers and the code started finding disciplinary profession involving specialized professional its use among the professionals. However, some owners inputs from disciplines like Architecture, Fire prevention, and developers retained the habit of the old method of Materials science, Structural engineering, Geotechnical construction giving rise to unplanned growth of structures

engineering Construction technology, Electrical in the urban areas. During this time some high rise engineering, Mechanical engineering, Acoustics, Sanitation structures failed to perform satisfactorily due to structural and plumbing technology, Chemical engineering, Law, etc. failure / fire hazard which caused alarm among the urban It is therefore imperative that a uniform standard of dwellers as well as the policy makers. The policy makers, practice covering all aspects of planning, design and therefore felt the urgency of updating the BNBC 1993 to construction of buildings, including the service facilities make its contents time worthy and also to bring it under provided in them such as electrical, mechanical, sanitary strict legal coverage to make its provisions binding to all and other services, be followed to ensure safety, involved in the planning, design, construction and use. minimization of wastage in construction and optimum The building construction sector was first brought into a return for the user. In the Building code each of the above legal framework through enactment of Building aspects is addressed adequately by professionals Construction Act 1952. By the power given by the Act, the specializing in the relevant disciplines to ensure safety and Government of Bangladesh has promulgated regulations comfort of the users of the buildings. which were amended from time to time. In 2006 the In order to regulate the technical details of building Building Construction Act was amended to include a new construction and to maintain the standard of construction Section 18A empowering the Government to promulgate the Bangladesh National Building Code (BNBC) was first the Building Code as a legally binding document. published in 1993. It was a 1000 page detailed document Since its publication, BNBC 1993 has been referred to and specifying safe and acceptable practices in all aspects of consulted by the professionals and designers in the field of building design and construction. However, since its building design and construction. After the endowment of publication, significant changes and developments have legal status, importance of the BNBC 1993 has further taken place in both building technology and material enhanced. However, unlike other building codes available properties requiring the use of the present state of the art in the world, the Bangladesh National Building Code has knowledge and practices in building planning, design and not yet been formally reviewed and updated since it was construction. To keep pace with the changed drafted in 1993. Neither any feedback of the professionals circumstances, it is a routine practice to update codes. regarding the document has been taken into formal Twenty two years have nearly been elapsed since consideration. In the last twenty two years, new materials publication of the first version of the Code. have been introduced, new scientific methods have After introduction of the BNBC in 1993, the technology of emerged, new technologies have evolved and both design building construction in Bangladesh remained almost the of structures and construction practices have gone through same for quite some time as was in practice before its enormous changes. Researchers, engineers and academics publication. The lack of legal provisions in enforcing its use in Bangladesh have also conducted new studies which has been the main reason behind it. In the meantime enriched our knowledge about planning, design, growing demand for home, scarcity of land and the upward construction and sustainability of buildings. trend in the land prices in the urban areas brought in the Ministry of Housing and Public Works formed a steering culture of construction of moderate to high rise structures committee with the responsibility of Updating BNBC 1993 and changed the prevailing culture of planning, design and by a G.O. having circular no. Section 8/IM-5/93(part) 812 construction of buildings in the private sector. Gradually, (28) date: 15.09.2008. The Steering Committee comprises the urban dwellers began to accept the concept of living in representatives from relevant government agencies, high rise apartment buildings and investment in the universities and professional societies. The Housing and

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Building Research Institute (HBRI) has been entrusted with BNBC 2015 FINAL DRAFT buildings. The updated BNBC contains chapters addressing the task of providing secretarial service to the Steering the issues of energy conservation, rainwater harvesting Committee and managing the implementation of the and distribution mechanisms in buildings. project. According to an agreement between HBRI and In Part 3, "General Building Requirements, Control and Bureau of Research Testing and Consultancy (BRTC), Regulation" a new Chapter titled, "Energy Efficiency and Bangladesh University of Engineering and Technology Sustainability" has been included giving minimum code (BUET), for the purpose of reviewing and updating the requirements for achieving the efficiency. Bangladesh National Building Code 1993, BRTC, BUET To reduce energy consumption in building provisions for deputed leading experts in all relevant fields among use of variable refrigeration system in HVAC applications,

academics and professionals. Finally the updated code is Variable Voltage, Variable frequency drives in elevator available both in printed form and soft copy in CDs and on applications has been included in Chapter-2 "Air website. Conditioning, Heating and Ventilation" of Part-8 "Building

The updated BNBC has 10 parts with a total of 49 chapters. Services". Energy conservation in lighting using energy Some parts contain a number of appendices wherein saving lamps, Fluorescent lamps and GLS lamps has also sample calculations, design tables, graphs etc. are provided been proposed in Chapter-1, "Electrical and Electronics for use by the readers for important analysis and designs. Engineering Services for Buildings" of the same part.

Part-6 Structural Design has 13 chapters which is the To augment water supply in Buildings, Chapter-8, maximum among all the parts. "Rainwater Management" in Part-8 "Building Services" has In the contents of the Updated Code, almost all of the been included in the Updated Code containing specific topics of BNBC 1993 have been retained. Moreover some guidelines for harvesting, storage and distribution of of these have been elaborated to accommodate the rainwater.

changes identified during review of the BNBC 1993 and the Contents of tlhe chapters already existing in BNBC 1993, various codes and documents collected to make their have been thoroughly revised in the updated version. In scope wider, up to date and user friendly. some cases new concepts have been included. For

Part-6 "Structural Design" in the Updated Code include two example, In Chapter-7 "Masonry structures" of Part 6, the new chapters, one on Bamboo Structure and the other on concept of 'Confined Masonry' is introduced and guidelines Steel-Concrete Composite Structures. The former is for design and detailing are provided.

intended for use in the rural areas. The use of well designed In general up to date information and standards are and economic bamboo structures is expected to be included in the updated Code in a way which is practicable attractive to the rural people. The Steel Concrete by designers and professionals involved in building composite structures are expected to be widely used in the construction. I acknowledge adoption of provisions of industries. In urban areas this type of structure is expected various recognized codes and standards in the present to find application in high rise construction. code after a thorough review. Part 2, a practical approach

Contrary to the presentation of Geotechnical engineering is delineated in administering and enforcement of the in BNBC 1993 wherein it has been treated as "Foundation" Code; which I believe will pave the way in actually having limited scope, in the Updated code the chapter on implementing the Code provisions and ensure safer geotechnical engineering has been re-named as "Soils and building construction in Bangladesh.

Foundations." The scope of the proposed "Soils and I gratefully acknowledge contribution of members of the Foundations" chapter has been made wider by including Steering Committee and the Editorial Committees for their topics such as ground improvement, geo-textiles, soil active participation and guidance in updating the building reinforcement, slope stability, foundation on problematic code. The process of updating has undergone a rigorous soils and sanitary landfills, dewatering, evaluation of and time-consuming review exercise. I deeply appreciate liquefaction potential of soils. The new scope of the "Soils the diligence and cooperation of the authors during the and Foundations" chapter is in line with the codes exhaustive process. Final editing of this huge document has reviewed and requirements of the Geotechnical been extremely tedious. We tried to present the entire professionals of the country. document in a uniform format. To enhance readability, Depletion of energy resources and environmental changes many figures of the previous version of the code have been

is a major concern worldwide. Bangladesh is no exception redrawn and improved. However, we regret any to it. Keeping these aspects in mind, changes and unintentional editorial or typographical mistakes that may modifications have been suggested in BNBC 1993 for use of still exist in the code. energy saving appliances, non-conventional fuels etc. in

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Chapter 1

TITLE, SCOPE AND GENERAL

1.1 TITLEBNBC 2015 FINAL DRAFT

The provisions and regulations contained in this document shall constitute and be collectively known and may be cited as the "Bangladesh National Building Code 2015", abbreviated, where desired, as BNBC, and will hereinafter be referred to as the "Code".

1.2 PURPOSE

The purpose of this Code is to establish minimum standards for design, construction, quality of materials, use and occupancy, location and maintenance of all buildings within Bangladesh in order to safeguard, within achievable limits, life, limb, health, property and public welfare. The installation and use of certain equipment, services and appurtenances related, connected or attached to such buildings are also regulated herein to achieve the same purpose.

The provisions of this Code are applicable to all persons of Bangladesh irrespective of class, creed, culture, religion or sex. The Code does not in any way create or otherwise establish or designate any particular class or group of persons who will or should be specially protected or benefited by the provisions of this Code.

The expressed intent of this Code is to ensure public safety, health and general welfare insofar as they are affected by the construction, alteration, repair, removal, demolition, use or occupancy of buildings, structures or premises, through structural strength, stability, means of egress, safety from fire and other hazards, sanitation, light and ventilation.

1.3 SCOPE

The provisions of this Code shall apply to the design, construction, use or occupancy, alteration, moving, demolition and repair of any building or structure and to any appurtenances installed therein or connected or attached thereto, except such matters as are otherwise provided for in other ordinances and statutes controlling and regulating buildings.

If for any case different sections of this Code provide different specifications for materials, methods of design or construction, or other requirements, the most restrictive specification shall govern.

In case of any conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

Unless otherwise explicitly stated in this Code, all references to part, chapter or section numbers or to provisions not specifically identified by number, shall be construed to refer to such part, chapter, section or provision of this Code.

References made to a section without mentioning a part shall be construed to refer to that section of the part in which the reference is made.

The provisions of any appendix in this Code shall not be mandatory unless they are referred to as such in any section of the Code or they are specifically adopted by any regulation.

Part 1 1-1 Scope and Definition

BNBC 2015 FINAL DRAFTPart 1 Scope and Definition

Inspection conducted or permission granted for any building or plan of building, under the provisions of this Code, shall not be construed as a warranty of the physical condition of such building or the adequacy of such plan. Neither the Authority administering the Code, nor any employee thereof shall be liable for damages or any defect or hazardous or illegal condition or inadequacy in such building or plan, nor for any failure of any component of such building which may occur subsequent to such inspection or granting of permission under the provisions of the Code.

1.4 EXISTING BUILDINGS

Buildings which are in existence on the date of promulgation of this Code may have their use or occupancy continued without undergoing any alteration, abandonment or removal unless in the opinion of the Authority such continued use is hazardous to life and property and provided such use or occupancy was legal on the date of promulgation of this Code. Buildings approved before adoption of the present updated Code and compliant with the previous version of the Code may continue to be used or occupied unless any deviation is made thereafter or any deterioration has rendered the building unsafe in the opinion of the Authority.

1.4.1 Addition and Alteration

Additions, alterations, modifications or repair to an existing building may be made without requiring the existing building to comply with all the requirements of this Code, provided the additions, alterations, modifications or repairs conform to that required for a new building. Such additions or alterations shall not be permitted when the existing building is not in full compliance with the provisions of this Code except when the addition or alteration will result in the existing building or structure being no more hazardous based on life safety, fire safety and sanitation than it was before the addition or alteration was undertaken.

Any building together with the new additions shall not exceed the height, number of storey's and area specified in this Code for new buildings having the relevant occupancy and type of construction. Non-structural alterations or repairs to an existing building or structure which do not adversely affect any structural member, nor reduce the strength of any part of the building or structure to result in an unsafe condition shall be made with materials and components having the required fire resistance.

1.4.2 Change of Use

Change in use or occupancy in an existing building may be made when such change complies with the requirements of this Code for a new building and provided such change does not render any part or the whole of the affected building or structure any more hazardous based on life safety, fire safety and sanitation than it was before such change was effected.

1.5 HISTORIC OR ARCHITECTURALLY VALUABLE BUILDINGS

A building or structure which has been designated by official action as having special historical or archaeological interest, or a building or structure identified by a legally constituted authority as being architecturally valuable, may be undertaken for repairs, alterations and additions necessary for its preservation, restoration, rehabilitation or continued use provided:

- (a) the proposed repair, alteration or addition to buildings of historical or archaeological significance is approved by the legally constituted authority, such as the Department of Archaeology;
- (b) the proposed repair, alteration or addition to buildings of architectural value does not impair the aesthetic quality and architectural character of such buildings; and
- (c) the restored building or structure will be no more hazardous, if any, based on life safety, fire safety and sanitation than the existing building.

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Chapter 2

DEFINITIONS

2.1 GENERAL

Unless otherwise expressly stated, the abbreviations, terms, phrases, words and their derivations listed below shall, for the purpose of this Code, be construed as set forth in this Chapter. Words not explicitly defined shall have their ordinarily accepted meanings as the context implies as provided in The Oxford English Dictionary, Second Edition, Simpson, J. & Weiner, E., Ed., Oxford University Press, London, 1989; and Chambers Science and Technology Dictionary, Chambers Harrap Publishers Ltd, New York, 1999.

The terms defined in this Part shall have a general applicability to the entire Code. Other than these, there are other terminology and definitions provided in different parts, chapters and sections which shall be applicable only to that particular part, chapter or section in which they are defined. In case of any conflict or contradiction between a definition given in this Part and that in any other part, chapter or section, the meaning provided in that part, chapter or section shall govern for the interpretation of the provisions of that particular part, chapter or section. In general, definitions given in a lower level shall override the meanings of all upper levels for the interpretation of the provisions within the scope of that lower level.

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2.2 DEFINITIONS OF TERMS

The terminologies used in this Code are defined in this Section. Irrelevance of gender, tense and number is implicit in these definitions and throughout the Code. Words in the masculine gender include the feminine and the masculine. Verbs used in the present include the future. Words used in the singular include the plural and the words used in the plural include the singular.

ACCESSORY USE Any use subordinate to the major use which is normally incidental to the major use.

ALTERATION

Any change, addition or modification in construction such as structural, dimensional,

APPROVED or any removal of any part of a building or any change to or closing of any required

ARCHITECT means of ingress or egress or a change to the fixtures or equipment or any change in

AUTHORITY land use or occupancy or use.

AUTHORIZED Approved by the Authority.

OFFICER

BASEMENT A person who has a Bachelor Degree in Architecture and is a member of the Institute BUILDING of Architects, Bangladesh (IAB).

The Authority which has been created by a statute and which, for the purpose of administering the 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).

Same as Building Official.

A floor of a building more than 50 percent of which is situated at a depth of 1m or more below crown of the main entry road.

Any permanent or semi-permanent structure which is constructed or erected for human habitation or for any other purpose and includes but not limited to the

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BUILDING LINE BNBC 2015 FINAL DRAFT foundation, plinth, walls, floors, roofs, stairs, chimneys, fixed platform, verandah,

balcony, cornice, projections, extensions, annexes etc. The term building will also BUILDING include the sanitary, plumbing, electrical, HVAC, appurtenances and all other building OFFICIAL service installations which are constructed or erected as an integral part of a building.

COMMITTEE

The line up to which the plinth of a building may lawfully extend. Also known as CONSTRUCT, TO SETBACK LINE.

CONVERSION

A person who is the jurisdictional administrator of Building Code appointed by the COVERED AREA Bangladesh Building Regulatory Authority (BBRA).

DEVELOPMENT A Building Construction Committee constituted for any area in the prescribed manner, if necessary.

DIPLOMA

ARCHITECT See ERECT, TO.

DIPLOMA The change in occupancy or premises to any occupancy or use requiring new ENGINEER occupancy permit.

DRAIN The ground area above the plinth level which is covered by a building structure. The covered area of a building shall exclude gardens, wells, cornice, sunshade, pergola, DRAINAGE septic tank, soak well, unpaved uncovered water body, fountains, drainage structures, ENGINEER boundary wall, gates, porch, uncovered staircase, watchman's cabin, detached pump house, garbage chutes and other uncovered utility structures.

ERECT, TO

Carrying out construction of buildings, engineering, mining or other operations in, or FORMATION over or under land or water. Includes re-development and layout and subdivision of LEVEL any land. 'To develop' and other grammatical variations shall be interpreted

GEOTECHNICAL accordingly.

ENGINEER

A person who has a Diploma in Architecture from any recognized Polytechnic or ENGINEERING Technical Institute and is a member of the Institute of Diploma Engineers, Bangladesh GEOLOGIST (IDEB).

GOVERNMENT

GRADE A person who has a Diploma in Engineering from any recognized Polytechnic or Technical Institute and is a member of the Institute of Diploma Engineers, Bangladesh (IDEB).

A conduit or channel for conveying water, sewage, or other waste liquid for subsequent disposal.

The disposal of any liquid with a system meant for this purpose.

A person who has a Bachelor Degree in Engineering and is a member of the Institution of Engineers, Bangladesh (IEB).

To erect a new building or re-erect an existing building or to convert a building from one occupancy to another. Also known as CONSTRUCT, TO.

Finished ground level of a plot. For hilly areas formation levels shall be the gradient of the plot surface.

Engineer with Master's degree in geotechnical engineering having at least 2 (two) years of experience in geotechnical design/construction or graduate in civil engineering/engineering geology having 10 (ten) years of experience in geotechnical design/construction.

A person having a postgraduate degree in engineering geology and having 2 years experience in geotechnical exploration and interpretation.

The government of the People's Republic of Bangladesh.

The lowest point of elevation of the finished surface of the ground, pavement or footpath within the area between the building and the property line or a line 1.5 m from the building whichever is nearer the building.

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Definitions Chapter 2

HEIGHT OF BNBC 2015 FINAL DRAFTThe vertical distance from a reference datum to the highest point of the building which

BUILDING includes all building appurtenances like overhead water tank, machine room, communication tower etc. The reference datum shall be the elevation of the nearest HIGH RISE footpath or the elevation of the nearest road or street or public way at its centre line, BUILDING whichever is higher.

OCCUPANCY OR Any building which is more than 10-storey or 33 m high from reference datum.

USE GROUP Building appurtenances like overhead water tank, machine room, communication OCCUPANCY, tower etc. will not be considered in determining the height.

MAJOR

OCCUPIER The purpose for which a building or a part thereof is used or intended to be used.

OWNER OF A BUILDING The major or principal occupancy of a building or a part thereof which has attached to it subsidiary occupancy or occupancies contingent upon it.

PERMIT A person paying or liable to pay rent or any portion of rent of a building in respect of which the ward is used, or compensation or premium on account of occupation of PLANNER such building and also a rent-free tenant. Does not include a lodger and the words 'occupancy' and 'occupation' do not refer to the lodger. In such cases the owner PLINTH AREA himself or herself is living in his or her own building, he or she shall be deemed to be the occupier thereof.

PLINTH LEVEL

The person, organization or agency at whose expenses the building is constructed or PLOT who has the right to transfer the same and includes his or her heirs, assignees and PLUMBING legal representatives, and a mortgagee in possession.

ENGINEER

PUBLIC WAY A written document or certificate issued by the Authority for carrying out a specific RELIABLE activity under the provisions of this Code.

LITERATURE

RELIABLE A person who has a Bachelor or a Post-Graduate Degree in Planning and is a member REFERENCE of the Bangladesh Institute of Planners (BIP).

ROAD The elements from the building bases which are exposed above the formation level to form a covered floor area by joining the peripheral points of the elements which are ROAD LINE intersected at finished floor plane at the height of plinth level.

ROOM HEIGHT

Height of a covered finished floor which is not more than 1m above the formation level SANCTIONED nor 1.85 m from the crown of adjacent road level.

PLAN

SERVICE ROAD See SITE.

An Engineer (Civil/Mechanical) who has experience in the field of plumbing or sanitation.

See ROAD.

See RELIABLE REFERENCE.

Reference materials such as published article, codes, standards or other material judged to be reliable by the professional users and specialists in the subject concerned. This may also be referred to as RELIABLE LITERATURE.

A thoroughfare or public way which has been dedicated or deeded to the public for public use. Also known as STREET.

A line defining the side limits of a road.

The clear head room between the finished floor surface and the finished ceiling surface or the underside of the joists or beams, whichever is lower.

The set of plans, design and specifications of a building submitted to the Authority as per provision of this Code and duly approved and sanctioned by the Authority.

A road or lane provided at the rear or side of a plot for service purposes.

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SETBACK LINE See BUILDING LINE.

SITE

A piece or parcel of land on which a building is intended to be or has already been SPECIALIST constructed. Also known as PLOT.

STOREY A professional who by education, research, practice and experience specializes in a particular branch of a broader discipline and is generally judged to be so by the STOREY, FIRST professional body in the relevant discipline.

STREET The portion of a structure between tops of two successive finished floor surfaces and STREET LEVEL for the topmost story, from surface of the finished floor of topmost floor to the top of STREET LINE the roof above.

SUPERVISOR,

CONSTRUCTION The lowest storey in a building which qualifies as a storey as defined herein; for a UNSAFE building with a basement it is the storey just above the basements.

BUILDING

See ROAD.

The elevation of the centre line of any road or street which a plot fronts.

See ROAD LINE.

An Architect or Engineer or Diploma Architect or Diploma Engineer having experience in supervision of construction works.

A building which, in the opinion of the Building Official, is structurally unsafe, or insanitary, or lacks proper means of ingress or egress, or which constitutes a hazard to life or property.

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Chapter 3

ABBREVIATIONS

3.1 ABBREVIATIONS OF NAMES

Names of institutions, organizations and professional societies referred to in this Code are listed below in an alphabetical order.

ACI BNBC 2015 FINAL DRAFT American Concrete Institute; Box 19150, Redford Station, Detroit, MI 48219, USA.

AISC

AISE American Institute of Steel Construction, Inc.; 400 North Michigan Avenue, Chicago, IL 60611, USA.

AISI Association of Iron and Steel Engineers; Suite 2350, Three Gateway Center, Pittsburgh, PA 15222, ANSI USA.

ASHRAE

American Iron and Steel Institute; Suite 300, 1133 15th Street N.W., Washington, DC 20005, USA.

ASME

American National Standards Institute; 1430 Broadway, New York, NY 10018, USA.

ASTM

AWS American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc.; 345 East 47th Street, BIP New York, NY 10017, USA.

BOCA American Society of Mechanical Engineers; United Engineering Centre, 345 East 47th Street, New York, NY 10017, USA.

BPDB

American Society for Testing and Materials; 1916 Race Street, Philadelphia, PA 19103, USA.

BSI

BSTI American Welding Society; 550 N.W. LeJeune Rd., P.O. Box 351040, Miami, FL 33135, USA.

BWDB Bangladesh Institute of Planners, Planners' Tower (Level-7), 13/A, Bir Uttam C.R. Datta (Sonargaon) Road, Bangla Motor, Dhaka-1000, Bangladesh.

CDA

CGSM Building Officials and Code Administrators International Inc.; 1313 East 60th Street, Chicago, DOA IL 60637, USA.

DPHE Bangladesh Power Development Board; WAPDA Building, Motijheel Commercial Area, Dhaka 1000, Bangladesh.

EED

British Standards Institution; 2 Park Street, London W1A 2BS, UK.

Bangladesh Standards and Testing Institution; 116A Tejgaon Industrial Area, Dhaka 1208, Bangladesh.

Bangladesh Water Development Board; WAPDA Building, Motijheel Commercial Area, Dhaka 1000, Bangladesh.

Chittagong Development Authority; Station Road, Chittagong, Bangladesh.

Canadian General Standards Board; Technical Information Unit, Ottawa, CANADA K1A 1G6.

Department of Architecture; Sthapatya Bhaban, Shahid Capt. Mansur Ali Sarani, Segunbagicha, Dhaka-1000, Bangladesh.

Department of Public Health Engineering; DPHE Bhaban, 14, Shaheed Captain Mansur Ali Sarani, Kakrail, Dhaka-1000, Bangladesh.

Education Engineering Department; Shikkha Bhaban, Dhaka-1000, Bangladesh.

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HED Health Engineering Department; Ministry of Health and Family Welfare, 105-106, Motijheel C/A, Dhaka-1000, Bangladesh.

FM Factory Manual; Standards Laboratories Department, 1151 Boston Providence Turnpike, Norwood, MA 02062, USA.

FSCD Fire Service and Civil Defence; Kazi Alauddin Road, Dhaka-1000, Bangladesh.

HBRI Housing and Building Research Institute; 120/3, Darus-Salam, Mirpur, Dhaka, Bangladesh.

IAB Institute of Architects, House-11(1st Floor), Road-4, Dhanmondi, Dhaka-1205, Bangladesh.

IEB Institution of Engineers, Ramna, Dhaka-1000, Bangladesh.

IDEB Institute of Diploma Engineers, IDEB Bhaban, 160/A, Kakrail VIP Road, Dhaka-1000, Bangladesh.

ICBO International Conference of Building Officials; 5360 South Workman Mill Road, Whittier, CA 90601, USA.

ISO International Organization for Standardization; 1, Rue de Varembe, Case Postal 56, CH-1211, Genève 20, Switzerland.

ISSMFE International Society of Soil Mechanics and Foundation Engineering; University Engineering Department, Trumpington St, Cambridge CB21PZ, UK.

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KDA Khulna Development Authority; Shib Bari Crossing, Khulna-9100, Bangladesh.

LGED Local Government Engineering Department; LGED Bhaban, Sher-e-Bangla Nagar, Agargaon, Dhaka, 1207. Bangladesh.

NFPA National Fire Protection Association; Batterymarch Park, Quincy, MA 02269, USA.

NHA National Housing Authority; Grihayan Bhaban, 82, Segunbagicha, Dhaka, Bangladesh.

PWD Public Works Department; Purto Bhaban, Shahid Capt. Mansur Ali Sarani, Segunbagicha; Dhaka 1000, Bangladesh.

RAJUK Rajdhani Unnayan Kartripakkha; Rajuk Avenue, Motijheel, Dhaka-1000, Bangladesh.

RCSC Research Council on Structural Connections of the Engineering Foundation; American Institute of Steel Construction (AISC).

RDA Rajshahi Development Authority; Rajshahi-6203, Bangladesh.

RMA Rubber Manufacturing Association; 1400 K Street N.W., Washington, DC 20005, USA.

SBCCI Southern Building Code Congress International; 3617 8th Ave, S. Birmingham, AL 35222, USA.

SMACNA Sheet Metal and Air Conditioning Contractors' National Association, 8224 Old Courthouse Road, Tysons Corner, Vienna, VA 22180, USA.

SPRI Single Ply Roofing Institute; 104 Wilmont Road, Suite 201, Deerfield, IL 60015-5195, USA.

UDD Urban Development Directorate; Ministry of Housing and Public Works, 82, Segunbagicha, Dhaka-1000, Bangladesh.

UL Underwriters Laboratories, Inc; 207 East Ohio Street, Chicago, IL 60611, USA.

3.2 ABBREVIATIONS OF WORDS

The abbreviations used in this Code are listed below in an alphabetical order. Abbreviations not explicitly defined herein below shall be construed to have their usual meaning as the context implies.

BDS Bangladesh Standards; published by the BSTI

BNBC Bangladesh National Building Code; published by HBRI

BS British Standard; published by the BSI

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Abbreviations Chapter 3

CBF Concentric Braced Frame BNBC 2015 FINAL DRAFT

CFC Chlorofluorocarbon

CGI Corrugated Galvanized Iron

CWPC Cold Drawn Low Carbon Wire Prestressed Concrete

DCP Dry Chemical Powder (fire extinguisher)

DDT Dichlorodiphenyltrichloroethane

DPC Damp-proof Course

EBF Eccentric Braced Frame

FAR Floor Area Ratio

FM Fineness Modulus

FPA Flood Prone Area

GI Galvanized Iron

IBC International Building Code

IMRF Intermediate Moment Resisting Frame

IS Indian Standard; published by the Bureau of Indian Standards

LFD Load Factor Design

LPG Liquefied Petroleum Gas

MCSP Multipurpose Cyclone Shelter Program

OMRF Ordinary Moment Resisting Frame

RC Reinforced Concrete

RS Rolled Steel

RSJ Rolled Steel Joist

SMRF Special Moment Resisting Frame

SPA Surge Prone Area

SRSS Square Root of the Sum of the Squares

UBC Uniform Building Code; published by the ICBO

WSD Working Stress Design

cps Cycles per second

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Scope and Definition

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PART 2
ADMINISTRATION
AND
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BNBC 2015 FINAL DRAFT

PART 2

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Chapter 1

PURPOSE AND APPLICABILITY

1.1 PURPOSE

The purpose of this Part is to relate the provisions of the Code to different documents for administration and enforcement of the Code. All legal issues shall be referred to the Building Construction Act.

1.2 TERMINOLOGY

ALTERATION Any change, addition or modification in construction such as structural, dimensional, or any removal of any part of a building or any change to or closing of any required means of ingress or egress or a change to the fixtures or equipment or any change in occupancy or use.

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APPLICANT A person, a firm, a company, a corporation, or a government, semi-government or non-government agency who intends to undertake any work regulated by this Code and who has filed an application to the Building Official for this purpose in a form prescribed in the Code.

APPROVED PLAN The set of plans, designs and specification of a building submitted to the Authority as per provision of this Code and duly approved and sanctioned by the Authority.

AUTHORIZED Same as Building Official.
OFFICER

BUILDING OFFICIAL A person who is the jurisdictional administrator of Building Code appointed by the Bangladesh Building Regulatory Authority (BBRA).

BUILDER A person, a firm, a company, a corporation or a government, semi-government or non-government agency who undertakes construction of any work regulated by the Code. Owner of a building or structure in connection to which the work is undertaken shall not be considered as a Builder.

CONSTRUCT, TO To construct a new building or reconstruct an existing building or to convert a building from one category of occupancy to another.

DEVELOPMENT Carrying out construction of buildings, engineering, mining or other operations in, or over or under land or water; includes re-development, setting of layout and subdivision of any land. 'To develop' and other grammatical variations shall be interpreted accordingly.

ERECT, TO See **CONSTRUCT, TO**.

OWNER (OF A BUILDING) The person, organization or agency at whose expenses the building is constructed and who has the legal right over the land on which it is constructed or one who has the right to transfer the same and includes his or her heirs, assignees and legal representatives, and a mortgagee in possession.

PERMIT A written document or certificate issued by the Authority for carrying out a specific activity under the provisions of this Code.

UNSAFE BUILDING A building which, in the opinion of the Building Official, is structurally unsafe, or insanitary, or lacks proper means of ingress or egress, or which constitutes a hazard to life or property.

Part 2 2-1 Administration and Enforcement

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1.3 APPLICABILITY

The requirements of this Code shall be complied within any construction, addition, alteration or repair, use and occupancy, location, maintenance, demolition and removal of a building or structure or any appurtenances connected or attached to it as set forth herein below.

1.3.1 Construction

For construction of a new building, the provisions of this Code shall apply to its design and construction.

1.3.2 Removal

For removal of any portion or the whole of a building, the provisions of this Code shall apply to all parts of the building whether removed or not.

1.3.3 Demolition

For dismantling or demolition of any part or the whole of a building, the provisions of this Code shall apply to any remaining portion and to the work involved in the dismantling or demolition process.

1.3.4 Alteration

For alteration of a building, the provisions of this Code shall apply to the whole building whether existing or new. If the portion of the building to which the alteration is made is completely self contained with respect to the facilities and safety measures required by this Code, the provisions of this Code shall apply only to that portion and not to the whole building.

1.3.5 Maintenance

Maintenance work shall be undertaken for all new and existing buildings and all parts thereof to continue their compliance with the provisions of this Code. All devices, equipment and safeguards installed as per the requirements of this Code shall be maintained in conformity with the edition of the Code under which installed. The owner of the building or his designated agent shall at all times be responsible for the safe and sanitary maintenance of the building or structure, its means of egress facilities and the safety devices, equipment and services installed therein. The Authorized Officer or his delegated persons as described in relevant documents mentioned in Chapter 2 may cause re-inspection of a building to determine its continued compliance with this Section.

1.3.6 Repair

Application or notice to the Authority administering the Code is not necessary for ordinary repairs to buildings or structures, provided such repairs do not involve the cutting away of any wall or portion thereof, the removal or cutting of any structural or bearing element, the removal or alteration of any required means of egress, or the rearrangement of any parts of a structure affecting the access and exit facilities. All works involving addition to, alteration or change of use of any building or structure shall conform to the requirements set forth in Part 9 of this Code.

1.3.7 Land Development

For development of a land for construction of a building, the provisions of this Code shall apply to the entire development work. For land development purposes the following laws shall also be applicable:

(a) Building Construction Act 1952

(b) Private Residential Land Development Rules 2004

(c) Natural Water Body Protection and Preservation of Open space and Playground Act 2000.

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ORGANIZATION AND ENFORCEMENT

2.1 CODE ENFORCEMENT AGENCY

2.1.1 Establishment of Authority

The Government shall establish a new Authority responsible for enforcement of this Code throughout

Bangladesh. The Code enforcing agency shall have the authority of the government and shall herein be referred to as the Bangladesh Building Regulatory Authority (BBRA). This Authority shall work as apex body to implement the provisions of the Bangladesh National Building Code (BNBC) and will be administered under the Ministry of Housing and Public Works, Government of Bangladesh.

2.1.2 Office of the Authority

Central Headquarters of BBRA will be located in Dhaka.

2.1.3 Constitution of Authority

Authority shall consist of 5 (five) members headed by Chairman, and the Government shall appoint them for 3(three) years. Among the members there will be one civil engineer as specified in Sec 2.1.5(a), one architect as specified in Sec 2.1.5(b), one planner as specified in Sec 2.1.5(c), one lawyer as specified in Sec 2.1.5(d) and one from Civil service as specified in Sec 2.1.5(e). Government will appoint one of them as the Chairman of the Authority, who shall be either an architect or a civil engineer having professional experience of minimum 30 years in (i) design/construction and/or (ii) teaching/research, related to building. The Authority shall appoint such numbers of officers, technical assistants, inspectors and other employees as shall be required for proper administration of the Code and smooth functioning of the Authority.

2.1.4 Responsibilities of the Authority

Bangladesh Building Regulatory Authority (BBRA) shall:

- (a) be the organization responsible for establishing regulatory framework for building design and construction with efficient and effective compliance mechanism.
- (b) develop building check and control procedure for ensuring high degree of regulatory compliance in planning and the Code requirements and reduce information asymmetry between the end user (building occupant, home owner) and seller (developers, builders).
- (c) streamline and improve transparency through dissemination of information related to built environment including detail land use plan, regulations on safety, water and environmental conservation, health, energy efficiency and urban planning requirements through print and digital media including its website.
- (d) develop an effective licensing system, jointly with the professional bodies by forming a National Council for Licensing of Building Professionals (NCLBP) for conducting examinations for the members of those respective professional bodies.
- (e) update the requirements of building permit and inspection procedure as per Bangladesh National Building Code.

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- (f) require the owner of an existing or under construction high risk building, having major impacts on public safety for inhabitants within and near the building, to carry out review of design and construction by licensed professionals acceptable to the Authority.

(g) introduce IT based automated procedure for permits and online information system to enable the applicants to track the progress of the permitting process.

(h) establish an independent quasi-judicial dispute-resolution body that can make binding decisions in disputes between practitioners, developers, stakeholders and permitting authorities on matters related to interpretation of the Code or sufficiency of compliance, which cannot be appealed except to the Supreme Court on matters of law .

(i) recommend punitive and other measures against developers and professionals for violation of the Code and safety measures.

(j) take measures for updating of the Code in light of research, improved building design and construction technique, availability of new products and technology.

(k) advise the Government on policy and administration of building regulations including capacity development.

(l) take up matters from time to time which the Authority deems necessary.

2.1.5 Qualifications of Members of the Authority

A Member shall be a person who is a/an;

(a) civil engineer having professional experience of 30 years in design / construction / teaching / research, related to building.

(b) architect having professional experience of 30 years in design / construction / teaching / research, related to building.

(c) planner having professional experience of 30 years in planning / teaching / research, related to building.

(d) judge having professional experience of 30 years in law including the qualification for appointment of a judge of the High Court Division.

(e) person having professional experience of 30 years in Bangladesh Civil Service.

2.2 ENFORCEMENT AT FIELD LEVEL

2.2.1 The Bangladesh Building Regulatory Authority will designate specific geographical jurisdiction as subordinate office of BBRA which will be named as Office of the Building Official (OBO). OBO will be established at various local/regional development area or local government levels.

2.2.2 These Offices of Building Official will have necessary number of officers, technical assistants, inspectors, and other employees as shall be required for proper implementation and administration of the provisions of the Code. All the officers and staff of these field offices shall be under administrative control of BBRA. They will be in the pay-roll of the office they will be serving and will be treated as on deputation to BBRA.

2.3 BUILDING OFFICIAL

2.3.1 The administrative and operational chief of the Code enforcing office shall be designated as the Building Official who shall act on behalf of the Authority. The Building Official may designate an employee or employees who shall carry out the specified duty and exercise the specified power of the Building Official.

2.3.2 Building Official shall exercise through a Building Construction Committee (BC Committee) comprising four members excluding Building Official. Such committee shall be formed in combination of one architect, one

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civil engineer, one town planner and representative from concerned body. Building Official shall work as ex-officio member-secretary of the Committee.

2.4 ADMINISTRATIVE JURISDICTION OF BUILDING OFFICIALS

2.4.1 The areas delineated below in Table 2.2.1 shall be under the jurisdiction of the Building Officials located in the offices/authorities mentioned in the right hand column:

Table 2.2.1: Jurisdiction of Building Officials of Designated Offices/Authorities

Sl. Area Authority

1 Areas falling under the master plan control of Rajdhani RAJUK
Unnayan Kartipokhkha (RAJUK)

2 Areas falling under the master plan control of Chittagong CDA
Development Authority (CDA)

3 Areas falling under the master plan control of Rajshahi RDA
Development Authority (RDA)

BNBC 2015 FINAL DRAFT4 Areas falling under the master plan control of KhulnaKDA
Development Authority (KDA)

5 Areas falling under the master plan control of any relevant development authority
Development Authority to be established in future

6 Areas falling under the geographical jurisdiction of any City relevant city corporation
Corporation where no Development Authority exists

7 Areas falling under the geographical jurisdiction of any Relevant municipality
Municipality where no Development Authority exists

8 Areas not falling under any of the above Office of The Executive Engineer Public Works

9 Special areas, if any Department (PWD).

To be declared by the government as and when
necessary

2.4.2 There may be as many Building Officials as required depending upon the area of jurisdiction. But every Building Official will be in charge of an independent and well demarcated area.

2.5 MERGING THE JURISDICTIONS UNDER SMALL LOCAL BODIES

Small local bodies like Pourashavas/Upazila/Union Parishad located outside the larger city municipalities and having insufficient funds for individually carrying out the task of the Code enforcing agency may jointly appoint or designate, with the approval of the Authority, a Building Official who shall have a jurisdiction over the combined area of jurisdiction of the concerned local bodies.

2.6 QUALIFICATIONS OF THE BUILDING OFFICIAL

The person to be designated as the Building Official shall be at least an architect, civil engineer, or town planner in addition to fulfilling any other requirement of the Authority. The employees of the Building Official shall be adequately qualified to carry out the responsibilities assigned to them by the Building Official.

2.7 RESTRICTIONS ON THE BUILDING OFFICIAL

The Building Official or any of his employees shall not in any way, directly or indirectly, be engaged in planning, design, construction, repair, maintenance, modification or alteration of a building, certification of any work or

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materials, supply of materials, labor, equipment or appliances or any other work regulated by the provisions of this Code. The Building Official or any of his employees shall not be interested in business, either directly or indirectly, as planner, engineer, architect, builder or supplier or in any other private business transaction or activity within the jurisdiction of the Authority which conflicts with his official duties or with the interest of the Code enforcing agency. If any Building Official or any of his employees violates the restrictions, he shall be liable to punishment as per service rule of the government.

2.8 DAMAGE SUIT

In the process of discharging the official duties as required and permitted by the Code, the Building Official or any of his employees shall not be personally liable for any damage that may be caused to any person or property. Any suit filed against the Building Official or any of his employees because of an act performed by him in the official discharge of his duties and under the provisions of the Code shall be defended by the legal representative of the Authority until the final decision of the proceedings. In no case shall the Building Official or any of his employees be liable for costs in any legal action, suit, or defense proceedings that may be filed in pursuance of the provisions of the Code.

2.9 POWERS AND DUTIES OF THE BUILDING OFFICIAL

2.9.1 General

The Building Official shall be authorized to enforce all the provisions of this Code and for such purposes the Building Official shall have the power of a law enforcing officer.

The Building Official shall be authorized to interpret this Code and to adopt and enforce rules and supplemental regulations in order to clarify the application of its provisions in conformity with the intent and purpose of this Code.

2.9.2 Deputies

The Building Official may appoint such number of technical officers and inspectors and other employees as shall be authorized from time to time in accordance with the prescribed procedures and with the approval of the Authority. The Building Official may designate such officers or inspectors as may be necessary to carry out the functions of the Code enforcement agency.

2.9.3 Application and Permits

Applications shall be made in writing to the Building Official for any erection, construction, addition, alteration, modification, repair, improvement, removal, conversion, change of occupancy, and demolition of any building or structure regulated by this Code. The Building Official shall receive such applications, examine the premises, enforce compliance with this Code and issue permits for the intended work.

2.9.4 Building Notices and Orders

All necessary notices and orders to correct illegal or unsafe conditions, to require the specified safeguards during construction, to require adequate access and exit facilities in existing buildings and to ensure compliance with all the requirements of safety, health and general welfare of the public as included in this Code shall be issued by the Building Official.

2.9.5 Right of Entry

The Building Official may enter a building or premises at reasonable times to inspect or to perform the duties imposed by this Code if:

(a) it is necessary to make an inspection to enforce the provisions of this Code; or

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(b) the Building Official has reasonable cause to believe that a condition contrary to or in violation of thisBNBC 2015
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Code exists making the building or the premises unsafe, hazardous or dangerous.

If the building or premises is occupied, the Building Official shall present credentials to the occupant and request entry. If the building or premises is unoccupied, the Building Official shall first make a reasonable effort to locate the owner or any other person having charge or control of the building or premises and request entry. If entry into the building or premises is refused or the owner of the unoccupied building or premises cannot be located, the Building Official shall secure entry as provided by the law.

2.9.6 Inspection

The Building Official or his designated deputies shall inspect all construction or work for which a permit is required or he may accept reports of inspection by a licensed engineer, architect or planner provided he satisfies the requirements of Table 2.3.4 and may disapprove the report showing specific reason for disapproval. The work or construction to be inspected shall remain accessible and exposed for inspection purposes until the approval is obtained.

All reports of inspection shall be in writing and certified by the Building Official or the licensed engineer or the architect making the inspection.

Approval of work or construction as a result of such inspection shall not be interpreted to be an approval of a violation of the provisions of this Code or of other ordinances of the jurisdiction.

The Building Official may require survey of the site and adjoining areas to verify that the structure is located in accordance with the approved plans.

The Building Official or his designated deputies shall carry proper identification when inspecting structure or premises in the performance of duties under the provision of this Code.

2.9.7 Orders to Stop Work

The Building Official may issue an order for immediate discontinuation of a work and cancellation of a previous permit for such work at any stage if:

(a) any work is being done contrary to the provision of this Code or other pertinent laws or ordinances implemented through the enforcement of this Code; or

(b) it is determined by the Building Official that the construction is not proceeding according to the approved plan, dangerous or unsafe.

In such cases the Building Official shall notify the owner in writing of such an order by showing the reason for the order, and the conditions under which the cited work will be permitted to resume.

When there is insufficient evidence of compliance with the provisions of this Code, a Building Official shall have the authority to require test as evidence of compliance to be made at no expense to the office of the Building Officials. Test shall be performed by an agency approved by BO.

2.9.8 Unlawful Continuance

Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to penalties as prescribed by law.

2.9.9 Occupancy Violation

The Building Official may order the current uses of a building discontinued and the building or portion thereof vacated by serving a notice on any person if the Building Official determines that the building or structure or equipment therein regulated by this Code is being used contrary to the provisions of this Code. Such person

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shall discontinue the use within the time prescribed by the Building Official after receipt of such notice to make the structure, or portion thereof, comply with the requirements of this Code.

2.9.10 Maintenance of Records

The Building Official shall maintain records of all applications and drawings received, permits and orders issued, inspections made and reports prepared and submitted by other recognized agencies. Copies of all relevant papers and documents for enforcement of the Code shall be preserved by the Building Official. All such records shall be kept open to public inspection at all suitable times.

2.9.11 Expert Opinion

The Building Official may engage, subject to the approval of the Authority, an expert or a panel of experts for opinion on unusual technical issues that may arise in administering the provisions of the Code.

2.10 BOARD OF APPEAL

There shall be a Board of Appeal to hear and decide appeals of orders, decisions or determinations made by the Building Official related to the application and interpretation of this Code. Board of Appeal shall be constituted by BBRA as per the provisions of Sec 2.1.4. The Board shall provide reasonable interpretation of the provisions of this Code and determine the suitability of alternative materials or methods of design or construction. Such Board shall consist of members appointed by the Authority who are noted for their education and experience in the relevant field of building construction and whose term of office shall be as decided by the BBRA. This Board shall, with the approval of the government, adopt rules of procedure for conducting its business, and shall communicate all decisions and findings in writing to the Appellant with a copy to the Building Official. This Board shall have no discretion for interpretation of the administrative provisions contained in Part 2 of this Code, nor shall be empowered to waive any requirement of this Code.

2.11 REQUIREMENT OF CERTIFICATION OF WORK

Any planning, design, supervision of construction, repair, maintenance, modification and alteration of buildings, or any other work regulated by the Code shall be certified by a licensed engineer, architect or planner for its compliance with the provisions of the Code as per Tables 2.3.3 and 2.3.4.

2.12 LIMITS OF PROFESSIONAL CONDUCT

Any licensed architect, engineer or planner may take assistance from fellow professionals who are not licensed but is member of professional bodies and who shall work under his direct control. He shall be allowed to plan, design and supervise construction, repair, maintenance, alteration and modification of buildings or structures regulated by this Code provided the licensed professional certify compliance of the work with the provisions of the Code. In case of any violation of the Code the licensed professionals who shall certify will be liable for action through professional bodies. Such a person may provide any such certificate as long as his or her services are recognized by the Building Official and such recognition is not withdrawn under the provisions of Sec 2.13.2.

2.13 VIOLATION AND PENALTIES

2.13.1 General (Unlawful Acts)

Any person, firm, corporation or government department or agency who as owner of the property erects, constructs, enlarges, alters, repairs, moves, improves, removes, converts, demolishes, equips, uses, occupies or maintains any building or structure or cause or permit the same to be done in violation of this Code shall be guilty of an offence and the Authority shall take legal action against such offenders as prescribed by law. The

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term owner shall, for the purpose of these provisions include any developer who by appointment, contract or lease is or has been responsible for the actions listed above.

2.13.2 Professional Violation

The engineer, architect or planner responsible for design, supervision or certification of any construction or other work of a building or structure shall ensure compliance of such work with the provisions of this Code. Any violation of the Code or any other professional misconduct insofar as implementation of the provisions of this Code is concerned including making false statements or issuing false certificates or any incidence of proven professional incapability shall be recommend to the respective professional bodies for necessary disciplinary measure including withdrawal of recognition/registration.

2.13.3 Obligation of Offender

A person shall not be relieved from the duty of carrying out the requirements or obligations imposed on him or her by virtue of the provisions of this Code even if such person is convicted for an offence under the provisions of this Section.

2.13.4 Conviction No Bar to Further Prosecution

If a person is convicted under the provisions of this Code for failing to comply with any of its requirements or obligations such conviction shall not act as a bar for further prosecution for any subsequent failure on the part of such person to comply.

2.14 POWER TO MAKE RULES

The Authority may make rules for carrying out the provisions and intentions of this Code. Such rules shall not contradict nor nullify any of the provisions of this Code. The Authority may fix and re-fix from time to time application fees for issuance of permits for all works under the provisions of this Code.

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Chapter 3

PERMITS AND INSPECTIONS

3.1 PERMITS

No building or structure regulated by this Code shall be erected, constructed, enlarged, altered, repaired, moved, improved, removed, converted or demolished without obtaining permit for each such work from the Building official.

Exceptions:

The following works are exempted from the requirement of a permit unless they do not otherwise violate the provisions of this Code, for the said work or any other adjacent property, regarding general building requirements, structural stability and fire safety requirements of this Code:

- (a) Opening or closing of a window or a door or a ventilator;
- (b) Providing internal doors;
- (c) Providing partitions;
- (d) Providing false ceiling;
- (e) Gardening;
- (f) Painting;

- (g) Plastering and patch work;
- (h) Re-flooring;
- (i) Construction of sunshades on one's own land;
- (j) Re-erection of portion of buildings damaged by earthquake or cyclone or other natural calamities, to the

extent and specification as existed prior to such damage; and

- (k) Solid boundary walls less than 1.5 m and open boundary wall less than 2.75 m in height.

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3.2 TYPES OF PERMIT

Building permit shall comprise of the following 4(four) stages:

- (a) Land use certificate
- (b) Large and specialized project permit.
- (c) Building permit
- (d) Occupancy certificate.

Permit of all or any of the above may be necessary for a particular area/city/town/municipality. Requirement in this regard shall be incorporated in the building construction byelaws/ rules/regulations valid for that particular area/city/town/municipality.

Validity of Permits from the Date of Issuance

The validity of permits for different purposes from the date of issuance shall be as follows:

- (a) Land use certificate 24 months
- (b) Large and specialized project permit 24 months
- (c) Building permit 36 months (unless construction up-to plinth level is done)
- (d) Occupation certificate Perpetual (unless any change in use and physical properties)

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Permits Obtained Prior to Adoption of Code

If permit for a building or structure or a work regulated by this Code is obtained before adoption of this Code and the building or structure or work for which the permit is obtained is not completed within three years from the date of issuance of such permit, the said permit shall be deemed to have lapsed and fresh permit shall be necessary to proceed further with the work in accordance with the provisions of this Code.

3.3 CONSTITUTION OF BUILDING PERMIT COMMITTEES

As per the provisions laid out in the Building Construction Act the government may constitute various committees to examine and scrutinize applications mentioned in Clause 3.2 above and approve or refuse permits thereby.

Each committee will have specific Terms of Reference and Work Procedure.

3.4 APPLICATION FOR PERMIT

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Any person who intends to undertake any work on a building or structure or land regulated by this Code shall file application in writing on the prescribed form furnished by the Building official for that purpose.

Application for permit for any work under the provisions of this Code shall be accompanied by necessary documents, drawings, certificates, clearances and other relevant information as required by the Building Official for that particular city/town/municipality/jurisdiction area etc.

The drawings shall have any of the sizes specified in the Table 2.3.1:

Table 2.3.1: Drawing Sizes for Permit Applications Size (mm)

Notation (ISO Standard) 841 x 1189

A0

A 1 594 x 841

A 2 420 x 594

A 3 297 x 420

A 4 210 x 297

Operation and Maintenance of Utility Services

The government may undertake works for operation, maintenance, development or execution of any of the following utility services without requiring obtaining permit from the Building Official.

- (a) Railways
- (b) National Highways
- (c) National Waterways
- (d) National Gas grid
- (e) National Power grid
- (f) Major Ports
- (g) Airways and Aerodromes
- (h) Telecommunications
- (i) Electronic Broadcasting Services
- (j) Any other services which the Government may, by notification, declare to be a service for the

purpose of this Section if the Government is of the opinion that the operation, maintenance, development or execution of such service is essential to the community.

Buildings constructed in connection with these services shall conform to the specifications of this Code.

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3.5 DISPOSAL OF APPLICATION

Subject to the submission of correct and complete application for the permits included in Sec 3.2 above, should be disposed by the Building Official within the time limit as shown in Table 2.3.2:

Table 2.3.2: Time Limit for Disposal of Application for Permits

Type of Permit Maximum type allowed for disposal (approval or refusal of the Building official)

Land use certificate 15 days

Large and Specialized Project permit 45 days

Building permit 45 days

Occupancy certificate 15 days

The Building Official shall notify the applicant according to above table as the case may be either approval or refusal of the permit for any work. If the Building Official does not notify the applicant of such approval or refusal within this specified period, the application shall be deemed to have been approved provided the fact is brought to the notice of the Building Official. Such approval shall not be interpreted to authorize any person to do anything in contravention of or against the terms of lease or titles of the land or against any other regulations, bylaws or ordinance operating on the site of the work or any of the provisions of this Code.

Refusal of permit shall be accompanied with reason and the Building Official shall quote the relevant sections of this Code which the application/drawings/submissions contravene. The applicant may correct or remove such reasons and reapply for permit with any fee if applicable. The Building Official shall scrutinize the re-submitted application and if there be no further objection it shall be approved and permit issued.

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3.6 PREPARATION AND SIGNING OF DRAWINGS

All drawings submitted for approval shall be prepared and signed by registered professionals as specified in Table 2.3.4, which shall be considered as equivalent to certifying that the drawing on which the signature appears conforms to all the requirements of this Code. Registered Professionals shall put his or her signature with date on the title box of the drawing along with his name, address, professional society membership number, registration number and any other information required by the concerned Building Official.

The drawings shall also contain the signature, name and address of the owner.

Subject to the classification and use of buildings, all drawings for approval and execution shall be prepared and signed by the registered professionals as per building category specified in Tables 2.3.3 and 2.3.4 corresponding to relevant work.

Table 2.3.3: Building classification based on height, floor area and occupancy type

Building Height of Building Floor Area Type of Occupancy
Category Up to 250 m² A (A1-A2)

I Up to 2 Stories or 8 m height (without basement) applicable only for areas beyond the jurisdiction of Development authority, city corporation and pourashava

II Up to 5 Stories Up to 1000 m² A (A1-A5)

III Up to 10 stories or 33 m height for engineering design and supervision Up to 7500 m² A, B, C, E1, E2, F1, F2

and any height for land survey, sub-soil investigation and architectural and H1

design

IV Any height Any Size All Occupancy Type

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Table 2.3.4: Eligible registered professionals for signing Design Drawings/Documents

Types of Work Registered Professional Minimum Experience Requirement in Years for Building category

I II III IV

Land Survey Civil Engineer NA NR NR NR

Planner NR NR NR

Diploma Engineer (Civil) 3 3 3

Certified Surveyor 3 3 3

Soil Investigation Geotechnical Engineer having experience in NA NR NR NR
Report soil investigation and soil test report analysis.

Civil Engineer having experience in soil NA 2 2 5

investigation and soil test report analysis.

Architectural Design Architect NA NR 2 8

Civil Engineer NA NR NE NE

Diploma Architect NA 5 NE NE

Structural Design Civil Engineer with experience in structural NA 2 4 8 (having 5 years in design or PEng.BNBC 2015 FINAL DRAFT Structural design)

Civil Engineer with M.S in Structural NA 1 3 8 (having 4 years in Engineering. Structural design)

Plumbing Design Plumbing Engineer NA NR 4 8

Architect NA NR NE

Diploma Engineer (Civil) NA 3 NE NE

Mechanical Mechanical Engineer NA 2 4 8

(HVAC/Vertical

Transportation)
Design

Electrical Design Electrical Engineer. NA 2 4 8

Diploma Engineer (Electrical) NA 3 NE NE

Construction Architect/Engineer in their respective field NA 2 4 8
Supervision
or PEng.

Diploma Architect/Diploma Engineer in their NA 2 4 NE
respective field.

Building Demolition Civil Engineer NA NR 2 8

Diploma Engineer (Civil) NA 2 NE NE

Completion Report Architect and Engineer with experience in NA 2 4 8
their respective field.

Note: NA: Not Applicable, NE: Not Eligible, NR: Not Required

3.7 FEES

All applications shall be accompanied by fees as specified by the authority from time to time without which the application shall be deemed to be incomplete.

3.8 RESPONSIBILITIES AND DUTIES OF THE OWNER

General

The owner of a building or structure regulated by the provisions of this Code shall be responsible for carrying out the work in conformity with the provisions of this Code. Granting of permission for any work or approval of plans or inspection by the Building Official or any of the deputies shall not relieve the owner from such responsibility.

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Employment of Technical PersonnelBNBC 2015 FINAL DRAFT

Design, execution and supervision work of any building shall be carried out by authorized Registered Professionals as outlined in Table 2.3.4. Owner shall take the services of as many professionals as required according to type and size of the work.

Right of Entry

The owner shall allow the Building Officials to enter the site for the purpose of enforcing the Code as required by the provision of Sec 2.9.6 and for the purpose of inspection as provided in Section 3.10 below.

Permits from Other Agencies

The owner shall obtain permit as may be applicable from other concerned agencies relating to building, zoning, grades, sewers, water mains, plumbing, fire safety, signs, blasting, street occupancy, gas, electricity, highways and all other permits required in connection with the proposed work.

Information on Progressive Work

The owner shall inform the Building Official about attainment of construction work of different stages as required by the Building Official in prescribed form.

Safety Measures

The owner shall take proper safety measures in and around the construction site.

Notice of Completion

The owner shall notify the Building Official the completion of the work for which permit was granted in prescribed form. The work shall not be accepted as complete, without a certification from the Building Official.

Documents at Site

The owner shall preserve at the site a copy of all permits issued and all drawings approved by the Building Official. Results of tests carried out for determination of conformity of the work with the provisions of this Code shall also be preserved and made available for inspection during execution of the work.

Live Load Posted

Where the live loads for which each floor or portion thereof of a commercial or industrial building is or has been designed to exceed 2.4 kN/m², such design live loads shall be conspicuously posted by the owner in that part of each storey in which they apply, using durable signs. It shall be unlawful to remove or deface such notices.

3.9 RESPONSIBILITIES AND DUTIES OF TECHNICAL PERSONNEL

To qualify as Architect, Engineer, Supervisor of any building works one shall have membership of the respective professional body in the country. In addition they shall have to qualify as registered professional through an examination (written/oral) to be conducted by their respective professional body as per requirement of this Code.

Only technical professionals qualified under Sec 3.9.1 shall design, execute and supervise any building which is subjected to approval granted under this Code.

Any lapses on the part of the technical personnel in delivering the requirements of the Code shall call for punitive actions against him/her in the proper forum.

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3.10 INSPECTION

All works relating to a building or structure regulated by the provisions of this Code for which permits are required

shall be subject to inspection by the Building Official. Modalities and frequency of such inspections shall conform to the requirements put forward by the approving authority.

3.11 UNSAFE BUILDINGS

General

All buildings considered to constitute danger to public safety or property shall be declared unsafe and shall be repaired or demolished as directed by the Building Official.

Examination

The Building Official shall examine or cause examination of every building reported to pose threat to safety or be damaged by wear and tear or accident and shall make a written record of such examination.

Notification

If a building is found to be unsafe the Building Official shall notify the owner of the building and specify the defects thereof. The notice shall require the owner within a stated time either to complete the required repair or improvement or demolish and remove the building or portion thereof.

Disregard of Notice

In case the owner fails, neglects or refuses to carry out the repair or improvement of an unsafe building or portion thereof as specified in the notice, the Building Official shall cause the danger to be removed either by demolition or repair of the building or portion thereof or otherwise, the cost of which shall be borne by the owner.

Cases of Emergency

If the Building Official considers that an unsafe building or structure constitute imminent danger to human life or health or public property, the Building Official shall at once or with a notice as may be possible promptly cause such building or structure or portion thereof to be rendered safe or removed. In such cases the decision of the Building Official shall be final and binding and he or any of his assigned deputies may at once enter such structure or land on which it stands or the abutting land or structure, with such assistance from and at such cost to the owner as may be deemed necessary. The Building Official may also get the adjacent structures vacated and protect the public by an appropriate fence or such other means as may be necessary.

3.12 DEMOLITION OF BUILDINGS

If a building or structure is to be demolished, the owner shall notify all agencies providing utility services to the building. Such agencies shall remove all their appurtenances and equipment and dismantle all service connections to ensure a safe condition. The Building Official shall not grant any permit for demolition of a building until a release is obtained from the utility services stating that all service connections have been removed in the proper manner. The demolition work shall be done under the supervision of demolition expert as per provisions of Table 2.3.4.

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3.13 VALIDITY OF THIS CODE

3.13.1 Partial Invalidity

In case any provision of this Code is held to be illegal or void, this shall have no effect on the validity of any other provision of the Code nor on the same provision in different cases nor on the Code as a whole, and they shall remain effective.

3.13.2 Invalidity of Existing Buildings

If any provision of this Code is held to be illegal or void by the Authority as applied to an existing building or structure, validity of that provision or any other provision of the Code in its application to buildings hereafter erected shall not be affected.

3.14 ARCHITECTURAL AND ENVIRONMENTAL CONTROL

Besides enforcing the provisions of this Code for normal buildings and structures, the Building Official shall, for special structures such as those listed in Sec 3.14.2 below, also examine the aesthetics and environmental issues vis-a-vis the existing structures and the characteristics of the area, and exercise architectural and environmental control in accordance with the provisions of this Section.

Special structures for which architectural and environmental control shall be exerted by the Building Official shall include:

- (a) major public building complexes
- (b) buildings in the vicinity of monuments and major sculptures
- (c) buildings and structures near existing structures identified to be architecturally valuable.
- (d) buildings and structures near historic buildings or in a area of historical or archaeological significance.
- (e) buildings near any structures that represents the special characteristics of an area
- (f) any proposed building or structure that represents the special characteristics or forms part of a larger master plan of an area, and
- (g) any development that may have an effect on or mar the environment or characteristics of an area.

The Authority shall, for the purpose of exercising the architectural and environmental control and for identifying existing structures having architectural value, appoint a standing committee comprising noted experts from the fields of Architecture, Archeology, Planning, History, Art, Literature, Engineering or any other discipline which may be deemed relevant. The committee shall examine the aesthetic quality of the proposed building, structure or development and the effect it may have on the characteristics and environment of the area in order to ensure aesthetic continuance of the new structure with the existing ones and aesthetic blending of the new structure with the surroundings. The committee may require additional drawings and information for a detailed study of the proposed work. The committee for the purpose of arriving at their decision, may at their discretion depending on the magnitude of the project and impact it may have on public life, hear the architect of the proposed work who may wish to explain the various features of the project, note comments of other experts in the relevant disciplines, or in exceptional circumstances, institute a public hearing to assess public reaction to the project.

The committee may approve the proposed work, recommend changes in the scheme, or disapprove the scheme, for reasons of aesthetics and environmental control.

The Building Official shall not issue permit for undertaking the proposed work until obtaining a report from the standing committee stating that the intended work is acceptable in respect of its effect on the

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environment, landscape, architectural characteristics, historical feature or any other aesthetical quality of the locality, area or landscape concerned.

3.15 MAKING IMPLEMENTATION PROCEDURES

Detailed byelaws and implementation procedure to enforce the provisions of this Code shall be prepared and published by the relevant authorities.

3.16 LIST OF RELATED APPENDICES

Appendix A Form for Application of Land Use/Development/Building Permit

Appendix B Form for Certificate of Supervision

Appendix C Form for Sanction or Refusal of Land Use/Development/Building Permit

Appendix D Form for Appeal against Refusal of any Permit

Appendix E BNBC 2015 FINAL DRAFT Form for Completion Certificate

Appendix F Form for Occupancy Certificate

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Appendix A

(Position and Address of the Building Official)
Form for Land Use/Development/Building Permit
First Application to Develop, Erect, Demolish or to Make

Alteration in any Part of the Building

Type of intended work: Develop Erect Demolish Alter
(Check one)

Name of the owner: _____

Contact address: _____

Post code: _____

Telephone no: _____

Name, address and qualification of the engineer, architect or planner involved in the proposed work:

For planning: _____

For architectural design: _____

For structural design: _____

For civil works design: _____

For other services design: _____
BNBC 2015 FINAL DRAFT
Address of the site

Plot number: _____ Holding number: _____

Dag/Khatian number: _____ Mouza/Block/Sector: _____

Street name: _____ Municipal ward number: _____

Documents enclosed along with this form:

Name of document Number of sheets Number of copies

1. Key plan ____ ____
2. Site plan ____ ____
3. Subdivision/layout plan ____ ____
____ ____
4. Building plan ____ ____
5. Services plan ____ ____
6. Specifications ____ ____
7. Ownership title

Date Signature of the owner

For use of the Building Official. Do not write anything below this line.

Reference number: _____ Date: _____
(To be referred to in all subsequent correspondences)

Received by: _____

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Appendix B

Form for Certificate of Supervision

Reference number: _____ Holding number: _____
Address of the site:
Plot number: _____
Street name: _____

Municipal ward number: _____

Type of intended work (Check one) :

Develop Erect Demolish Alter

Name of the owner:BNBC 2015 FINAL DRAFT_____

Contact address: _____

Post code: _____

Telephone no: _____

I hereby certify that the building for which the location, the type of work, and the name and address of owner appear above will be supervised by me as per the provisions of the Bangladesh National Building Code.

Signature of the engineer, architect, planner or supervisor

Name of the engineer, architect, planner or supervisor

Address

Qualification Date

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Appendix C

(Position and Address of the Building Official)
Form for Sanction or Refusal of Land Use/Development/Building Permit

Reference number: _____

In response to your application whose reference number appears above, I hereby inform that the documents submitted along with your application have been (check as appropriate)

Approved for implementation by the Authority

Refused by the Authority for violation of the following provisions of the Bangladesh National Building

Code:

(List of the sections violated)

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Signature of the Officer Permit number

Name of the Officer Official stamp

Designation Date

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Appendix D

Form for Appeal against Refusal of any Permit

Reference number: _____

The application whose reference number appears above has been refused by the Authority. I hereby appeal against the refusal for the following reasons.

(List of the justifications for the appeal)

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Date Signature of the owner

For use of the Building Official. Do not write anything below this line.

Received by: _____

Date: _____

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Appendix E

Form for Completion Certificate

Reference number: _____

Permit number: _____

Address of the site:

Plot number: _____ Holding number: _____

Dag/Khatian number: _____ Mouza/Block/Sector: _____

Street name: _____ Municipal ward number: _____

Documents enclosed along with this form:

Type of work (Check one)BNBC 2015 FINAL DRAFT

Develop Erect Demolish Alter

Name of the owner: _____

Contact address:

Post code: _____

Telephone No: _____

I hereby certify that the work having the above mentioned detailed particulars has been supervised by me and completed in accordance with the plan and design approved by the permit number cited and the provisions of the Bangladesh National Building Code.

Signature of the engineer, architect, planner or supervisor

Name of the engineer, architect, planner or supervisor

Address

Qualification Signature of the owner

Date Date

This Part to be completed by the Building Official.

The work identified by the reference number and permit number at the top of the form is hereby accepted as complete in accordance with the approved plan and design.

Signature of the Officer

Name of the Officer Official stamp

Designation Date

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Appendix F

(Position and Address of the Building Official)

Form for Occupancy Certificate

Reference number: _____

Permit number: _____

Address of the site :

Plot number: _____ Holding number: _____

Dag/Khatian number: _____ Mouza/Block/Sector: _____

Street name: _____ Municipal ward number: _____

Documents enclosed along with this form:

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Type of work (Check one)

Develop Erect Demolish Alter

Name of the owner: _____

Contact address:

Post code: _____

Telephone No: _____

I hereby certify that the work having the above mentioned detailed particulars has been completed in accordance with the plan and design approved by the permit number cited and the provisions of the Bangladesh National Building Code. The owner has submitted all the required documents for issuance of occupancy certificate. Thus, I, hereby, certify that the holding may be occupied as _____ (mention the occupancy type).

Signature of the Officer Official stamp

Name of the Officer Date

Designation

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PART 3
GENERAL
BUILDING
REQUIREMENTS,
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Chapter 1

GENERAL BUILDING REQUIREMENTS

1.1 SCOPE

This Part of the Code puts forward classification of buildings based on occupancy or nature of use and deals with the general and specific requirements of each of the occupancy groups. Fire resistance requirements are expressed in terms of type of construction which shall conform to the specified fire-resistive properties.

1.2 TERMINOLOGY

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This Section provides an alphabetical list of the terms used in and applicable to this Part of this Code. In case of any conflict or contradiction between a definition given in this Section and that in any other Part of this Code, the meaning provided in this Part shall govern for interpretation of the provisions of this Part.

ACCESSIBILITY The provision in a plot or a building or a facility or any part thereof that can be approached, entered and used without assistance by persons with temporary or permanent physical ACCESSIBILITY limitations.

ROUTE

ACCESSIBLE A continuous unobstructed path that starts from the entry and shall continue through all accessible elements and spaces within a plot and buildings or facilities thereof up to the ADAPTABLE exit termination.

AREA PLANNING

AUTHORITY The term accessible or adaptable shall be used as a prefix for spaces or features which are ASSEMBLY designed for persons having physical limitation; such as accessible toilet, accessible kitchen, accessible lift and so on.

ATRIUM

See ACCESSIBLE

BALCONY

A government or semi-government agency or a local body which has been legally designated

BALUSTER to formulate land use or plans of the area under their jurisdiction.

BALUSTRADE

In a building or a portion thereof used for gathering of 50 or more persons for deliberation, worship, reading, entertainment, eating, drinking, awaiting transportation, or similar uses not limited to these; or used as a special amusement building, regardless of occupant load.

A large volume space within a multistoried building having series of floor openings or corridors or similar elements in and around and floors are connected from there and series of openings or a glazing on roof or a portion thereof constructed with glazing and having a minimum two stories high. The word Atria or Atriums are the plural form of Atrium.

A covered and hanging platform at a height of minimum 2.286 m from the plinth level of a building and having access from any floor level and which is laterally open to outer air by three sides up to 2.06 m in height and edges are protected with guards. Within an interior space, a balcony is a portion which are positioned sidewise as similar as Mezzanine.

Single vertical member of a guardrail or a Handrail or a member of both which shall be complied with the provisions of this Code.

Plural form of BALUSTER.

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BARRIER A wall or a partition or a floor slab or a ceiling within a building which confines and protects flow of smoke and fire from the exposed side of the barrier. The fire rating of barriers shall be complied with the provisions of this Code.

BASEMENT A floor of a building or a portion thereof which is situated as a whole or partially at depth of minimum 50 percent of ceiling height below formation level shall be called as a basement.

BUILDING LINE The peripheral lines of a building mass or volume up to which the plinth area or any floor area may be lawfully extended within a plot.

CARRIAGEWAY A path including over bridge or bridge which is open to the outer air and may or may not be covered or roofed or an underpass, design and designated for vehicles only

CEILING HEIGHT Height measured from the top of finished surface of floor level up to the bottom of roof or ceiling or suspended or false ceiling level or Beam drops. In case of multistoried building, Vertical distance in between two slabs from which deduction shall be made for any suspended or false ceiling or Beam drops. For slope or pitch ceiling or roof, the minimum

value shall be the ceiling height.

COMMON SPACE See NON-SEPARATED SPACE CONDITION
CONDITION

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CONTROL AREA A space or a room within a building enclosed by barriers with the fire rated walls, floor and ceiling, where the quantity of hazardous material shall not be exceeded the maximum allowable quantity per control area for storing, displaying, handling, dispensing or using as per provisions of this Code.

DETACHED A building separated by distance in a same plot to accommodate different type of OCCUPANCY occupancies shall be termed as Detached Occupancy.

DEVELOPMENT A government or semi-government agency or a local body which has been legally designated

AUTHORITY to carry out and/or control any works of land development of an area having jurisdiction.

FAR (FLOOR FAR is a ratio between the area of a plot and the sum of floor areas of building or buildings AREA RATIO) are erected or intended to be erected thereof. In the buildings, there may have some specific and calculated floor areas which shall be treated as bonus or exempted from the total floor area calculation and such areas shall be specified by the authorities having jurisdiction.

FIRE An uncontrolled fire which poses threat to safety of life or property or both.

FIRE A minimum distance which to be maintained between potential sources and/or between SEPARATION structures for fire safety. In case of differences between building setback and the required DISTANCE minimum fire separation distance measurement; the higher value shall be implied.

FLOOD

A Land or a plot normally dry but submerges or drowns as whole or partially by over flown FLOOD LEVEL water from any source.

FLOOD PRONE A measurement of height from an existing ground level or from top level of river water of an AREA area or a locality recorded in a Flood Hazard Map by the authorities having jurisdiction.

FLOOR HEIGHT

At least once in a year a dry ground of an area or a plot or a portion thereof flooded at a FRONTAGE height of 1m or more shall be designated as a Floor Prone Area.

FORMATION In a multistoried building, floor height shall be measured from the top of finished surface of LEVEL the two successive floor slabs and the measurement of the top most floor shall be from the top of finished surface of the floor slab and the top of the finished roof, in case of the slope roof, measurement shall be taken up to pick of that slope.

Irrespective of the entry provision to a plot, full or partial length of any sides of a plot which are abutted to roads or streets shall be designated as frontage.

Finished ground level of a plot. For hilly areas formation levels shall be the gradient of the plot surface.

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GALLERY A special type of seating arrangement where each and every row or tier of seats are successively elevated to provide a clear view to audiences or spectators within and around
GUARD a playground or outdoor or indoor stadium or within an auditorium or in a hall.

HEAD ROOM

CLEARANCE A vertical protective barrier erected up to a height along exposed edges of stairways, balconies and similar areas.

HELISTOP

HIGH RISE A vertical distance measured from the top of finished floor level up to the bottom of ceiling BUILDING or lowest roof level or bottom of beam drop or bottom of any hanging element within a LIGHTING SHAFT space. In case of a stairway, a vertical distance measured from the bottom surface of flight or ceiling or beam drop to any outer edge point of a tread below and for the landings ceiling LOFT height measurement system shall be adopted to determine head room clearance.

MANDATORY

OPEN SPACE A designated area on ground or on water or on a portion of a building for helicopter landing MEZZANINE or takeoff without servicing, repairing and refueling facilities.

FLOOR

Any building which is more than 10-storey or 33 m high from reference datum. Building MIXED appurtenances like overhead water tank, machine room, communication tower etc. will not OCCUPANCY be considered in determining the height.

NON SEPARATED

SPACE A space within a building which is fully enclosed by all sides and shall be open to the sky to CONDITION provide daylight to adjacent interiors and less than the dimensions that stipulated for minimum closed or internal courts of corresponding to the building heights.

An intermediate space in-between a floor or a ceiling and under a pitch or a slope roof of a building.

The spaces within a plot which shall remain unpaved with or without vegetation to allow water penetration and uncovered up to the sky from formation level of the building. No underground or above ground construction is allowed in such spaces.

Within one space where more than one floor exists, the floor at the lowest level shall be designated as main floor and each Intermediate floor is limited to an area which is not more than one third of the main floor under one roof or one ceiling, thus gives two or more useable floor levels. These types of intermediate floors shall be designated as mezzanine floors. Mezzanine floor may be as gallery or flat floor type and which also includes interior balcony.

When two or more occupancies are amalgamated in a building shall be termed as Mixed Occupancy.

Walls or partitions between compartments, rooms, spaces or areas within a building or part of a building which are not separated by an approved fire rated barrier walls or partitions shall be designated as non-separated space condition or effective undivided single space.

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OPENINGS Apertures or holes in any wall of a building that allow air to flow through and which are designed as open.

OPENING,

VERTICAL An opening through a floor or roof of a building.

OPEN SPACE

Open space within a plot includes all spaces other than spaces covered by the Maximum

PLINTH Ground Coverage (MGC)

PLINTH LEVEL

Bases of the building and the elements that negotiate with the ground.

PLINTH AREA

Height of a covered finished floor which is just above the formation level and measured from the formation level up to the top of that finished floor.

The elements from the building bases which are exposed above the formation level to form a covered floor area by joining the peripheral points of the elements which are intersected finished floor plane at the height of plinth level shall be designated as Plinth Area.

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PLOT A scheduled piece or parcel of land which is classified and restricted to its intended use.

RAMP A sloping walkway which is steeper than 1 in 20 but not steeper than 1 in 8 and shall have guard and handrail.

RAMP, A sloping walkway not steeper than 1 in 12.

ACCESSIBILITY

RAMPED Ramped Driveways are inclined floors that provide access to vehicles between two levels.

DRIVEWAY Ramped walkway when provided side by side of a ramped driveway shall be separated by safety guard rails and curbs. A sloping driveway or Ramped Driveway steeper than 1 in 8 shall not be credited as a component of means of exit.

RAMP GRADIENT Ramp gradient refers to the ratio of the inclination of a ramp (height by length ratio) measured along the center line of the ramp.

ROAD LEVEL The road level means top surface at the center point of the road width which is used for site entry and shall be considered as the reference point for measuring height or depth of any development.

ROOF Weather exposed and uncovered surface of the topmost or the terminal ceiling of a building which may be horizontal or pitched or may have slopes shall be treated as the roof of a building.

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SEPARATED A building or a portion thereof separated by barriers with wall or ceiling slab that into two OCCUPANCY or more parts to accommodate different type of occupancies in different parts.

SEPARATE SPACE Rooms, spaces or areas within a building when separated by approved barrier wall.
CONDITION

SEPARATION This is a peripheral wall of a building or a building which shall be divided into two or more or WALL a common wall between two buildings to control spreading of fire as per provisions of this Code.

SITE See PLOT

SMOKE DRAFT A vertical panel dropped from the ceiling of a building or portion thereof to protect and BARRIER control the movement of smoke draft during fire. The construction of such smoke draft

barriers shall be complied with the provisions of this Code.

STAGE An elevated platform which is designed or used for presentation of plays or lectures or other entertainments in front an assembly of spectators or audiences.

STAGE, INTERIOR An elevated platform within a building which is designed or used for presentation of plays or lectures or other entertainment in front an assembly of spectators or audiences.

STAGE, Ceiling Height of a stage from the top surface of the platform is 15.24 m or more shall be **LEGITIMATE** designated as a legitimate stage.

STORAGE A storage or display of solid or liquid merchandises shall not be exceeded 976 kg/m² or 814 DENSITY L/m² respectively and shall be limited to the exempted quantity of an actually occupied net floor area. Maximum height of display or storing of merchandises shall not be exceeded 1829 mm or 2438 mm respectively. Allowable Height and Quantity may be less depending on the total area and the ceiling height of a store or a display.

STREET OR ROAD An open to outer air and unobstructed space having required width and used by the public as pedestrian or walkway or animal or vehicular movement or any combination of these for the purpose of access to a plot or plots and is connected with the national public transportation system other than railway track shall be designated as street or road which may or may not be paved.

STREET OR ROAD The width of any street or road shall be measured form any plot to its opposite or face to **WIDTH** face plot distance. For the determination of a road width, measurements shall be taken up to the connection of the national public transportation system other than railway track from any plot and the least width shall be the road width.

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STREET FLOOR A story or floor level of a building which is accessible at the main entrance of a building from **LEVEL** the street or from the outside at ground level and the floor shall not be more than three risers above or below the grade level.

STRUCTURAL All members or elements such as columns, girders, beams, trusses and spandrels which **FRAME** forms a frame and have direct connections with bearing and transferring as an integral and essential elements for the stability of a building or a structure as a whole.

SURGE PRONE Expected occurrence of a surge or wave of water may flow above 1 m or higher from the **AREA** formation level.

TALL STRUCTURE A building used for human occupancy located more than 80m high from the center of the adjacent road level or from lowest level of the fire department vehicle access.

TERRACE A paved surface not steeper than 1 in 20 and adjacent to a building which is connected by a stairway or a walking ramp or at the same level of any floor below the roof level of a building and at least one side of that area is exposed to the weather and having the guards and open to the sky.

UNIVERSAL See **ACCESSIBILITY**

ACCESSIBILITY

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UNPROTECTED The element that shall have no prerequisites of fire protection rating.

VENTILATION A space sidewise enclosed but open to sky used to provide ventilation as inlet and/or outlet

SHAFT, NATURAL to adjacent interiors of dimensions less than that stipulated for internal courts of corresponding to building heights.

VERANDAH Portions of a building at any level which have ceiling or roof and at least one side open up to 2.13 m height to the outside air and have guards as per provisions of this Code.

WALKUP A multi storied building which does not have any mechanical means of vertical circulation BUILDING other than stairway shall be designated as a walkup building and the maximum height of the walkup building shall be as per provision of this Code or as approved by the authority having jurisdiction.

1.3 LAND USE CLASSIFICATION

A city or a township or a municipality or a union or any other habitat development shall be brought under a structured planning including detailed area planning to implement the intended land use pattern, transportation and maintaining environmental conditions by the development or planning authorities and shall be approved by the government. This land use classification may divide an area into zones such as residential, commercial, industrial, storage, green park, agricultural land, reserved area etc. or any combination of these. The land use zones shall be shown on the approved master plan of the area and the planning regulation shall clearly state the permitted occupancies, restricted occupancies and conditionally permitted occupancies for each zone.

1.4 OCCUPANCY AND CONSTRUCTION CLASSIFICATION OF BUILDINGS

Every building or portion thereof shall be classified according to its use or character of occupancy. A brief description of such occupancy groups is presented in Table 3.1.1. Details of all occupancy group and sub-divisions are set forth in Sec 2.1 of Chapter 2 of this Part. Types of construction based on fire resistance are specified in Table 3.1.2. Details of such types of construction are set forth in Chapter 3 of this Part. Any development permit for a site or a location shall clearly mention the permitted occupancy and construction type in accordance to Tables 3.1.1 and 3.1.2 for the existing or proposed building.

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Table 3.1.1: Summary of Occupancy Classification

Occupancy Type Subdivision Nature of Use or Occupancy Fire Index*

1

A: Residential A1 Single family dwelling 1

1

A2 Two families dwelling 1

1

A3 Flats or apartments 1

1

A4 Mess, boarding houses, dormitories and hostels 1

1

A5 Hotels and lodging houses 1

1

B: Educational B1 Educational facilities up to higher secondary levels 1

1

Facilities B2 Facilities for training and above higher secondary education 2

2

B3 Pre-school facilities 2

2

C: Institution for C1 Institution for care of children 2

Care C2 Custodial institution for physically capable adults 2

2

C3 Custodial institution for the incapable adults 2

3

C4 Penal and mental institutions for children 3

3

C5 Penal and mental institutions for adults 3

1

D: Healthcare BNBC 2015 FINAL DRAFTD1 Normal medical facilities 1

Facilities D2 Emergency medical facilities

1

E: Business E1 Offices

1

F: Mercantile E2 Research and testing laboratories

E3 Essential services 1

F1 Small shops and market

4

F2 Large shops and market

4

F3 Refueling station 4

4

G: Industrial G1 Low hazard industries 2

Buildings G2 Moderate hazard industries 1

3

H: Storage H1 Low fire risk storage 2

Buildings H2 Moderate fire risk storage 2

I: Assembly I1 Large assembly with fixed seats

I2 Small assembly with fixed seats

I3 Large assembly without fixed seats

I4 Small assembly without fixed seats

I5 Sports facilities

J: Hazardous J1 Explosion hazard building
Building

J2 Chemical hazard building

K: Garage J3 Biological hazard building

J4 Radiation hazard building

L: Utility K1 Parking garage

M: Miscellaneous K2 Private garage
K3 Repair garage
L Utility
M1 Special structures

M2 Fences, tanks and towers 1

* Fire Index: fire index is an absolute number, Occupancy group having same fire index may be permitted as mixed occupancy and different fire index shall be separated or detached as per provisions of this Code.

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Table 3.1.2: Summary of Classification of Buildings Based on Types of Construction

Construction Group Construction Type Description

Type I-A 4 hour protected

3 hour protected

Type I-B 2 hour protected

1 hour protected

Group I: Non-combustible Type I-C Unprotected

Heavy timber

Type I-D Protected wood joist

Unprotected wood joist

Type I-E Protected wood frame

Unprotected wood frame

Type II-A

Type II-B

Group II: Combustible Type II-C

Type II-D

Type II-E

1.5 REQUIREMENTS OF PLOTS

BNBC 2015 FINAL DRAFT1.5.1 General Requirements

1.5.1.1 No building shall be constructed on any site which is water logged, or on any part of which is deposited refuse, excreta or other objectionable material, until such site has been effectively drained and cleared to the satisfaction of the Authority.

1.5.1.2 Provision shall be kept for any space within the plot left vacant after the erection of the building to be effectively drained by means of surface or underground drainage system.

1.5.1.3 Basic minimum sanitary waste and excreta disposal facility shall be created on the premises, whether or not the plot is served by a disposal system provided by any utility service authority or agency.

1.5.1.4 Written approval of the Authority or the appropriate drainage and sanitation authority shall be obtained for connecting any soil or surface water drain to the sewer line.

1.5.2 Clearance from Overhead Electric Lines

A building or any part thereof shall not be erected within, nor any auxiliary part of the building be allowed to come closer to the distance shown in Table 3.1.3 from any overhead electric line.

Table 3.1.3: Minimum Distances from Overhead Electric Lines

Line Voltage	Vertically (m)	Horizontally (m)
--------------	----------------	------------------

Low to medium voltage lines and Service lines	2.5	1.25
---	-----	------

High voltage lines up to 33 kv	3.5	1.75
--------------------------------	-----	------

High voltage lines beyond 33 kV	3.5 plus 0.3 for each additional 33 kV	1.75 plus 0.3 for each additional 33
---------------------------------	--	--------------------------------------

or part thereof kV or part thereof.

1.5.3 Road , Formation Level and Plinth Levels

1.5.3.1 Road level shall be lower than the habitable formation level of an area, except that of a hilly region. When a road is designed and designated as a part of national disaster management system formation levels shall be determined by the authorities having jurisdiction.

1.5.3.2 The formation level of a plot shall not be lower than the adjacent road levels, except that of a hilly region. For hilly region, the elevation of the formation level shall be determined by the authority having jurisdiction. Where areas are not susceptible to flood or water logging, the formation level shall not be more than 450 mm high from the surface level of the center line of the adjacent roads.

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1.5.3.3 The plinth level of a building shall be at least 450 mm above the surface level of the center line of the adjacent road. In Flood or Surge prone area plinth level shall be determined by the development authority having jurisdiction.

1.5.4 Boundary Wall

1.5.4.1 Solid boundary walls of a plot or in between plots shall not be higher than 1.5 m or a boundary made of grill, screen, balustrade etc. with a maximum height of 2.75 m shall not require the permission of the Authority. For boundary walls made of a combination of solid wall and grill or screen, the solid wall portion shall not be higher than 1.5 m. The Authority may, on specific application, permit the use of higher boundary walls.

1.5.4.2 Construction of a boundary wall shall be capable to resist collapsing as per provision of this Code.

1.6 PLOT SIZES

Plot divisions and plot sizes are part of integrated planning decision of detail area plan and shall be determined by the Area Development Authority having jurisdiction. Where no such guideline exists or yet to be undertaken,

the criteria mentioned in Sec A.5 of Appendix A regarding plot size shall be applicable.

1.7 MEANS OF ACCESS

The provision of means of access is implied on an area or a plot when more than one plots are intended to be created or when more than one buildings are intended to be erected respectively, where such plots or buildings do not have frontage to or not approachable by a public or a private road or street. All buildings within such area or a plot shall have access facilities which shall be connected with national road transportation system. The components of means of access shall comply with the followings:

- (a) The access facilities shall meet the requirements of fire service vehicles and engines movement for rescue and fire extinguishment operation.
- (b) Where required for fire apparatus access roads shall have an unobstructed carriageway width of 4.8 m and the minimum vertical clearance shall be 5m. The width and vertical clearance of fire apparatus access roads may be increased as per requirement of the fire authority, if the clearances are not adequate to provide fire apparatus access.
- (c) Access roads longer than 30 m having a dead end shall be provided with appropriate provisions for turning around of the fire apparatus at the dead end.
- (d) The provision of fire apparatus shall be marked by approved sign.
- (e) For large Assembly Occupancy of I1, I3 and I5, width of the approach road shall not be less than 15 m.
- (f) The minimum width of the approach road for all plots other than residential and assembly occupancies mentioned in Sec 1.7(e) and Sec 1.7(g) shall be 10.8 m.
- (g) For area fully covered by private hydrant system with street side hydrant points and/or hydrants within the building equivalent to fire service and civil defense department's specification and the buildings have fire stairs as per provisions of this Code, the requirements of Sections 1.7(a), (b) and (c) may be exempted. This provision shall not be applicable for planning new developments. The minimum width of access roads for plot divisions in new developments shall follow guidelines of Table 1 of Appendix F.

1.7.1 Internal Access Road

Internal access road is legally restricted for thoroughfare to the citizens and/or reserved for a group of people of a plot or an area that shall have access provisions for the department of fire service and civil defense.

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1.7.1.1 The width of access roads and drive ways in a plot or an area shall be decided by the number and height of the buildings served thereby.

Table 3.1.4: Maximum Permissible Length of Internal Access Roads in Non-Residential Plots

Width (m) Maximum Permissible Length (m)

7 150

8 300

10.8 or more Unlimited

1.7.2 Pedestrian Path or Walkway or Footpath

Any path including over bridge or bridge which is open to the outer air and may or may not be covered or roofed or an underpass design and designated for walkers only shall be designated as pedestrian path or walkway or footpath.

1.7.2.1 An uncovered paved pedestrian path that links buildings and the approach road shall not be included as a floor area of a building.

1.7.2.2 The walkways shall not be used for any other purpose than pedestrian movement and as accessibility route.

1.7.2.3 The minimum width of the pedestrian path shall not be less than the calculated width of connected corridor or passage or walking ramp of a building for entry or exit provided it is not enclosed by adjacent walls on both sides; for pedestrian paths enclosed by adjacent walls on both sides the minimum width shall be 1.25 m. For public buildings and places where high pedestrian movement is expected, Table F.3.1 of Appendix F may be followed.

1.7.2.4 Pedestrian walkways as accessibility route in public buildings shall comply with the provisions of this Code. Any changes in elevation in accessibility route shall comply with the provisions of Appendix D (Universal Accessibility).

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1.8 OPEN SPACES WITHIN A PLOT

1.8.1 Minimum open space requirements for the sides, rear and frontages of a plot shall be as per the provisions of this Code or the authority having jurisdiction. In absence of such guideline, provisions of Sec 1.8.2 to Sec 1.8.11 shall decide the provisions of open space for any building or buildings within a site. All such open spaces shall ensure access of the users.

1.8.2 At least 50 percent of the minimum open space in a plot shall remain unpaved with or without vegetation to allow water penetration.

1.8.3 The total open area in a plot on which a building of educational, institutional, health care occupancy is constructed shall not be less than 50 percent of the plot area.

1.8.4 The total open area in a plot on which a building of any occupancy, except those mentioned in 1.8.3, is constructed shall not be less than 33 percent of the plot area.

1.8.5 For the purpose of Sec 1.8.2, Sec 1.8.3 and Sec 1.8.4, the total open area shall include all exterior open spaces and interior courtyards, but exclude the area of any lighting and ventilation shaft.

1.8.6 For approved row type or cluster type housing or site and service schemes, the requirement of Sec 1.8.3 shall be applicable.

1.8.7 Separation of Buildings in the Same Plot

1.8.7.1 More than one building in a plot shall comply with the requirements of means of access and setback distances in relation with the corresponding building height and the occupancy classification as per provisions of this Code and laws of the land.

1.8.7.2 To determine the separation distance between buildings of same height and same occupancy an equidistant imaginary line shall be drawn between the buildings where each building shall comply with requirement of setback and fire separation distance from that imaginary line.

1.8.7.3 Exception: Utilities under Occupancy L is incidental to operation in all type of occupancy except Occupancy J and shall not require the separation distance from the main occupancy. This exception shall not be applicable for Occupancy J.

1.8.7.4 When variation in either height or occupancy occurs, the imaginary line shall satisfy the setback distances for each individual building separately as shown in Figure 3.1.1.

1.8.7.5 Due to the common walls, row or semidetached houses shall be treated as one building. For semidetached houses separation distance in the detached sides shall comply with Sec 1.8.7.2 and Sec 1.8.7.3.

Figure 3.1.1 Separation distance for variation in occupancies and heights

1.8.8 Front Open Space for All Buildings

1.8.8.1 Irrespective of the height of building frontage open space shall be constructed at a distance of at least 4.5 m from the center of the street or at least 1.5 m from the street-front property line whichever is larger.

1.8.8.2 In a corner situation where two frontages of a plot intersects each other and form a sharp corner a turning clearance with a minimum radius of 2 m shall be required as per guidelines of Figure 3.1.3. No construction or visual obstruction shall be allowed within such turning clearance space.

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1.8.9 Side and Rear Separation Distances

1.8.9.1 The minimum side and rear open space requirements of a plot for buildings of various occupancy classes shall be as specified in Table 3.1.5.

1.8.9.2 For approved row type residential, mercantile or office as may be permitted by the respective city or development authority and for approved affordable row type, cluster or site and service schemes, the requirement of side separation distance may be waived as per provisions of this Code.

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Figure 3.1.2 Definition of front, side and rear of a plot 3-11
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BNBC 2015 FINAL DRAFTFigure 3.1.3 Restrictions for corner-plots

1.8.9.3 For semidetached buildings approved by the city or development authority, which are permitted to be

constructed with one side on the property line or with pounding gap, the minimum requirements of open space, specified in Sections 1.8.9.1 and 1.8.9.2, for the side opposite to that property line shall be increased as per Table 3.1.5. The requirement of separation distance for the remaining sides shall remain unchanged.

Table 3.1.5: Minimum Rear and Side Open Space Requirements of a Plot

Occupancy	Plot Size* (m ²)	Rear Separation Distance (m)	Side Separation Distance a(m)
Residential (Row type, not higher than 15m or 4 stories)	1.25	Nil	b
Residential (Semi-detached, not higher than 10 stories or 33 m)	Over 67	1.5	Nil
Residential (Detached, Not higher than 10 stories or 33 m)	Over 67 to below 134	2.5	3.0
Residential (Detached, Not higher than 10 stories or 33 m)	134 to 268	2.5	PGc, 2.5
Residential (Detached, Not higher than 10 stories or 33 m)	Over 268	3.0	1.25
Residential (Detached, Higher than 10 stories or 33 m)	Over 268	3.0	1.25
Institution for care	Over 268	3.0	3.0
Educational, As permitted for this occupancy	3.0	3.0	
Assembly	3.0	3.0	
Business and Mercantile (Not higher than 10 stories or 33 m) semi-detached	d As permitted for this	1.5	
Business and Mercantile (Not higher than 10 stories or 33 m) Detached	Any PGc,	3.0	
Business and Mercantile (Not higher than 10 stories or 33 m) Detached	Any	1.25, 2.5	
Business and Mercantile (Higher than 10 stories or 33 m) semi-detached	d (Higher PGc,	6.0	
Business and Mercantile (Higher than 10 stories or 33 m) Detached	Over 536	3.0	
Industrial As permitted for this occupancy	As per provisions of this Code	As per provisions of this Code	

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Occupancy	Plot Size* (m ²)	Rear Separation Distance (m)	Side Separation Distance a(m)
Storage	As permitted for this occupancy	As per provisions of this Code	As per provisions of this Code
Hazardous	As permitted for this occupancy	As per provisions of this Code	As per provisions of this Code

Notes:

a The two dimensions separated by comma stands for each of side separation distances of a semi-detached development.

b No side separation distance is required between buildings up to 15 m or 4 stories even for independent plots.

c PG stands for 'Pounding Gap', which is a calculated gap for safe distance to avoid pounding due to lateral loads as per provisions of Part 6 of this Code. This gap is not required if the adjoining plots are consolidated and built monolithically. Where pounding gap do not comply with the minimum separation distance, all walls within the separation distance shall be barrier walls.

d Mercantile occupancies shared walls between adjacent plots shall only be allowed in accordance to the detail area plan (DAP) administered by the development authority.

* For narrow plots (with site frontage below 12 m) of size 268 m² or above in unplanned areas, the local regulatory authority may allow semi-detached typology with a minimum side separation distance of 3m on the unattached side.

1.8.10 Courtyard and Interior Courtyard

An area having proper dimensions as per provision of this Code and open to the sky from the formation level and surrounded by a building or a group of buildings or walls or combination thereof shall be designated as Courtyard. The minimum size of such courtyard shall be derived from Table 3.1.6 depending on the height of the highest building or highest wall abutting the courtyard. The shorter side dimension of such courtyard shall not be less than one-third of the longer side dimension. All such courtyards shall remain open to sky over its entire cross section.

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When the sum of exposure area of a courtyard to outer air through its adjacent walls exceed more than thirty percent area of its total peripheral enclosure it shall be designated as Open courtyard. All other courtyards shall be designated as Interior or Closed courtyard.

1.8.10.1 If any room depends entirely on an interior open space for its natural light and ventilation, such interior open space shall be in the form of an interior courtyard open to the sky over its entire cross-section. The interior courtyard shall have the minimum dimensions depending on the height of the building as specified in Table 3.1.6. The shorter side dimension of such interior courtyard shall not be less than one-third of the longer side dimension.

Table 3.1.6: Minimum Area of Interior Courtyard

No. of Stories Maximum Height Minimum Net Area of the
(m) Interior Courtyard, m²

Up to 3 11 9

4 14 16

5 17 25

6 20 36

7 23 49

8 26 64

9 29 81

10 32 100

11 36 121

12-13 42 144

14-15 48 196

16-17 54 256

18-20 63 361

Notes:

1. For buildings above 20 storeys height, the size of the interior courtyard shall not be less than the square of one-third the height of the tallest wall abutting the courtyard.

2. Enclosed open to sky spaces used to provide ventilation as inlet/outlet or daylight to adjacent interiors having dimensions less than that stipulated for internal courts of corresponding storey height given in this Table will be considered ventilation or lighting shafts and not interior courtyards and will follow minimum requirements stipulated in Table 3.1.11

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1.8.10.2 The courtyard shall not be interrupted by any form of construction at the courtyard level, except landscaping, sculpture, walkways and water bodies.

1.8.10.3 If the courtyard is to serve as a component of the means of egress, it shall be accessible from all exit points at ground level.

1.8.11 Permitted Construction in the Mandatory Open Space

1.8.11.1 Landscaping, sculpture, walkways, water body shall be permitted in the open space. Any such construction shall comply with Sec 1.8.2 of this Chapter.

1.8.11.2 A maximum of 50 percent of the open space in a plot required by the provisions of Sec 1.8.8 and Sec 1.8.9 may be used for construction of garage, ramps, caretaker or guards' quarter and other services auxiliary to and required for the main occupancy of the building, provided that the requirement of community open space in Occupancy A3 is attained, and building is not higher than 10 storey or 33 m, and provided further that conditions

(a) to (g) below are satisfied:

(a) No such construction permitted in the open space shall be higher than 2.75 m from the formation level of the plot, except for the tops of inverted beams or intermittent parapets, which may rise up to 3.25 m.

(b) No window, door or ventilator shall be placed on any wall adjacent to the abutting plot or street.

(c) Entrance to the garage or sloping drive way shall not be directly from a public road or street. Distance

between the plot line adjoining the road and the entrance to a garage or a sloping drive way shall be kept at least 1.5 m or 4.8 m respectively.

(d) Drainage from the roof or any other part of such construction shall not be allowed to discharge into the adjacent property. Drainage from any part shall not discharge directly into the street through spouts.

(e) No structure or room shall be constructed over the garage or any other permitted service structure within the limits of the mandatory open space.

(f) The roof of any such construction permitted in the mandatory open space shall not be used as a balcony or a terrace or in any such manner that would interfere with the privacy of the occupants of the adjacent property.

(g) No toilet, generator room or electrical substation shall be constructed adjoining the abutting property or street.

1.8.11.3 Edges of slope roof or cornice of the building may be projected into the mandatory open space for a maximum distance of 750 mm. Such extensions shall not be accessible from the building at any level. The construction of a roof or a cornice shall be as such that rain or other water shall not fall from there into the adjacent plot or street.

1.8.11.4 Sunshades over exterior doors or windows of the building may extend into the mandatory open space for a maximum distance of 750 mm, provided that such sunshades are at least 2.5 m above the formation level of the ground.

1.8.11.5 Cantilever canopy at a clear height of at least 2.5 m above the formation level may project into the mandatory open space provided that a horizontal clearance of at least 1.5 m is maintained between the edge of the canopy and the property line. The top surface of such canopy shall not be used as a balcony and shall not be accessible from the building.

1.8.11.6 Balconies at levels higher than 6 m may project in to the mandatory open space by not more than 0.9 m provided that a clearance complying the separation distances required in Sec. 1.8.8 and Sec. 1.8.9 are maintained between the edge of the balcony and the property line. Balcony shall be constructed as per provisions of this Code.

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1.8.11.7 Water reservoirs, septic tanks, inspection pits, sewer and other underground or above ground service lines shall be permitted in the open space provided that no part of such construction is elevated more than 150 mm above the formation level and the 50 percent mandatory open space shall be unpaved green area.

1.9 GENERAL HEIGHT AND AREA LIMITATIONS

1.9.1 Authorities having jurisdiction shall permit the built area and building height for an area in accordance to the proposed density of the detail area plan (DAP). Where no such guideline is available, the height of the

building shall be determined by the guidelines of Sections 1.9.2.1 to 1.9.2.9 and the built area will be a resultant of open space requirement and permitted height.

1.9.2 Height Limitations Based on Road Width

1.9.2.1 The maximum height of any building of Type I-A and Type I-B construction shall not exceed the nominal value of two times the sum of the width of the front road and the front open space (distance between the front property line and the building). For the purpose of fulfilling this requirement, the height limitations specified in Table 3.1.7 shall apply.

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1.9.2.2 For plots having front road width not less than 23 m in an approved residential or business and/or mercantile area, there shall be no restriction on height for residential, business and mercantile buildings of Type I-A and I-B construction provided the minimum open space requirements specified in Table 3.1.8 are satisfied.

1.9.2.3 For Type I-C construction, the maximum permissible height of the building shall be 4 storeys or 14 m for values of two times the sum of the width of the front road and the front open space not less than 13.6 m.

Table 3.1.7: Height Limitations Based on Road Width, and Front Open Space

Maximum Permissible Height in Terms of Construction Classification

2 × (Front Road Width Group- I* Group II*

Plus Front Open Space)

Type I-A and Type I-B Type I-C Type I-D Type II-A, II-B, II-D

Below 10.6 m

10.6 m to below 13.6 m No. of Height No. of Height No. of Height No. of Height

13.6 m to below 16.6 m

16.6 m to below 19.6 m storeys (m) storeys (m) storeys (m) storeys (m)

19.6 m to below 22.6 m

22.6 m to below 25.6 m 3 11 2 8 2 8 28

25.6 m to below 28.6 m

28.6 m to below 31.6 m 4 14 3 11 2 8 28

31.6 m to below 34.6 m

34.6 m to below 37.6 m 5 17 4 14 3 11 3 11

37.6 m to below 40.6 m

40.6 m to below 43.6 m 6 20 4 14 3 11 3 11

43.6 m to below 46.6 m

and so on in increments of 3 7 23 4 14 3 11 3 11

m 8 26 4 14 3 11 3 11

9 29 4 14 3 11 3 11

10 32 4 14 3 11 3 11

11 36 4 14 3 11 3 11

12 39 4 14 3 11 3 11

13 42 4 14 3 11 3 11

14 45 4 14 3 11 3 11

15 48 4 14 3 11 3 11

Notes:

1. For plots with front road width (Sec 1.9.2.5) not less than 23 m, residential and business and mercantile buildings of Type I-A and I-B construction shall have no height restriction subject to additional open space requirements (Sec 1.9.2.2).

2. The maximum permissible height for Type I-C construction is 4 storeys or 14 m (Sec 1.9.2.3)

3. The maximum permissible height for Type I-D and I-E of Group I construction and all types of Group II construction is 3 storeys or 11 m (Sec 1.9.2.4)

* For all Unprotected Construction Types I-E of Group I, Type II-C and Type II-E of Group II the maximum allowable storey and height shall be one storey and 8 m respectively.

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1.9.2.4 For Type I-D and I-E of Group I construction and all types of Group II construction, the maximum permissible height of the building shall be 3 storeys or 11 m for values of two times the sum of the width of the front road and the front open space not less than 13.6 m.

1.9.2.5 For applying the provisions of Sections 1.9.2.1 to 1.9.2.4, the width of the front road for the layouts shown in Figures 3.1.2(b), (c), (d), (e) and (f) where the plot abuts more than one road, shall be taken as the average of the widths of the abutting roads.

1.9.2.6 For buildings more than six storeys or 20 m high, the following arrangements shall be provided:

(a) Lifts of adequate size, capacity and number as per provisions of this Code.

(b) Adequate fire protection and firefighting arrangements shall be as per provisions of this Code.

(c) Adequate emergency fire escape stair depending upon the type of occupancy and occupancy load as per provisions of this Code.

(d) For buildings with unlimited height (UL) provisions of Table 3.1.8 shall be mandatory.

Table 3.1.8: Minimum Separation Distance for Buildings of Unlimited Height

Occupancy Minimum Separation Distance from Plot

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Frontage Rear Side

(m) (m) (m)

Residential 4.0 6.0 4.0

Business, Mercantile 6.0 6.0 6.0

Educational, Institutional for care, 6.0 6.0 6.0

Medical facilities. As per provision of this Code
Others

1.9.2.7 For buildings in the vicinity of airports or aerodromes, the height shall be limited by the requirements of the civil aviation authority, city or area development authority or other concerned agencies of the Government.

1.9.2.8 Where more than one construction type is permitted within a building as per provision of this Code among them the lowest fire resistance rated construction type shall be applicable for FAR allotment, and lowest fire resistance rating shall be applicable for the whole structure.

1.9.2.9 For road width above 8.8 m, the building form shall be contained within the pyramid formed by the sky exposure planes on all four sides or as many sides it has, following the guidelines of Figure 3.1.4

1.9.3 Area Limitations based on FAR

1.9.3.1 Fire separation distance in terms of building setback and building occupancy type and construction type shall govern the FAR to restrict fire hazard volume. FAR shall be decided by the development authorities having jurisdiction.

1.9.3.2 For Occupancy in which unlimited FAR is permitted, the minimum open space requirements specified in Table 3.1 8 shall be applicable.

1.9.3.3 For the purpose of calculating FAR, the area of any floor including basement, of which at least two-third is used exclusively for car parking and the remaining one-third is used for purposes such as mechanical plant room, electrical substation, security cabin, reception booth, water tank, pump house, stairs, lifts and which are accessory to the main occupancy, shall be excluded from the calculation of the total floor area of the building.

1.9.3.4 For area with high public transport accessibility and high FAR the requirement for residential private parking should not be more than one car for every four dwellings or as per guidelines of the authority having jurisdiction.

1.9.3.5 In specifying FAR for a zone or an area, the city or area development authority shall follow the guidelines of Appendix-A (Development Control) and shall take into consideration the following:

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- (a) Proximity to Public/Mass Transport network
- (b) Availability of Urban social infrastructure including urban open spaces
- (c) Environmental balance
- (d) Adequacy of present and proposed Utility services
- (e) Occupancy group and land-use permitted by master plan
- (f) Type of construction
- (g) Population density of the area
- (h) Width of approach roads
- (i) Traffic density in the approach roads
- (j) Local fire-fighting facilities
- (k) Parking facilities

Figure 3.1.4 Limiting envelope for stepped tower structures

1.10 OFF STREET PARKING SPACES

1.10.1 Off street parking requirement for a building or an area shall be decided by the development authority having jurisdiction. A suggestive guideline for off-street parking given in appendix F might be followed.

1.10.2 Sloping drive way steeper than 1 vertical to 8 horizontal shall not be credited as a walking ramp. When a sloping surface used for both driveway and walking ramp shall be demarcated and the minimum width and sloping ratio of walkways shall be as per provisions of this Code. Sloping driveway entering below grade level shall be protected to prevent water flow into any level that they lead to.

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1.11 STREET ENCROACHMENT

No part of any building shall project beyond the property line or building line established by the provisions of this Code into the street, except the following:

(a) Below Grade: The footing of the boundary wall adjacent to the street may encroach on to the street land not more than 0.3 m and shall rest at least at a depth of 1.5 m below grade.

(b) Above Grade: Marquee, canopy or other temporary cantilever type projection from buildings of business and mercantile occupancy may project on the footpath of a road, provided that no part of such projection is below a height of 3 m from the footpath level and that the outer edge of the canopy is at a minimum clear horizontal distance of 0.25 m from the road side edge of the footpath. The canopy shall be so constructed as to be readily removable without endangering the building structure. No canopy shall project into a street without a footpath. Such canopies shall not project over Mandatory Open Space (MOS). Under no circumstances shall the top of the canopy be used by any floor of the building.

1.12 COMMUNITY OPEN SPACE AND AMENITIES

Community open space for an area or a building shall be decided by the development authority having jurisdiction. Where no such guide line exists or yet to be developed, the guidelines of Sections A.4 and A.5 of Appendix A and Sec B.3.2 of Appendix B shall be applicable.

1.13 MINIMUM STANDARD OF A DWELLING

Minimum standard of a dwelling shall be decided by the development authority having jurisdiction.

1.14 REQUIREMENTS OF PARTS OF BUILDINGS

1.14.1 Plinth and Formation Levels

The plinth and formation levels of the building and the plot shall conform to the requirements of Sec 1.5.3.

1.14.2 Room Dimensions

1.14.2.1 Ceiling heights

(a) All habitable rooms in non-air-conditioned residential, business and mercantile buildings, apart from kitchen,

store room, utility room, box room and garage, shall have a ceiling height not less than 2.75 m measured from the finished surface of the floor to the underside of the finished ceiling, or false ceiling. A maximum of one-third of the floor area of such habitable rooms may, however, have a minimum ceiling height of 2.44 m. For air-conditioned rooms in such buildings, the minimum ceiling height shall be 2.44 m.

In the case of pitched roof without a horizontal ceiling the lowest point of the finished ceiling shall be at least 2 m above the finished surface of the floor and the average height of the ceiling shall not be less than 2.44 m.

(b) The minimum clear head room under the ceiling, folded plate, shell etc. and under the false ceiling or duct in an air-conditioned room shall not be less than 2.44 m. The minimum clear distance between the floor below and the soffit of a beam shall not be less than 2.15 m.

(c) The requirements of ceiling height for buildings of occupancy other than residential and business and mercantile shall be as follows:

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Table 3.1.9: Minimum Ceiling Heights for Different Occupancies

Occupancy Minimum Ceiling Height

Educational, Institutional, Health Care, 3 m for non-air-conditioned and 2.6 m for air-Assembly. conditioned buildings.

Industrial, Storage, Hazardous. 3.5 m for non-air-conditioned and 3.0 m for air-conditioned buildings.

1.14.2.2 Room sizes

All habitable rooms used for sleeping and other purposes of a dwelling unit shall not be less than 9.5 m² of net floor area with a minimum width of 2.9 m and shall comply with indoor air quality requirement as per provisions of this Code. Other non-habitable rooms in the dwelling unit shall have a minimum area of 5 m² with a minimum width of 2 m.

1.14.3 Kitchen

1.14.3.1 The minimum clear height of kitchen measured from the finished surface of the floor to the finished ceiling shall be 2.75 m, except for any floor trap of the upper floor which shall have a minimum clearance of 2.15 m above the finished floor. The minimum clear height of kitchen shall be 2.15 m where mechanical exhaust is installed.

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1.14.3.2 The minimum floor area of kitchen without provision for dining shall be 4 m² with a minimum width of 1.5 m. The minimum floor area of a kitchen which is intended to provide dining or occasional sleeping space shall be 7.5 m² with a minimum width of 2.2 m.

1.14.3.3 Every kitchen shall be provided with a kitchen sink or other means for washing utensils. The waste water shall be discharged into the waste water pipe or drain as per provisions of Part 8.

1.14.3.4 The floor of the kitchen shall be slip-resistant and water tight.

1.14.3.5 Every kitchen shall be provided with window having a minimum area of 1 m² which shall open to the exterior or to an interior open space of adequate dimensions complying with Sec 1.19.

1.14.3.6 It is recommended that all kitchens should be designed as accessible kitchens for people with disability considering the door width, accessible route, turning clearance within the kitchen, counter heights, placement of fixtures, knee and toe clearances under counters and other relevant criteria in compliance to the guidelines of Appendix D.

1.14.4 Bathroom and Toilets

1.14.4.1 The height of any bathroom, toilet or water closet shall not be less than 2.15 m measured from the finished floor surface to the finished ceiling or false ceiling or to the lowest point of any trap of the upper floor's plumbing system.

1.14.4.2 The minimum requirement of floor area and width of a bathroom with 3 fixtures, 2 fixtures or single fixture shall conform to the space standards of Table 3.1.10.

1.14.4.3 Details for requirement of adaptable or accessible toilets shall follow the guidelines of Appendix D.

Table 3.1.10: Bathroom Space Standards Minimum Width (m) Floor Area (m²)

Facility 1.25 3.00

Water closet + bathing + hand washing

Water closet + bathing 1.00 2.80

Bathing only 1.00 1.50

Water closet only 1.00 1.20

Adaptable toilets 1.50 as per Appendix D

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1.14.4.4 No bathroom or toilet containing water closet shall open directly into any kitchen or cooking space by a door, window, ventilator, fanlight or any other opening. Every such bathroom or toilet shall have a door completely shutting it off from the exterior.

1.14.4.5 Every bathroom, toilet and water closet shall be located against an exterior wall or wall on the interior open space (see Sec 1.8.10), except where they are ventilated through an interior lighting and ventilation shaft. Such interior lighting and ventilation shafts shall have the minimum dimensions specified in Table 3.1.11 for different heights of buildings. In addition, shafts for buildings exceeding 6 storeys or a height of 20 m shall be mechanically ventilated. All shafts must be accessible at the ground floor level for cleaning and servicing purposes.

Table 3.1.11: Minimum Dimensions of Lighting and Ventilation Shaft

Building Height Minimum Net Cross Minimum Width

Sectional Area of Shaft of Shaft

No. of Stories Height (m)

(m²) (m)

Up to 3 Up to 11 1.50 1.00

4 14 3.00 1.20

5 17 4.00 1.50

6 20 5.00 2.00

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Over 6* Over 20 6.50 2.50

* Mechanical ventilation of the shaft shall be provided for buildings over 6 stories high. Shaft dimensions shall conform to mechanical design considerations.

1.14.4.6 Floors of bathrooms, toilets or water closets shall be treated with water repellent material and shall be water tight. All bathroom walls or partitions shall be treated with non-absorbent water repellent smooth impervious finish material to a height of not less than 1 m above the finished floor level. The floor shall be sloped gently towards gratings or openings of the floor traps.

1.14.4.7 All public buildings shall have adaptable toilet as per requirement of the development authorities having jurisdiction. Each dwelling unit shall have at least one adaptable toilet. The details of such toilet shall comply with requirements of Appendix D (Universal Accessibility).

1.14.5 Stairways

1.14.5.1 Limiting Dimensions

The minimum width of the staircase for various occupancies shall be as specified in Table 4.3.6 of Part 4.

1.14.5.2 Sum of two risers and one tread excluding nosing dimension shall not be less than 610 mm and not more than 648 mm. All Risers and Treads shall be identical in consecutive two flights starting from one floor to another floor. Difference between two consecutive risers or treads shall not be more than 5 mm. The combination of riser and treads shall comply with Table 4.3.4 Chapter 3, Part 4.

1.14.5.3 The maximum flight height between landings shall not be more than 3660 mm. For Assembly occupancy maximum flight height between landings shall not be more than 2440 mm.

1.14.5.4 The minimum clear head room between flights of a staircase shall be 2.15 m. The clear head room may be reduced to 2.03 m for not more than three flights in any staircase.

1.14.5.5 The minimum clear height of any passage below a landing providing access to non-habitable and service spaces shall be 2.03 m. The minimum clear height of all other passages and spaces below a landing shall be 2.15 m.

1.14.5.6 Handrails shall have a minimum height of 0.9 m measured from the nose of stair to the top of the handrail.

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1.14.6 Mezzanine FloorBNBC 2015 FINAL DRAFT

1.14.6.1 Each mezzanine floor area in a space shall not exceed one-third of the main floor area. The area of the mezzanine shall be included in calculating the FAR.

1.14.6.2 The clear headroom both over and under the mezzanine floor shall be at least 2.2 m.

1.14.6.3 The lighting and ventilation of the space both over and under the mezzanine floor shall not be obstructed in any way.

1.14.7 Lofts

1.14.7.1 Space under slope roof termed lofts shall not be used as a habitable space where minimum ceiling height is less than the requirement but more than 1.5 m.

1.14.7.2 The minimum ceiling height requirements for various rooms specified under Sections 1.14.2.1, 1.14.2.2, 1.14.3 and 1.14.4 shall be maintained under the loft.

1.14.7.3 A maximum of 25% of the floor area of any room may be covered by a loft, except bathrooms, toilets, water closets, store rooms and corridors where the whole area may have an overhead loft.

1.14.7.4 The loft shall not interfere with the lighting and ventilation of any room.

1.14.8 Cabins or Chambers

1.14.8.1 Cabins or Chambers created by removable partitions on open floor shall have a minimum area of 3m².

1.14.8.2 Clear passages at least 0.75 m wide (or as stipulated in Part 4) shall be maintained between the cabins leading to a means of exit which shall in no case be further than 16 m from any cabin.

1.14.8.3 A clear gap of at least 300 mm shall be maintained between the top of the partition walls enclosing the cabin and the ceiling, unless the cabin is exposed to the exterior deriving natural light and ventilation or is artificially lighted and ventilated.

1.14.9 Store Room

A store room provided in a dwelling unit of a residential building shall have a minimum area of 1.5 m² with a minimum width of 1 m. The clear height of the store room shall not be less than 2.2 m.

1.14.10 Private Garage

Private garage in residential occupancy A1 and A2 building shall have a minimum clear height of 2.03 m. The minimum area of the parking stall in a garage shall be decided in accordance with the provision of Sec F.7.1 of Appendix F.

1.14.11 Basement

Any underground floor of a building wholly or partially below formation level shall be called a basement and shall satisfy the requirements of the following sections.

1.14.11.1 Subject to the provision of Sec 1.9.3.3, the area of the basement shall be included in the calculation of FAR.

1.14.11.2 The walls and floors of the basement shall be damp-proof and water-proof as per provision of this Code. The basement shall be protected against surface and sub-surface waste water intrusion.

1.14.11.3 The basement shall be lighted and ventilated as per provision of this Code.

1.14.11.4 The staircases of a building serving above grade level also entering into below street floor level shall be

enclosed by barrier wall with two door smoke proof vestibule shall have minimum 2 hours fire resistance time.

1.14.11.5 Ramp provided as walkways shall not be steeper than 1 vertical in 8 horizontal.

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1.14.11.6 The clear height of the basement below soffit of beams shall not be less than 2.03 m.

1.14.12 Entrance to the Building

All buildings shall have a covered entrance or other covered area for callers waiting at the door. The main entrance door to the building shall not open into an uncovered exterior. All public buildings shall have universal accessibility as per provisions of Appendix D of Part 3.

1.14.13 Roof Drainage

1.14.13.1 The roof of a building shall be constructed in such a manner that rain water is drained freely away from the building without causing dampness of the roof or the walls of the building or of an adjacent building.

1.14.13.2 Water from the roof shall not be discharged into the adjacent property or street.

1.14.13.3 For one or two storied buildings with flat or pitched roof, rain water may be discharged directly to the ground, in which case the roof shall have extended eaves or cornices to direct the water away from the walls.

1.14.13.4 For other buildings, gutters or parapets shall be provided to direct the water to the piping of an adequate rain water drainage system.

1.14.13.5 The roof shall be impermeable or shall be treated with an impervious material to make it effectively water tight. Flat concrete roofs shall be topped with an impervious layer of lime concrete or other effective means of waterproofing. All flat roofs shall be sloped gently towards gutters, gratings or mouths of the rain water drainage pipes.

1.14.13.6 For sustainable development, building may have rain water harvesting system as stipulated in Part 8, Chapter 7.

1.14.14 Parapet

All accessible flat roofs shall be enclosed by parapets or guardrails having a height of at least 1 m. All such parapets and guardrails shall be designed to withstand the lateral forces due to wind and occupancy in conformity with the provisions of Part 6 of this Code.

1.14.15 Septic Tank

A septic tank shall be provided within the premises for disposal of sewage, whether any public sewer is available or not. The location, design and construction of the septic tank shall conform to the requirements of this Code.

1.15 LANDSCAPING

1.15.1 Plantation of trees and shrubs within the open spaces of a plot aimed at enhancing the environmental quality of the building shall comply with the requirements of this Section.

1.15.2 Trees and shrubs shall be planted judiciously to meet the requirements of shade and sunshine, to control noise and dust, to provide privacy and to improve visual quality, without jeopardizing natural ventilation and lighting of a building.

1.15.3 Species of trees shall be so chosen and planted that their roots do not endanger the building foundation and their branches do not interfere with the building superstructure. This shall be achieved by maintaining sufficient distance between the trees and the building depending on the species of the tree.

1.16 DAMP-PROOFING AND WATERPROOFING OF FLOORS AND WALLS

Foundation, floor slabs, walls and roof of a building shall be damp proof, water proof and weather proof in accordance with the provisions of Part 6 of this Code.

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1.17 EXISTING BUILDINGS

1.17.1 Existing buildings and structures in their present occupancy condition shall not be required to be in full compliance with all the requirements of this Part of this Code. Additions or alterations to such existing buildings or change of use thereof shall not be permitted if such addition, alteration or change of use or occupancy is likely to render the building more hazardous with respect to fire safety, life safety and sanitation than it was before.

1.17.2 Any horizontal or vertical extension of an existing building or any change of use thereof shall subject the altered building or occupancy to the provisions of this Code for a new building. The building together with the additions and changes shall not exceed the height, area and open space requirements for new buildings specified in this Code.

1.17.3 All buildings and structures, both new and existing shall be maintained in a safe and sanitary condition as provided for in this Code. To determine compliance with this requirement, the Authority may cause the building or structure to be periodically inspected.

1.17.4 Any proposed change in an existing building or structure shall have to satisfy the requirements set forth in Part 6 of this Code.

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1.18 BUILDINGS AND AREAS OF HISTORICAL OR ARCHITECTURAL VALUE

1.18.1 Buildings and areas of Historical value are part of our heritage and cultural inheritance and should therefore be protected. Similarly buildings and works under the jurisdiction of and identified by the Authority as having architectural value shall also be protected. The identification, listing and classification of all such buildings and places of historic or architectural values shall follow the guidelines of Chapter 3 of Part 9, Section 1.5 of Part 1 and Section 3.14 of Part 2.

1.18.2 Repairs, alterations and additions necessary for the preservation, restoration, rehabilitation, continued use or adaptive reuse of such historic buildings and structures, and of buildings and works of architectural value may be exempted by the Authority from having to be in full compliance with all the requirements of this Code, provided that the restored building or structure will be no more hazardous, if any, than the existing conditions in terms of life safety, fire protection and sanitation. All such buildings and places shall comply with the provisions for conservation of heritage buildings or area of Part 9.

1.19 VENTILATION, LIGHTING AND SANITATION

1.19.1 All rooms and interior spaces designated for human occupancy shall be provided with means of natural or artificial lighting and natural or mechanical ventilation as per provisions of this Code. At least one side of all habitable rooms shall be exposed to an exterior or an interior open space or to a balcony or verandah exposed to an open space.

1.19.2 All buildings shall have water and sanitation facilities as per provisions of this Code.

1.19.3 Every kitchen shall have facility for washing of utensils.

1.19.4 Every building or independent unit thereof shall be provided with at least one water closet.

1.19.5 All naturally ventilated and illuminated interior spaces, staircases and other areas of human occupancy in a building shall have windows or ventilators opening directly to the exterior or an interior open space or to a verandah. Ventilation of bathrooms may also be achieved through ventilation shafts as provided for in Sec 1.14.4.5.

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1.19.6 All habitable and non-habitable spaces within a building shall have the following minimum aggregate area of openings in the exterior wall, excluding doors, expressed as percentage of the net floor area:

Table 3.1.12: Dimension of Openings for Different Uses

Space Percent of Net Floor Area

Habitable rooms such as those used for 15

sleeping, living, study, dining etc.

Kitchens* 18

Non-habitable spaces such as bathrooms, 10

store, staircase and other utility

* Minimum height from of the window sill of a kitchen shall be 450mm above

cooking range. Air flow on cooking range shall be restricted.

1.19.6.1 An enclosed staircase shall have windows not less than 1 m² in area on exterior walls of every landings as per provisions of this Code.

1.19.6.2 Toilet and bathroom windows shall open to the exterior or an approved ventilation shaft and the operable area shall not be less than 1 m².

1.19.7 The required minimum average intensity of illumination in a habitable space at a height of 750 mm above the floor level shall be 65 lux. Any point in a room more than 7 m away from an exterior window shall be considered to be not illuminated by daylight unless measurement of illumination gives an intensity of 65 lux or more.

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1.19.7.1 The required intensity of illumination for various tasks in a building shall be as specified in Chapter 1 of Part 8.

1.19.7.2 Whenever the illumination achieved by daylight is not sufficient or occupancy at night is necessary, artificial lighting shall be installed to supplement daylight, or to provide the required night lighting, in accordance with the provisions of Chapter 1 of Part 8.

1.19.8 Protected openings, when and where are installed shall not be normally operable form the inside of a building. Such openings however, shall not be credited towards meeting any ventilation requirements.

1.19.9 The requirements of opening areas specified in Sec 1.19.6 shall suffice for ventilation provided that the windows or ventilators forming the opening are operable. When part of a window area is made of fixed glazing, only the operable portion shall be counted in aggregating the opening area.

1.19.9.1 To achieve the desired indoor air quality by natural means, an interior space shall preferably have minimum two openings on two different walls where the opening acting as inlet must be an exterior wall and the summation of the net opening area on walls shall not be less than 5% of the net floor area thereof.

1.19.9.2 Mechanical ventilation, when provided, shall conform to the requirements of Chapter 3 of Part 8.

1.20 AIR-CONDITIONING AND HEATING

When air-conditioning and heating system are installed, an indoor air quality shall be maintained as per provisions of Chapter 3 Part 8.

1.21 PROVISION OF LIFTS AND ESCALATORS

Wherever required by this Code or desired by the owner for comfort, lifts and escalator facilities shall be planned, designed and installed in accordance with the provisions of Part 4 and Part 8 of this Code. The minimum size of a lift lobby shall be 1.5 m x 1.5 m. For accessible lift guidelines of Appendix D shall be applicable.

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1.22 SOUND INSULATION

Acoustical design of a building to attain the desired noise levels shall be performed in accordance with the

provisions of Chapter 4 Part 8.

1.23 THERMAL INSULATION

Thermal comfort in a building shall be achieved through adequate ventilation and thermal insulation of walls and roof.

1.24 LIGHTNING PROTECTION OF BUILDINGS

Lightning protection measures shall be installed on all buildings whose exposure conditions indicate the likelihood of lightning strike and consequential hazard to life and property. The requirement of lightning protection systems shall be assessed and they shall be designed and installed in accordance with the provisions of Chapter 2 Part 8.

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1.25 RAT PROOFING AND TERMITE PROOFING OF BUILDINGS

Rat proofing and termite proofing measures shall be undertaken on the basis of the degree of protection desired from rats and termites. Any chemical used for the control of rats and termite shall be free from environmental hazards. Periodic inspections shall be undertaken for effective protection against rats and termites.

1.26 REQUIREMENTS FOR BUILDINGS IN FLOOD PRONE AND COASTAL REGIONS OF BANGLADESH

The specifications of this Section shall be applicable to all buildings located in the flood or surge prone areas in addition to other requirements of this Code.

(a) The planning and development control authority of the city, township, municipality or region where this Code is intended to be applied shall delineate any area having a potential for being flooded under at least 1 m deep water due to flooding as Flood Prone Area (FPA). The provisions of Sec 1.26.1 shall be applicable to areas designated as FPA. There shall be a design flood level in the FPAs which shall be recommended by the Authority to be used in interpreting the provisions of this Section.

(b) Similar delineation shall be made in the coastal regions on the basis of expected occurrence of a surge or wave run-up of 1 m or higher. Such areas shall be designated as Surge Prone Area (SPA). The provisions of Sec 1.26.2 shall be applicable to buildings located in the SPAs. There shall be a design surge height in the SPAs which shall be recommended by the Authority to be used in interpreting the provisions of this Section.

1.26.1 Flood Prone Areas

1.26.1.1 Elevation

The habitable floors of a building located in the flood prone area shall be elevated above the design flood level. Buildings up to two storeys high shall have accessible roof with an exterior stair. Buildings having three storeys or more height, the floor immediately above the design flood level shall be accessible with an exterior stair.

Exceptions:

(a) Except for Occupancy A (Residential), any occupancy may have floors below the design flood level in accordance with the provisions of Sec 1.26.1.3.

(b) Floors which are used only for building access, exits, foyers, storages or parking garages may be located below the design flood level in accordance with the provisions of Sec 1.26.1.2.

1.26.1.2 Enclosures below design flood level

There shall be no enclosed space below the design flood level except for building access, exits, foyers, storage, and parking garages. There shall be vents, valves or other openings in the walls of the enclosed spaces which shall equalize the lateral pressure of the water. The bottom of such openings shall not be higher than 300 mm above the finished grade. There shall be at least two openings for each enclosure in a building. The total net area of openings for an enclosure shall be at least 0.4 m², or 7 percent of the floor area of the enclosure, whichever is greater.

1.26.1.3 Flood-resistant Construction

Floors constructed below the design flood level under the provisions of Exceptions in Sec 1.26.1.1 shall comply with the following requirements:

- (a) Floors and exterior walls of such floors shall have a construction impermeable to the passage of water.
- (b) Structural components of such floors shall be capable of resisting the hydraulic and buoyant forces

resulting from the occurrence of floods at the design flood level. Design requirements in such cases are specified in Chapter 1, Part 6.

(c) Vents, openings and valves provided below the design level shall have water-tight closures capable of resisting any structural forces resulting from the occurrence of the design flood.

(d) Penetrations made for electrical, mechanical or plumbing installations shall be made water-tight to prevent any penetration of flood water. Sewerage systems having opening below the design flood level shall have a closure device to prevent backwater flow during the occurrence of floods.

1.26.2 Surge Prone Areas

1.26.2.1 Elevation

The habitable floor of any building in a surge prone area shall not be located below the design surge height. For buildings of height two storeys or less the roof shall be accessible with an exterior stair. For buildings three storeys or higher, the floor immediately above the design surge level shall be accessible with an exterior stair.

Exception:

Footings, mat or raft foundations, piles, pile caps, columns, grade beams and bracings may be constructed below the design surge height.

1.26.2.2 Enclosures below Design Surge Height:

Spaces of a building in the SPAs below the design surge height shall not obstruct any flow of water during the occurrence of surge.

Exception:

Structural or non-structural members serving as entries or exits may be constructed below design surge height.

1.26.2.3 Foundations

Foundations of the buildings erected in the SPA's shall be located well below the ground level so that they are protected from erosion or scour during the occurrence of surge. If piled foundations are used, they shall be designed to withstand with adequate factor of safety the loss of support due to scour. Design of the foundations shall conform to the requirements of Chapter 3 Part 6.

1.27 REQUIREMENTS FOR BUILDINGS IN OTHER DISASTER PRONE AREAS

In hilly region, authority shall ask for a special site drainage plan conforming to the area drainage network before approval of any building work. This shall apply for all buildings to be constructed in hilly areas where there is the danger of failure of slopes, including mudslides, flash floods and soil erosion. Such failures may occur in hilly areas, where the angle of slope is greater than 30°. Prevention of failure of slopes shall be achieved by the following measures:

- (a) Retaining walls to prevent soil erosion as per provisions of Part 6 of this Code.
- (b) Weep holes to allow water pressure balancing from the water logged soil on the retaining wall.
- (c) Adequate site drainage respecting the natural topography of the site and surrounds.
- (d) Use of vegetation to retain the top soil and bonding quality of the soil.
- (e) Protection of soil by catchment pools to prevent soil erosion due to discharge from elevated level onto

the ground.

1.28 SPECIAL PROVISION FOR STORAGE OF DANGEROUS GOODS AND THEIR NBC 2015 FINAL DRAFT CLASSIFICATION

1.28.1 Any substance including mixtures and solutions shall be assigned to one of the following Classes for any Occupancy if it crosses the limits of exempted quantities as per Table 3.2.5 of Part 3, Section 2. Some of these classes are subdivided into divisions also. The numerical order of the classes or divisions is not the representative of the degree of danger. These classes including their divisions are listed below:

Class 1: Explosives

Division 1.1: Substances and articles which have a mass explosion hazard.

Division 1.2: Substances and articles which have a projection hazard but not a mass explosion hazard.

Division 1.3: Substances and articles which have a fire hazard and either a minor blast hazards or a minor

projection hazards, but not a mass explosion hazard.

Division 1.4: Substances and articles which present no significant hazard.

Division 1.5: Very insensitive substances which have a mass explosion hazard.

Division 1.6: Very insensitive substances which do not have a mass explosion hazard.

Class 2: Gases

Division 2.1: Flammable gases

Division 2.2: Non-flammable, non-toxic gases

Division 2.3: Toxic gases

Class 3: Flammable Liquids

Class 4: Flammable Solids; Substances Liable to Spontaneous Combustion; Substances which, in contact with Water, Emit Flammable Gases:

Division 4.1: Flammable solids, self-reactive substances and solid

Division 4.2: Substances liable to spontaneous combustion

Division 4.3: Substances which, in contact with water, emit flammable gases

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Class 5: Oxidizing Substances and Organic Peroxides

Division 5.1 Oxidizing substances

Division 5.2 Organic peroxides

Class 6: Toxic and Infectious Substances

Division 6.1: Toxic substances

Division 6.2: Infectious substances

Class 7: Radioactive Material

Class 8: Corrosive Substances

Class 9: Miscellaneous Dangerous Substances and Articles

The quantity and procedure for storage, merchandising, handling, processing, packaging, transportation, shipment and uses of all dangerous goods of above classification shall be regulated as per guidelines of Explosive Act and other relevant Acts and as per rules of Bangladesh Shipping Corporation for safe handling of container for dangerous goods. The signs and symbols for all such goods shall comply with the requirements of Bangladesh Shipping Corporation's guidelines.

1.28.2 HS Code, Proper Shipping Names and UN Numbers

First Schedule of Bangladesh customs tariff that is Harmonized System code shall be used for the description of any substances and its corresponding UN number shall be used for proper shipping name and for the classifications of dangerous goods. The storage and use of all such substances and goods shall be controlled as per provision of this Code and explosive control act.

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1.29 LIST OF RELATED APPENDICES

Appendix A Development Control and Planning

Appendix B Minimum Standard Housing

Appendix C Cluster Planning

Appendix D Universal Accessibility

Appendix E Building Types

Appendix F Road Hierarchy, On-street and Off-street Parking

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Chapter 2

CLASSIFICATION OF BUILDINGS BASED ON
OCCUPANCY

2.1 OCCUPANCY CLASSIFICATION

2.1.1 Every building or portion thereof and land-use shall be classified according to its use or the character of its occupancy as a building of Occupancy A, B, C, D, E, F, G, H, I, J, K, L or M as defined below:

Occupancy A:BNBC 2015 FINAL DRAFTResidential

Occupancy B: Educational
Occupancy C: Institution for care
Occupancy D: Health Care
Occupancy E: Business
Occupancy F: Mercantile
Occupancy G: Industrial
Occupancy H: Storage
Occupancy I: Assembly
Occupancy J: Hazardous
Occupancy K: Garages
Occupancy L: Utilities
Occupancy M: Miscellaneous

2.1.2 Utilities under Occupancy L is incidental to operation in all other type of occupancy except Occupancy J shall be considered as non-separated use of the main occupancy but shall be taken special safety measure as per provision of this Code.

2.1.3 Any occupancy or use type not mentioned specifically in Table 3.2.6 (A-Z list) or elsewhere in this Code shall be classified by the Board of Appeals under the occupancy group to which its use most closely resembles, considering the life safety and fire hazard.

2.1.4 Each occupancy group shall be subdivided as detailed in the following sections. The detail classification including mixed occupancy provided in the Table 3.2.6 (A-Z list) is non-exhaustive. If there is any use or character of occupancy in a building which is not mentioned here, it shall be classified as per provision of Sec 2.1.3 of this Chapter.

2.1.5 Occupancy A: Residential Buildings

This occupancy type shall include any building or portion thereof providing sleeping and living accommodations to related or unrelated groups of people, with or without independent bathroom, cooking or dining facilities, except any building classified under Occupancy C or D. This Occupancy shall be subdivided as follows:

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2.1.5.1 Single Family Dwelling (A1)

These shall include any building, row type or semi-detached or detached from neighboring buildings by distances required by this Code and having independent access to the plot, which is used as private dwelling by members of a single family.

2.1.5.2 Two Family Dwelling (A2)

These shall include any building, row type or semi-detached or detached from neighboring buildings by distances required by this Code and having shared or independent access for two families and having facilities for living, cooking and bathroom facilities independent of each other.

2.1.5.3 Flats or Apartments (A3)

These shall include any building or portion thereof which is provided for more than two families, having facilities for living, cooking and bathroom facilities independent of each other.

2.1.5.4 Mess, Boarding Houses, Dormitories and Hostels (A4)

These shall include any building or portion thereof in which sleeping, living accommodations and bathroom are

provided for groups of related or unrelated persons, with or without common dining and facilities, and with common cooking under single management control or with individual or group cooking facilities.

2.1.5.5 Hotels and Lodging Houses (A5)

These shall include any building, a portion thereof or group of buildings under single management, in which sleeping, living accommodation and bathroom facilities are provided with or without dining facilities but without cooking facilities for adult individuals, is provided for hire on transient or permanent basis.

2.1.6 Occupancy B: Educational Facilities

This occupancy type shall include any building or portion thereof in which education, training and care are provided to children or adults. This Occupancy shall be subdivided as follows:

2.1.6.1 Educational Facilities up to Higher Secondary Level (B1)

These shall include any building or portion thereof used for purposes involving assembly for instruction, education and recreation of more than six persons on regular basis to fulfill the requirement of an academic curriculum approved by the Government up to Higher Secondary (12th Grade), and which is not covered by occupancy I.

2.1.6.2 Facilities for Training and for Above-Secondary Level (B2)

These shall include any building or portion thereof used for purposes involving assembly for instruction, education, training and recreation of more than six persons, and which is not covered by occupancy I and B1.

2.1.6.3 Pre-School Facilities (B3)

These shall include any building or portion thereof used for purposes involving care, recreation and education of children more than six in number, who have not yet reached the age to attend the school.

2.1.7 Occupancy C: Institution for Care

Buildings classified under this occupancy shall include those used for purposes of institutional care of the occupants, such as detention for correctional or penal purposes, medical or nursing care of persons suffering from illness or infirmity due to mental condition, or accommodation of children or minor, where the personal liberty of the inmate is restricted. These buildings shall ordinarily provide accommodation for sleeping, dining and other provisions approved by the authority for the occupants. This occupancy shall be subdivided as follows:

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2.1.7.1 Institution for Care of Children (C1)BNBC 2015 FINAL DRAFT

These shall include any building or portion thereof or group of buildings under single management used as an institution for the full time care of children or minor, each providing accommodation for sleeping, dining and other provisions approved by the authority for more than six children.

2.1.7.2 Custodial Institution for Physically Capable Adults (C2)

These shall include any building or portion thereof or group of buildings under single management used for purposes of full time care and custody of adult or mentally disabled persons but physically capable of responding to emergency.

2.1.7.3 Custodial Institution for the Incapable Adults (C3)

These shall include any building or portion thereof or group of buildings under single management used for purposes of full time care and custody of persons physically or mentally incapable of responding to emergency.

2.1.7.4 Penal and Mental Institution for Children (C4)

These shall include any building or portion thereof or group of buildings under single management used for housing children under restraint, or who are detained for penal and corrective purposes, in which personal liberty of the inmates is restricted.

2.1.7.5 Penal and Mental Institution for Adults (C5)

These shall include any building or portion thereof or group of buildings under single management used for housing persons under restraint, or who are detained for penal and corrective purposes, in which personal liberty of the inmates is restricted.

2.1.8 Occupancy D: Health Care Facilities

Buildings under this Occupancy group shall include those used for purposes of providing medical care, diagnostic facilities and treatment to persons suffering from physical discomfort, in which sleeping accommodation may or may not be provided. This Occupancy shall be subdivided as follows:

2.1.8.1 Normal Medical Facilities (D1)

These shall include any building or portion thereof or group of buildings under single management in which essential medical facilities having surgery, emergency and casualty treatment facilities, general or specialized medical and other treatment is provided to persons suffering from physical discomfort.

2.1.8.2 Emergency Medical Facilities (D2)

These shall include any building or portion thereof used for purposes of providing essential medical facilities having surgery, emergency, casualty treatment facilities, general or specialized medical and other treatment is provided to persons suffering from physical discomfort. This Type shall be equipped and designated to handle post disaster emergency, by construction it is required to remain operational during and after disasters, built as a part of disaster preparedness program.

2.1.9 Occupancy E: Business

These shall include any building or portion thereof which is used for any business transaction other than mercantile. This Occupancy shall be subdivided as follows:

2.1.9.1 Office (E1)

These shall include any building or part thereof which is used for paper works, documentations, only display of samples of Products but not for direct sale, maintaining accounts and records for administrative or consulting services, banking or activities for business purposes and professional training.

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2.1.9.2 Research and Testing Laboratories (E2)

These shall include any building or portion thereof which is used as research establishment and/or test laboratory involving hazardous materials within the limit of exempted quantity permitted in this Code.

2.1.9.3 Essential Services (E3)

These shall include any building or portion thereof used for purposes of providing emergency services and utilities which are required to remain operational during and after a disaster or other emergency situations.

2.1.10 Occupancy F: Mercantile

This occupancy type shall include any building or portion thereof or group of buildings which is used for display and sale of merchandises. This Occupancy shall be subdivided as follows:

2.1.10.1 Small Shops and Market (F1)

These shall include any building or portion thereof with an area divided or undivided not exceeding 300 m², used for purposes of display and sale of merchandise, either wholesale or retail, with or without incidental storage and service facilities.

2.1.10.2 Large Shops and Market (F2)

These shall include any building or portion thereof with an area divided or undivided more than 300 m² used for purposes of display and sale of merchandise, either wholesale or retail, with or without incidental storage and service facilities.

2.1.10.3 Refueling Station (F3)

These shall include any building or portion thereof used for providing refueling and maintenance without repair services for automobiles which is moderately hazardous in nature.

2.1.11 Occupancy G: Industrial Buildings

Buildings under this Occupancy shall be subdivided on the basis of hazard potential of the contents and the processes of the industry. The hazard shall generally mean the relative danger of the start of fire and the rapidity of its spread, the danger of smoke and gases generated that pose a potential threat to the safety of the occupants of the building. Unless areas with different degrees of hazard are effectively segregated and separated in accordance with the provisions of this Code, the most hazardous area in a building shall govern its classification. This occupancy shall also include facilities for public utility services at the producer or distributor's end that deals with generation and distribution of utility facilities. Any such building or portion thereof, which is not using hazardous material quantified and categorized in occupancy group J, shall be subdivided as follows:

2.1.11.1 Low Hazard Industry (G1)

These shall include any industrial building in which the contents are of such low combustibility and the processes conducted therein are of such low hazardous nature that danger of self-ignition and self-propagation of fire is nonexistent, the only danger being an onset of fire from external sources with the resulting danger to life and property.

2.1.11.2 Moderate Hazard Industry (G2)

These shall include any industrial building in which the contents are moderately combustible and the industrial processes conducted therein are liable to give rise to a fire which will spread with moderate rapidity, giving off considerable smoke.

2.1.12 Occupancy H: Storage Buildings

Buildings under this Occupancy group shall include any building or portion thereof used primarily for storage or sheltering of goods, wares, merchandises, vehicles or animals. Any such building or portion thereof, which is not

used for storing hazardous material quantified and categorized in occupancy group J, shall be subdivided as follows:

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2.1.12.1 Low Fire-risk Storage (H1)BNBC 2015 FINAL DRAFT

These shall include any building or portion thereof which is used for storage of materials or other contents which do not constitute the danger of self-ignition, and in the event of fire the rate of burning shall be less than moderate rapidity.

2.1.12.2 Moderate Fire-risk Storage (H2)

These shall include any building or portion thereof which is used for storage of materials which do not constitute the danger of self-ignition but which in the event of fire will burn with moderate rapidity.

Items which shall be deemed to render a building hazardous are specified in Sec 2.14.3 along with the exempted amount for each item.

2.1.13 Occupancy I: Assembly

Buildings under this Occupancy group shall include any building or portion thereof in which groups of people congregate or assemble for recreation, amusement, social, religious, political, cultural, travel and similar purposes. This Occupancy shall be subdivided as follows:

2.1.13.1 Large Assembly with Fixed Seats (I1)

This occupancy shall include a building or a portion thereof for assembly in a space provided with fixed seats for 1000 or more persons. Assembly buildings under this subdivision may be for theatrical, operatic performances or cinema projection having or not a raised stage, proscenium curtains, scenery loft or projection screen, lighting equipment, projection booth and necessary theatrical and mechanical equipment.

2.1.13.2 Small Assembly with Fixed Seats (I2)

This occupancy type shall include any building or portion thereof primarily meant for use as described for buildings under Occupancy I1, but with fixed seats for less than 1000 persons in a space. These assembly buildings may or may not be provided with a legitimate theatrical stage or related accessories or equipment.

2.1.13.3 Large Assembly without Fixed Seats (I3)

This occupancy type shall include any building or portion thereof for assembly in a space, in which there are no fixed seats, which may or may not be provided with a legitimate stage or theatrical accessories, and which has accommodation for 300 or more persons.

2.1.13.4 Small Assembly without Fixed Seats (I4)

This occupancy type shall include any building or portion thereof primarily intended for use as described in Occupancy I3, but with accommodation for less than 300 persons in a space.

2.1.13.5 Sports Facilities (I5)

This occupancy type shall include any building or portion thereof meant for assembly of spectators for recreational and amusement purpose mainly related to sports.

2.1.14 Occupancy J: Hazardous Buildings

Any Building or portion thereof used as storage, industrial, research and other facilities dealing with hazardous material in excess of exempted quantity defined in the Table 3.2.5 or any micro-biological facilities shall be categorized in this Occupancy group.

Definition of hazard and the amount of such materials which shall be deemed to render a building hazardous are set forth in Sec 2.14.3. This Occupancy shall be subdivided as follows:

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2.1.14.1 Explosion Hazard Buildings (J1)

These shall include any building or portion thereof which is used for storage, handling, processing or manufacture of explosive materials and products that have explosion hazard.

2.1.14.2 Chemical Hazard Buildings (J2)

These shall include any building or portion thereof which is used for storage, handling, processing or manufacture of materials and products that are highly corrosive, toxic, poisonous and physically harmful including corrosive and toxic alkalis, acid or other liquids or chemicals, producing flame, fumes, radiation, and explosive, poisonous, irritant and corrosive gases.

2.1.14.3 Biological Hazard Buildings (J3)

These shall include any building or portion thereof which is used for storage, handling, processing or manufacture of materials and products that use biological processes and in which the risk of harmful biological threat to the occupants exist.

2.1.14.4 Radiation Hazard Buildings (J4)

These shall include any building or portion thereof which is used for storage, handling, processing or manufacture of materials and products that use nuclear and radioactive processes and in which the risk of radioactive contamination exists.

2.1.15 Occupancy K: Garage

These occupancy types shall include any building or portion thereof used one or more vehicles having containers of flammable liquid or compressed gas or carrying power or combination of any of these as a supply source for self-propelling are kept for use, sale, rental purpose, storage, repair, exhibition and all those floors of a building or portion thereof in which such vehicles are not separated by suitable cutoff to prevent fire spreading.

2.1.15.1 Parking Garage (K1)

This occupancy type shall include any building or portion thereof used solely for parking Motor Vehicles for a

limited period of time.

2.1.15.2 Private Garage (K2)

This occupancy type shall include any building or portion thereof used as store of owner's or tenant's Motor Vehicles for private use for unlimited period of time.

2.1.15.3 Repair Garage and Showrooms (K3)

This occupancy type shall include any building or portion thereof wherein repair of electrical or mechanical system or denting or painting works of body is performed on any type of vehicles and includes associated floor spaces used as office, showrooms, incidental store and parking.

2.1.16 Occupancy L: Utility

This occupancy type shall include any building or portion thereof used to install any type of equipment to provide support service to any building or portion thereof or group of buildings of all occupancy groups and with special provisions for occupancy J.

This shall also include all public and private utility facilities of the consumer's end that are located within the consumer's site and all installations are required special care to ensure life and property safety as per provisions of this Code.

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2.1.17 Occupancy M: MiscellaneousBNBC 2015 FINAL DRAFT

Buildings under this Occupancy group shall include special buildings not covered in other Occupancy groups. These Occupancies shall be subdivided as follows:

2.1.17.1 Special Structure (M1)

Any building or structure which is neither listed in the A-Z list nor covered in any occupancy group provided in this Code but unique in character may be categorized in this occupancy by the Board of Appeals. Each and every individual M1 Structure shall be complied with NFPA or equivalent standards for the life and fire safety.

2.1.17.2 Fences, Tanks and Towers (M2)

These shall include fences and boundary walls over 1.5 m high, standalone structures for gravity water tank and towers for telecommunication, power distribution, air-traffic control terminal or observation towers.

2.2 CHANGE OF USE

2.2.1 Without prior permission from the Authorities having jurisdiction no change shall be made in the type of occupancy or use of any building that would place it in a different occupancy group or in a different subdivision of the same occupancy group. Such changes shall be permitted only when the land use and the building complied with the provisions of this Code and the laws of the land for such group of Occupancy.

2.3 MIXED OCCUPANCY

2.3.1 The following occupancies shall not be required to designate as a separated occupancy classification from uses to which they are accessory any occupancy Group other than Occupancy Group J

- (a) Assembly rooms having a floor area not more than 75 m².
- (b) The administrative and clerical offices and similar offices not exceeding 25 Percent of the floor area of the major occupancy and not related to Hazardous Buildings as defined in Occupancy J.
- (c) Administrative offices, gift shops and other similar uses in Occupancy A provided the uses do not exceed 10 Percent of the floor area of the major occupancy.
- (d) Kitchens associated with a dining area.
- (e) Carports having at least two sides entirely open associated with Occupancy A.

2.3.2 Forms of Occupancy Separations

A building is permitted to have multiple occupancy type, each type of occupancy shall be in groups, which may have combination of different occupancies and shall be separated horizontally or vertically or both accordingly as specified in the Table 3.2.1.

2.3.3 Types of Occupancy Separation

The occupancy separations shall be classified as follows:

- (a) Four Hour Fire Resistive: The four hour fire resistive separation wall or slab shall have no unprotected openings therein and shall provide a fire resistance for at least three hour.
- (b) Three Hour Fire Resistive: The three hour fire resistive separation wall or slab shall provide a fire resistance of not less than three hour. The total width of all openings in separation wall of any one storey shall not exceed 25 Percent of the length of that wall in that storey and no single opening shall have an area greater than 12 m². The openings shall be protected with a fire resistance assembly doors or windows providing fire resistance of at least three hour.

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- (c) In case of a floor slab having three hour fire resistance rating, the openings on floor slab shall be protected by vertical enclosures extended above and below such floor openings. The walls of such vertical enclosures shall be at least two hour of fire resistance. All openings in such enclosures shall be protected with fire assembly door or window having fire resistance rating of at least one and one-half hour.
- (d) Two Hour Fire Resistive: The two hour fire resistive separation shall be of a construction having a fire resistance rating of not less than two hour. All openings in such separations shall be protected with a fire assembly door or window of a fire protection rating of at least one and one-half hour.
- (e) One Hour Fire Resistive: The one hour fire resistive separation shall be of at least one hour fire protection construction. All openings in such separations shall be protected with a fire protection assembly door or window of at least one-half hour fire resistance.

Table 3.2.1: Fire Resistance Rating Requirements for Barrier Walls and Floor/Ceiling Assemblies between Separated Occupancies
(hours)

2.4 GENERAL REQUIREMENTS OF ALL OCCUPANCIES

2.4.1 Location on Property

2.4.1.1 All plots for building construction shall have access to a public road from at least one side.

2.4.1.2 Fire separation distance shall be measured from the face of peripheral wall of a building to the adjacent property line. For the purpose of this Section, if a public road adjoining all along a property line shall get the benefit of half of Road width as a part of Fire separation distance. For two or more buildings on the same plot, distances of imaginary lines equidistant from all side of buildings shall be considered as the required fire separation distances.

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2.4.1.3 The exterior walls of a building shall have a fire resistance and opening protection as specified in Tables 3.3.1 (a), 3.3.1 (b) and 3.2.3.

2.4.1.4 Any outward projected elements from the peripheral wall of a building line shall be limited to the sunshade line.

2.4.1.5 When openings in exterior walls are required to be protected due to distance from the property line, the aggregate area of such openings shall not exceed 50 Percent of the total area of the wall in each storey.

2.4.1.6 Dwellings separation walls in semi-detached or row type development shall comply with Sec 2.4.3.

2.4.2 Allowable Floor Areas

2.4.2.1 The total area of the building shall comply with Sec 1.8.3 Chapter 1 of this Part.

2.4.2.2 The floor area of the mezzanines shall be included in the area of the respective main floor.

2.4.2.3 Floor area calculation shall be divided in to two: (a) All Floor areas at and above the formation level which shall be generally included in the FAR calculation. (b) Floor areas below the formation level shall generally be excluded in FAR calculation provided the Occupancy classifications remain within Utility or Private Garages.

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Table 3.2.2: Fire Resistance Ratings in Hours of Exterior Walls for Various Occupancy Groups

Fire Separation Distance Occupancy

A1, A2, K2, A3, A4, A5, B,C, D, E2, F3, F4, E3, H2, J
M2
E1, F1, F2, G1, I G2, H1

Up to 1.5 m 1 2 34

Greater than 1.5 m and up to 3 m N 1 23

Greater than 3 m and up to 4.5 m N N 12

Greater than 4.5 m and up to 9 m N N N1

Greater than 9 m N N NN

N= No requirements

Table 3.2.3: Requirements for Opening Protection Assembly Based on Fire Resistance Rating of Exterior Walls

Fire Resistance Ratings of Exterior Walls Fire Resistance Ratings for Opening Assembly
(in hours) (in hours)

4 Not permitted

3 3.0

2 1.5

1 0.5

N No requirements

2.4.3 Permitted Types of Construction

2.4.3.1 The types of construction for any occupancy shall conform to the specifications set in Table 3.2.4.

2.4.3.2 Common walls in semi-detached or row type development shall not have any unprotected openings and shall be Type I-A construction and all such wall shall comply with requirements of Party wall or Fire wall or Separation wall.

2.4.3.3 Ground floor or basement of a building used for car parking and utilities within the barriers by at least three hour fire resistive construction shall be considered as non-separated occupancy provided the building accommodate one or more of the following occupancies:

(i) A3, A5

(ii) E1, F1, F2

(iii) I2, I3, I4

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2.4.3.4 Entry lobbies, mechanical and electrical rooms and other similar uses incidental to the operation of the building may be provided in the car parking floors provided that the total area of such uses remains within $\frac{1}{3}$ (one third) of the parking floor area.

Table 3.2.4: Permitted Types of Construction and Fire Zones for Various Occupancy Groups

Occupancy Permitted Types of Construction Fire Zones

A

B

C

D Group I and Group II* 1

E1

F1,F2

I

K1, K2, M2

E2, E3, F3, K3, M1 BNBC 2015 FINAL DRAFT

G Group I or Group II* 2

H

J Group I 3

*Fire resistance rating of a building shall be credited in case of the mixed type of construction on the basis of lower rated construction elements among the same group or same type used thereof.

2.4.4 General Provision for High-Rise Buildings

For the purpose of this Code, a building of any class of Occupancy will be considered as high-rise when it has floors used for human occupancy located more than 33 m from ground level or the lowest level of fire department vehicle access. The provisions of Sec 2.9.6 shall be applicable to all such buildings.

2.4.4.1 Maintenance and inspection

All fire protection systems shall be maintained and inspected on a regular basis to keep them in operative condition. The maintenance inspection shall be performed quarterly.

All plumbing installations shall be maintained and inspected periodically to keep them in operative conditions.

2.4.4.2 Type of construction

All high-rise buildings shall be of Type I-A or I-B construction.

2.4.4.3 Fire detection, alarm, evacuation and extinguishment system

All high-rise buildings shall conform to regulations set forth in Part 4 of this Code

2.4.5 Helipads

2.4.5.1 General

Helipads on the roof top of a building or other locations shall be constructed in accordance with this Section.

2.4.5.2 Size

The minimum dimension of the landing area for helicopters weighing less than 1600 kg shall be 6 m x 6 m. There shall be an average clearance of 4 m surrounding and at the level of the landing area which shall not be less than 2 m at any point.

2.4.5.3 Construction

Helicopter landing areas and supports shall be constructed with non-combustible material.

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2.4.5.4 Aviation approvalBNBC 2015 FINAL DRAFT

Before helipads start operating formal approval shall be obtained from the civil aviation authority.

2.4.6 Universal Accessibility

2.4.6.1 All Building (except Occupancies G, H, M and J) shall have universal accessibility as per provisions of this Code.

2.4.6.2 Buildings have universal accessibility shall have accessible egress system.

2.5 REQUIREMENTS FOR OCCUPANCY A - RESIDENTIAL BUILDINGS

Buildings shall be classified as Occupancy A in accordance with Sec 2.1.5.

2.5.1 Construction, Height and Allowable Area

2.5.1.1 Buildings or parts thereof classified as Occupancy A shall be limited to the type of construction set forth in Table 3.2.4 and shall not exceed in area or height as specified in Sections 1.8 and 2.4.2 of this Part.

2.5.1.2 Walls and floors separating dwelling units in the same building shall not be less than Type I-D construction.

2.5.1.3 Storage or laundry rooms in Occupancy A2, A3, A4 or A5 that are used in common by the occupants shall be at least Type I-D construction.

2.5.1.4 When a basement or a ground floor of a building of Occupancy A3 or A5 is used for parking or storage of private cars of the occupants, the parking floor shall be of at least Type I-B construction.

2.5.1.5 When the basement or ground floor of a building of Occupancy A is used wholly or partly for generator or electrical substation, the walls and floors surrounding such use shall be of at least Type I-B construction.

2.5.2 Location on Property

Buildings of Occupancy A shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in this Code.

2.5.3 Access and Exit Facilities and Egress System

2.5.3.1 Facilities for access and exit and egress or escape shall comply with the provisions set forth in this Code.

2.5.3.2 Every sleeping room in ground, first and second floors shall have at least one operable window or door for emergency escape which shall open directly into the exterior or an interior courtyard. The units shall be operable from the inside without the use of any tool to provide a minimum clear opening of 500 mm width by 600 mm height with a maximum sill height of 1 m above the floor.

2.5.4 Lighting and Ventilation

All buildings or part of a building classified as Occupancy A shall conform to the provisions of Part 3, and Chapters 1 and 3 of Part 8.

2.5.5 Sanitation

Sanitation facilities provided in all Occupancy A buildings shall conform to this Part and Chapter 7 Part 8.

2.5.6 Minimum Dimension of Habitable and Non-habitable Rooms

The minimum dimensions of habitable and non-habitable rooms are specified in Sec 1.12.2 Chapter 1 Part 3.

2.5.7 Fire detection, Alarm, Evacuation and Extinguishment

All buildings shall conform to regulations set forth in Part 4 of this Code.

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2.5.8 Shaft and Exit Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction as specified in Part 4. Exit requirements shall comply with Part 4 of this Code.

2.6 REQUIREMENTS FOR OCCUPANCY B - EDUCATIONAL BUILDINGS

Buildings shall be classified as Occupancy B in accordance with Sec 2.1.6.

2.6.1 Construction, Height and Allowable Area

Buildings or parts of buildings classified as Occupancy B shall be limited to type of construction set forth in Table 3.2.4 and comply with the provisions of Sections 1.8 and 2.4.2 of this Part to meet the requirements of height and area limitations.

2.6.1.1 Rooms or groups of rooms sharing a common space where flammable liquids, combustible dust or hazardous materials are used, stored, developed or handled in an amount exceeding that specified in Sec 2.14.3

shall be classified as Occupancy J. Such rooms or groups of rooms shall comply with the requirements of fire protection as specified in Part 4, Chapters 4 and 5.

2.6.1.2 Rooms or groups of rooms, sharing a common space or having separate spaces, served by a common corridor or passage with less than 20 percent outdoor opening of wall in a building of height 11 m or less, or three storey's or less, need not be provided with smoke detectors and standpipe or sprinkler system for fire protection provided it conforms with the access and exit requirements specified in Part 3, Chapter 1, Sec 1.6 and Part 4, Chapters 4 and 5.

2.6.1.3 Buildings of Occupancy B situated outside the jurisdiction of any municipality shall have a construction of at least two hours fire resistance.

2.6.2 Location on Property

Buildings of Occupancy B shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.6.3 Access and Exit Facilities and Egress System

Facilities for access and exit and Egress system shall comply with the provisions set forth in Sec 1.6, Chapter 1 Part 3 and Chapter 3 Part 4.

2.6.4 Lighting, Ventilation and Sanitation

Lighting, ventilation and sanitation facilities provided in Occupancy Group B buildings shall conform to Sec 1.16, Chapter 1 Part 3 and Chapters 1 and 3 Part 8.

2.6.5 Minimum Dimensions of Class Rooms, Common Toilets and Staircases

The dimension of a class room shall be not less than 4 m on any side and shall have an area of not less than 0.75m² per student. Other provisions for minimum dimensions shall comply with the requirements set forth in Sec 1.8 of Chapter 1 Part 3.

2.6.6 Shaft and Exit Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 3 hour fire resistance. Exit requirements shall comply with Chapter 3 Part 4.

2.6.7 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

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2.7 REQUIREMENTS FOR OCCUPANCY C - INSTITUTIONAL BUILDINGS

Buildings shall be classified as Occupancy C in accordance with Sec 2.1.7.

2.7.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy C shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 Chapter 1 Part 3 and Sec 2.4.2 to meet the requirements of height and area limitations.

2.7.2 Location on Property

Buildings of Occupancy C shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.7.3 Access and Exit Facilities and Egress System

Facilities for access and exit and egress system shall comply with the provisions set forth in Sec 1.6, Chapter 1 Part 3 and Chapter 3 Part 4.

2.7.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy C shall conform to the provisions of Sec 1.16, Chapter 1 Part 3 and Chapters 1 and 3, Part 8.

2.7.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

2.7.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

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2.8 REQUIREMENTS FOR OCCUPANCY D–HEALTH CARE FACILITIES

Buildings shall be classified as Occupancy D in accordance with Sec 2.1.8.

2.8.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy D shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 Chapter 1 Part 3 and Sec 2.4.2 to meet the requirements of height and area limitations.

2.8.2 Location on Property

Buildings of Occupancy D shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.8.3 Access and Exit Facilities and Egress System

Facilities for access and exit and egress system shall comply with the provisions set forth in Sec 1.6 Chapter 1, Part 3 and Chapter 3 of Part 4.

2.8.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy D shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Chapters 1 and 3 of Part 8.

2.8.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least three hour fire resistance. Exit requirements shall comply with Chapter 3 of Part 4.

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2.8.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.9 REQUIREMENTS FOR OCCUPANCY E–BUSINESS

Buildings shall be classified as Occupancy E in accordance with Sec 2.1.9.

2.9.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy E shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 Chapter 1 Part 3 and Sec 2.4.2 to meet the requirements of height and area limitations.

2.9.2 Location on Property

Buildings of Occupancy E shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.9.3 Access and Exit Facilities and Egress System

Facilities for access and exit and egress system shall comply with the provisions set forth in Sec 1.6 Chapter 1 Part 3, Chapter 3 of Part 4.

2.9.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy E shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Chapters 1 and 3 of Part 8.

2.9.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 3 hour fire resistance. Exit requirements shall comply with Chapter 3 of Part 4.

2.9.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.10 REQUIREMENTS FOR OCCUPANCY F—MERCANTILE BUILDINGS

Buildings shall be classified as Occupancy F in accordance with Sec 2.1.10.

2.10.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy F shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8, Chapter 1 of Part 3 and Sec 2.4.2 to meet the requirements and limitations of height and area.

2.10.2 Location on Property

Buildings of Occupancy F shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.10.3 Access and Exit Facilities and Emergency Escapes

Facilities for access and exit and emergency escape shall comply with the provisions set forth in Sec 1.6 Chapter 1 Part 3 and Chapter 3 Part 4.

2.10.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy F shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Chapters 1 and 3, Part 8.

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2.10.5 Shaft and EnclosureBNBC 2015 FINAL DRAFT

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

2.10.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.10.7 Special Hazards

Installations which are discharging exhaust, heating apparatus, boiler and central heating/air-conditioning plant shall conform to the provisions of this Code as specified in this Code.

2.11 REQUIREMENTS FOR OCCUPANCY G—INDUSTRIAL BUILDINGS

Buildings shall be classified as Occupancy G in accordance with Sec 2.1.11. A non-exhaustive and indicative list of low hazard and moderate hazard industrial uses are listed in A to Z list. Storage and use of hazardous materials shall not exceed the exempt amount specified in Sec 2.14.3.

2.11.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy G shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 of Chapter 1, Part 3 and Sec 2.4.2 to meet the requirements and limitations of height and floor area.

The ceiling height of the production area, shall conform to the minimum volume required per workers as specified by the Bangladesh Labor Act, 2006 and other laws of the land. In any case the ceiling height and the head room clearance of a production floor shall not be less than 3.3 meter and 2.286 meter respectively.

2.11.2 Location on Property

Buildings of Occupancy G shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.11.3 Access and Exit Facilities and Egress System

Facilities for access and exit and emergency escape shall comply with the provisions set forth in Sec 1.6 Chapter 1, Part 3 and Chapter 3, Part 4.

2.11.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy G shall conform to the provisions of Sec 1.16 Chapter 1, Part 3 and Chapters 1 and 3, Part 8. Industrial buildings having roof opening for day lighting and natural ventilation shall comply with the following requirements:

(a) The aggregate opening in roof and external windows shall not be less than 10 Percent of the floor area.

(b) For natural ventilation by means of exterior window openings, the operable window area shall not be less than 5 Percent of the total floor area.

Exception:

Industrial buildings wherein artificial lighting and mechanically operated ventilation systems of approved quality are installed need not be provided with natural ventilation or natural lighting.

2.11.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

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2.11.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.11.7 Special Hazards

Chimneys, vents and ventilation ducts shall be constructed with noncombustible materials. Every boiler, central heating plants, electrical rooms, or hot water supply boiler shall be separated from the rest of the occupancy or

use by not less than two hour fire resistive construction.

2.12 REQUIREMENTS FOR OCCUPANCY H—STORAGE BUILDINGS

Buildings shall be classified as Occupancy H in accordance with Sec 2.1.12.

2.12.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy H shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 of Chapter 1, Part 3 and Sec 2.4.2 to meet the requirements of height and area limitations.

2.12.2 Location on Property

The location on property for Occupancy H shall conform to Sec 2.4.1.

2.12.3 Access and Exit Facilities and Egress System

Facilities for access and exit and egress system shall comply with the provisions set forth in Sec 1.6 of Chapter 1, Part 3 and Chapter 3, Part 4.

2.12.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy H shall conform to the provisions of Sec 1.16 of Chapter 1 Part 3, Chapters 1 and 3, Part 8.

2.12.4.1 Special provision

The provisions of Sec 1.16, does not apply to non-habitable spaces of H1 and H2 occupancies unless otherwise required by this Code. Ventilators of size not less than 0.25 m² shall be provided where suitable 0.30 m above the floor level for floor level ventilators and 0.30 m below the roof level for roof level ventilators. There shall be one floor level ventilator and one roof level ventilator for every 0.25 m² of the floor area. Mechanized ventilation system of approved quality shall be installed where required.

2.12.4.2 Though inhabitable, the minimum air quality of such indoor spaces shall be maintained in a way that it does not pose any health hazard to the occasional users of that space.

2.12.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

2.12.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.12.7 Special Hazards

The storage of hazardous materials shall not exceed the exempt amount as specified in Table 3.2.5. The storage of moderate and low hazardous materials shall be separated at least by a two hour fire resistive construction.

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2.13 REQUIREMENTS FOR OCCUPANCY I—ASSEMBLY BUILDINGSBNBC 2015 FINAL DRAFT

Buildings shall be classified as Occupancy I in accordance with Sec 2.1.13.

2.13.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy I shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 Chapter 1 Part 3 and Sec 2.4.2 to meet the requirements and limitations of height and area.

2.13.2 Location on Property

Buildings of Occupancy I shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.13.3 Access and Exit Facilities and Egress System

Facilities for access and exit and Egress system shall comply with the provisions set forth in Sec 1.6 Chapter 1 of Part 3 and Chapter 3 of Part 4 and universally accessibility as per provisions of this Code.

2.13.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy I shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Part 3 and Chapters 1 and 3, Part 8.

2.13.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

2.13.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

The specification of this Section shall apply to all parts of buildings and structures that contain stages or platforms and other similar appurtenances as herein defined.

(a) Stages: A stage is a three side enclosed or partially enclosed portion of a building which is designed or used for presentation of plays or lectures or other entertainment. A stage shall be further classified as legitimate stage, regular stage and thrust stage.

(b) Stage, Legitimate: A stage wherein curtains, drops, leg drops, scenery, lighting devices or other stage effects are adjustable horizontally or vertically or suspended overhead.

(c) Stage, Regular: A stage wherein curtains, fixed drops, valances, scenery and other stage effects are suspended and are not adjustable or retractable.

(d) Stage, Thrust: A stage or platform extended beyond the proscenium line and into the audience.

2.13.6.1 Legitimate Stage

Legitimate stage shall be constructed as specified in Part 4, specifying the type of construction but shall not be less than construction Type I-C. The position of the legitimate stage extending beyond the proscenium opening line shall be permitted to be constructed with two hour fire-resistive materials. The floor of the stage may be constructed with one hour fire rating materials. Thickness of a wooden floor shall not be less than 50 mm.

2.13.6.2 Regular and Thrust Stages

Regular stages and thrust stages shall be constructed by not less than two hour fire resistive materials. Wooden floor when required in a stage shall not be less than 50 mm in thickness with one hour fire resistive rating.

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2.13.6.3 Trap doors

All trap doors and any other opening in stage floors shall be equipped with tight fitting solid wood trap doors with thickness not less than 50 mm.

2.13.6.4 Stage rigging loft

The grid iron frame in the loft, housing lighting and audio equipment, all the machinery for flying scenery and fly galleries, along with their installations, shall be constructed of approved noncombustible materials.

2.13.6.5 Foot lights and stage electrical equipment

Foot lights and border lights shall be installed in a protective cover constructed of noncombustible materials.

2.13.6.6 Trim, finish and decorative hangings

All materials used in moulding and decoration around the proscenium shall be of approved noncombustible materials.

2.13.6.7 Proscenium curtain

The proscenium curtain shall be of approved fire retardant material and shall protect against passage of flame and smoke for at least 30 minutes.

2.13.7 Motion Picture Projection Rooms

2.13.7.1 Every projection room shall be constructed in conformity with the construction requirements for the type of the building in which the projection room is located. The wall opening required for projection need not have a fire protection assembly but shall be closed with glass or other approved materials.

2.13.7.2 The floor area of a projection room shall not be less than 8 m² for a single machine. The working space between the machines when more than one machine is used shall not be less than 0.75 m.

2.13.7.3 The height of the projection room shall have a minimum clear space of 2.5 m.

2.13.8 Sports Facilities

2.13.8.1 Vomitors, aisles and exits of seating galleries

Tunnels, aisles and exits of galleries shall be constructed conforming to the following requirements.

(a) There shall be a minimum of two exits remotely located from each other immediately to the outside for each balcony or tier. There shall be at least three exits when seating capacity exceeds 1000 persons and four exits when it exceeds 4000 persons. For every additional 1000 persons the exit shall be designed to accommodate provision (f) given below.

(b) There shall be at least 0.6 m² of space per person in the gallery. Minimum width considered for a seat in the gallery shall be 0.45 m.

(c) There shall be a maximum of 33 seats on each side of any aisle. Minimum width of the main aisles and the secondary aisles shall be 1.0 m and 0.7 m respectively.

(d) Entrance and exits shall be protected by safety railings.

(e) Back to back space between two rows of seats shall not be less than 0.80 m.

(f) The evacuation time in the galleries shall not be more than 10 minutes.

(g) All tunnels, aisles and exits shall conform to safety guidelines for means of escape set forth in Part 4.

(h) One percent of the total seat capacity shall have provisions for accommodation with universal

accessibility at the approach or exit level.

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2.13.8.2 Swimming poolsBNBC 2015 FINAL DRAFT

Any swimming pool used or constructed for exclusive use by Occupancy A1 and is available only to the occupants and private guests shall be classified as a private swimming pool. Any swimming pool other than private swimming

pool shall be classified as a public swimming pool. Swimming pools shall be constructed in conformity with the following requirements.

(a) There shall be at least 1.5 m space between any sides of a swimming pool and a rear or side property line. For street property lines, this distance shall be at least 2.0 m.

(b) Swimming pools shall be provided with overflow provision to remove scum and other materials from the surface of the water. When water skimmers are used for private pools there shall be one skimming device for each 50 m² of surface area or fraction thereof.

(c) The overflow gutters shall not be less than 75 mm deep and shall be pitched to slope of one unit vertical to 50 units horizontal (1:50) toward drains.

(d) Public swimming pools shall be so designed that the pool water turnover is at least once every 8 hours.

(e) Private swimming pools shall be designed so that there is a pool water turnover at least once every 18 hours.

(f) Public swimming pools shall be equipped with filters, the capacity of which shall be controlled to filter 140 liters per minute per m² of surface area. Private swimming pool filters shall not filter more than 230 liters per minute per m² of the surface area.

(g) The pH value of the pool water shall be between 7.0 and 7.5.

(h) All recirculation systems shall be equipped with an approved hair and lint strainer installed in the system ahead of the pump.

(i) All swimming pool and equipment shall be designed to be emptied completely of water and the discharged water shall be disposed in an approved manner and shall not create problems in the neighboring property.

(j) Pumps, filters and other mechanical and electrical equipment shall be placed in enclosed spaces and shall not be accessible to the bathers.

(k) Used water from the pool when being discarded shall be reused as grey water for the building and its premises as per provision of Appendix G.

2.13.9 Amusement Building Fire Protection System

The fire protection system shall be as per provisions of this Code.

2.14 REQUIREMENTS FOR OCCUPANCY J—HAZARDOUS BUILDINGS

Buildings shall be classified as Occupancy J in accordance with Sec 2.1.14.

2.14.1 General

The plans for buildings and structures accommodating Occupancy J shall clearly indicate the type and intended use of materials and its processing or handling methods so as to reflect the nature of use of each portion of such buildings.

2.14.1.1 Occupancy J1

Any building or portion thereof containing any of the following items more than exempted quantity shall be

classified as Occupancy J1.

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(a) Combustible dusts and any similar solid material sufficiently comminuted for suspension in still air which, when so suspended, is capable of self-sustained combustion.

(b) Combustible liquids - Any liquid having a flash point at or above 40°C shall be known as class II and class III liquids. Combustible liquids shall be classified as follows:

(i) Liquids having flash point at or above 40°C and below 60°C.

(ii) Liquids having flash points at or above 60°C and below 95°C.

(c) Cryogenic liquids (flammable or oxidizing): Any liquid that has a boiling point below -130°C.

(d) Flammable Gases: Any gas when mixed with air in a proportion of 13% (by volume) forms a flammable

mixture under atmospheric temperature and pressure.

(e) Flammable Liquids: Any liquid that has a flash point below 40°C and has a net vapour pressure exceeding

275 kPa at 40°C. Flammable liquids shall be known as Class I liquid and shall be further classified as follows:

(i) Liquids having flash point below 25°C and having a boiling point below 40°C.

(ii) Liquids having flash point below 25°C and having a boiling point at or above 40°C.

(iii) Liquids having flash points at or above 25°C and below 40°C.

(f) Oxidizers class 3: As determined in accordance with NFPA 43A.

(g) Oxidizing gases: As determined in accordance with NFPA 43C.

(h) Pyrophoric liquids, solids and gases that will ignite spontaneously in air at a temperature of 55°C or below.

(i) Unstable (reactive) materials class 3, non-detonable as determined in accordance with NFPA 704.

(j) Combustible fibers: Includes readily ignitable fibers like cotton, sisal, jute hemp, tow, cocoa fiber, oakum, baled waste, baled waste paper, kapok, hay, straw, excelsior, Spanish moss and other similar materials.

(k) Flammable solid: Any solid including blasting agent or explosive that is liable to cause fire through absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing, or which when ignited burns so vigorously and persistently as to create a serious hazard.

(l) Organic peroxides, Class II and Class III as determined in accordance with NFPA 43B.

(m) Oxidizers Class I and Class II as determined in accordance with NFPA 43A.

(n) The bulk storage of unstable (reactive) materials Class 1 and Class 2 as determined in accordance with NFPA 704, water reactive materials, Class 2 and Class 3 which react with water to release a gas that is either flammable or present a health hazard as determined in accordance with NFPA 704.

2.14.1.2 Occupancy J2

Any building or portion thereof containing the following shall be classified as Occupancy J2:

(a) Corrosives: Any substance that causes visible destruction of or irreversible alteration in living tissues by chemical action at the site of contact.

(b) Highly toxic materials: The materials falling in this category are as follows:

(i) Oral Toxicity: A chemical that has a median lethal dose of 50 mg or less per kg of body weight when

administered orally to albino rats weighing between 200 and 300 gm each.

(ii) Toxicity of Inhalation: A chemical that has a median lethal concentration in air of 200 ppm or less by

volume of gas or vapors, or 2 mg per liter or less of mist, fume or dust, when administered by

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continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

(iii) Toxicity by Skin Absorption : A chemical that has median lethal dose of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kg each.

(iv) Irritants: Any noncorrosive chemical or substance which causes a reversible inflammatory effect on living tissues by chemical action at the site of contact.

(v) Radioactive Material: Any material or combination of materials that spontaneously emit ionizing radiation.

(vi) Sensitizers: A chemical or substance that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure.

(c) The Occupancy J2 shall also include among others the followings:

- (i) Dry cleaning establishments using flammable solvents.
- (ii) Explosive manufacturing.
- (iii) Paint or solvent manufacturing (flammable base).
- (iv) Pyrexin plastic manufacturing.
- (v) Sodium nitrate or ammonium nitrate
- (vi) Storage of combustible film.

2.14.1.3 Occupancy J3

Any building or portion thereof which is used for storage, handling, processing or manufacture of materials and products that use biological processes and in which the risk of harmful biological threat to the occupants exist, shall comply with the guidelines specified by the Department of Health.

2.14.1.4 Occupancy J4

Any building or portion thereof which is used for storage, handling, processing or manufacture of materials and products that use nuclear and radioactive processes and in which the risk of radioactive contamination exists, shall comply with the guidelines specified by Bangladesh Atomic Energy Commission.

2.14.2 Special Provisions

2.14.2.1 The following shall not be included in Occupancy J but shall be classified in the occupancy group which they most nearly resemble and such classification shall be approved by the Authority:

(a) All buildings and structures and parts thereof which contain less than the exempt quantities as specified in Table 3.2.5, when such buildings comply with the fire protection provisions of this Code.

(b) Rooms containing flammable liquid in lightly closed containers of 4 litre capacity or less for retail sales or private use on the premises and in quantities not exceeding 820 litres/m² of room area.

- (c) Retail paint sales rooms with quantities not exceeding 820 litres/m² of room area.
- (d) Closed systems housing flammable or combustible liquids or gases used for the operation of machinery or equipment.
- (e) Cleaning establishments.
- (f) Liquor stores and distributors without bulk storage.
- (g) Tire storage containing less than 10,000 vehicle tires.
- (h) The storage or use of materials for agricultural purposes for use on the premises.

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- (i) Pyrophoric solids or liquids not exceeding 3 m³ in storage cabinet located in a building that is equipped throughout with an automatic sprinkler system provided in accordance with the fire protection provisions of this Code.
- (j) Pyrophoric solids or liquids not exceeding 3 kg in storage cabinet located in a building that is provided with an automatic sprinkler system installed in accordance with the fire protection provisions in accordance to Part 4 of this Code.
- (k) Class 2 water reactive materials not exceeding 100 kg in an approved storage cabinet located in a building that is provided with automatic sprinkler installed in accordance with the fire protection provisions in accordance to Part 4 of this Code.

2.14.3 Construction, Height and Allowable Area

2.14.3.1 The buildings or parts thereof classified as Occupancy J shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the provisions of Sec 1.8 of Chapter 1, Part 3 and Sec 2.4.2 of this Chapter to meet the requirements of height and area limitations.

2.14.3.2 Floors: The floors and spaces containing hazardous materials and in areas where motor vehicles, boats, helicopters or airplanes are stored, repaired or operated shall be of noncombustible, liquid-tight construction.

Exception: In floors and areas where no repair works are carried out may be surfaced or waterproofed with asphaltic paving materials.

2.14.3.3 Spill Control: The floors containing hazardous repair or other works shall be recessed a minimum of 100 mm so as to prevent flow of liquids to adjoining areas.

2.14.3.4 Drainage: The buildings and areas shall be provided with approved drainage system to direct the flow of liquids to an approved location or room or area designed to provide secondary containment of the hazardous materials and fire protection water.

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Table 3.2.5(a): Exempted Amount of Hazardous Materials in Terms Physical Hazard in a Control Area

Sl. Maximum Quantities in
No.

Material Class/State Storage Limit Use Closed Use Open
Systems Systems

38 liters

Class I-A 115 liters * 115 liters * 115 liters

1 Flammable liquids 454 liters * 454 liters * 114 liters

320 liters

Class I-B and Class I-C 12490 liters

Class-II 454 liters* 454 liters* 113 liters*

2 Combustible liquids Class-III-A 1249 liters* 1249 liters* Not
applicable

Class-III-B 49962 liters* 49962 liters*

Not

3 Combination of Class I-A, Class I-B, 454 liters* 454 liters* applicable
flammable liquids Class I-C 38 liters

28 m3 at NTP (Natural 28 m3 at NTP 113 liters

Gaseous Temperature and (Natural
Pressure) 0.57 m3

4 Flammable gases Temperature and 5.7 m3
Pressure)

Liquefied 113 liters 113 liters

Class I-A 113 liters 113 liters

5 Liquefied flammable 454 liters 454 liters

2.832 m3 2.832 m3

Class I-B and Class I-C 28.32 m3 28.32 m3

6 Combustible fibres Loose

Baled

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Sl. Maximum Quantities in
No.

Material Class/State Storage Limit Use Closed Use Open
Systems Systems

Pigs, ingots, heavy

castings 454 kg 454 kg 454 kg

7 Flammable solids Light castings, light 57 kg 57 kg 57 kg
metallic products

8 Unstable (reactive) Scraps, shavings, 0.454 kg 0.454 kg 0.454 kg
detonable powders, dusts

0.454kg or 0.28m3 0.113 kg or 0.454kg or

9 Unstable (reactive) Class 4 (NTP) 0.057m3 (NTP) 0.28m3 (NTP)

detonable

Class 3 0.454kg or 0.28m³ 0.113 kg or 0.454kg or
(NTP) 0.057m³ (NTP) 0.28m³ (NTP)

Class 4

0.454kg or 0.28m³ 0.113 kg or 0.454kg or

Class 3 (NTP) 0.057m³ (NTP) 0.28m³ (NTP)

Class 2 2.27 kg or 1.42m³ (NTP) 0.454kg or 0.454kg
0.2832m³ (NTP)

Class 1 22.7kg or 70.8 m³ (NTP) 22.7kg or 70.8m³ 4.54 kg

3

2 Not limited or 21.24m³ (NTP) Not limited

(NTP)

Not limited 11.25 kg

0.454 kg 11.25 kg

11.25 kg

0.454 kg

10 Water-reactive detonableBNBC 2015 FINAL DRAFT 11.25 kg

11 Water-reactive non- 3 2.27 kg 2.27 kg 0.454 kg

detonable 2 22.7 kg 22.7 kg 4.54 kg

1 Not Limited Not Limited Not Limited

Class 4 0.454 kg, 0.1135kg 0.1135kg

12 Oxidizing Materials Class 3 4.54 kg 0.227kg 0.227kg

Class 2 113 kg 113 kg 113 kg

13 Oxidizing Gas Class 1 1816 kg 1816 kg 1816 kg

Gaseous 42.48 m³ (NTP) 42.48 m³ (NTP) Not

14 Pyrophoric Material Liquefied

detonable Not applicable 56.78 liters 56.78 liters applicable

Not applicable 0.454 kg or 0.056 m³ 0.056 m³ (NTP) Not

15 Pyrophoric Material non- Division 1.1 0.28m³ (NTP)

detonable (NTP) applicable

1.8 kg. or 1.4 m³(NTP) 0.1135 kg

0

0.454 kg

0

0.1135 kg

Division 1.2 0.454 kg 0.1135 kg 0.1135 kg

Division 1.3 2.27 kg 0.454 kg 0.454 kg

16 Explosives** Division 1.4 22.7 kg 22.7 kg Not

Division 1.4G 56.75 kg Not applicable applicable

Not

applicable

Division 1.5 0.454 kg 0.1135 kg 0.1135 kg

Division 1.6 0.454 kg Not applicable Not applicable

* The maximum quantities may be increased by 100 Percent in areas not accessible to the public in buildings provided with automatic sprinkler system.

** see: Explosive control act.

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Table 3.2.5(b): Exempted Amounts of Hazardous Materials in Terms Health Hazard in a Control Area

Material Class/State Maximum Quantities in
Corrosive
Highly toxic Not Single Storage Closed Systems Open Systems
applicable 454kg or 379 liters
Toxic 2270 kg or 1892 liters or 227kg or 1892 liters
Not 1.362 kg
applicable 23 m3 NTP or 23 m3 NTP
56.75 kg
Not 4.54 kg or 0.57 m3 NTP 4.54 kg or 0.57 m3
applicable
NTP

227 kg or 23 m3 NTP 227 kg

Table 3.2.5(c): Location and Number of Control Areas

Grade Number of Control Fire Resistance Rating of Barriers in Hours
Level Areas per Floor2
Floor Level1 Walls Floors Floor Supporting
Members

Higher than 9 5 12 2
7-9 5
6 12.5 22 2
5 12.5
4 12.5 22 2
3 50
2 75 22 2

Above BNBC 2015 FINAL DRAFT 22 2

21 2

31 2

1 100 4 1 2

Below 1 75 3 1 2
2 50 2 1 2

Lower than 2 Not Allowed Not Allowed Not Allowed Not applicable

The maximum allowable quantity per control area shown in Table 3.2.5

2.14.3.5 The drains shall be designed with adequate slope and section to carry the design discharge of the sprinkler system. The material used in the drains shall be suitable for drainage of the storage materials.

2.14.3.6 Separate drainage system shall be designed for materials which react with each other producing undesirable results. They may be combined when they have been provided with approved means of discharge into the public sewer or natural stream or river.

2.14.3.7 Containment: The outflow from the drains shall be directed to a containment system or other area that provide a secondary storage for the hazardous materials and liquids and fire protection water. The containment capacity shall be capable of containing the outflow from the drains for a period of at least one hour.

2.14.3.8 The overflow from secondary containment system shall be directed to a safe location away from the building, adjoining properties and storm drain.

2.14.3.9 If the secondary containment storage area is open to rainfall it shall be designed to accommodate 24 hour rainfall or a continuous rainfall of 100 mm per day.

2.14.3.10 Smoke and Heat Vents: Smoke and heat vents shall be provided in areas or rooms containing hazardous materials exceeding the exempt amount of Table 3.2.5.

2.14.3.11 Standby Power: Standby power shall be provided in the occupancies where Class I, II or III organic peroxides are stored.

2.14.4 Location on Property

The location on property for Occupancy J shall conform to Sec 2.4.1 and Part 4.

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2.14.5 Access and Exit Facilities and Emergency EscapesBNBC 2015 FINAL DRAFT

Facilities for access and exit and emergency escape shall comply with the provisions set forth in Sec 1.6 of Chapter 1 Part 3, and Chapter 3, Part 4.

2.14.6 Lighting and Ventilation

2.14.6.1 All spaces and rooms customarily occupied by human beings shall be provided with natural light by means of exterior glazing with an area of not less than 10 Percent of the floor area. Such rooms and spaces shall be provided with natural ventilation by means of exterior openings with an open able area not less than 5 Percent of the total floor area or artificial light and mechanically operated ventilation system as per provisions of this Code.

2.14.6.2 Ventilation in Hazardous Locations: The rooms, spaces or areas where explosive, corrosive, combustible, flammable or highly toxic dust, mists, fumes, vapors or gases are stored or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated.

2.14.6.3 The mechanical ventilation of all hazardous uses shall be segregated or separated from the ventilation of other areas. The emissions generated at work areas shall be confined to the area in which they are generated and shall be removed or discharged outside the building and preventive measures against back flow of such hazardous fumes or gases inside the building shall be installed.

2.14.6.4 Ventilation of Toilets: Toilets shall be provided with fully open able exterior window of at least 0.3 m² in area or a vertical duct not less than 62500 mm² in cross-section for the first water closet, with 31250 additional mm² for each additional fixture or a mechanically operated exhaust system equipped to provide a complete change of air in every 15 minutes. Such system shall be connected to the outside air and the point of discharge shall be at least 1.0 m away from any other opening into the building.

2.14.6.5 Other requirements of water closets are specified in Sec 1.12.4 Chapter 1, Part 3.

2.14.7 Sanitation

All buildings or part of a building classified as Occupancy J shall conform to the provisions of Sec 1.16 of this Chapter and Part 8 of this Code.

2.14.8 Shaft and Exit Enclosures

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3, Part 4.

2.14.9 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.14.10 Explosion Control

Explosion control, equivalent protective devices or suppression systems or barricades shall be installed to control or vent the gases resulting from deflagrations of dusts, gases or mists in a room or area, building or other enclosures to minimize structural or mechanical damage.

Walls, floors and roofs separating a use from explosion exposure shall be designed according to the provisions of Chapter 1, Part 6.

Explosion venting shall be designed in exterior walls or roof only. The venting shall be provided to prevent serious structural damage and production of lethal projectiles. The venting design shall recognize the natural characteristics and behaviors of building materials in an explosion. The vents shall be designed to relieve at a maximum internal pressure of 1.0 kPa but not less than the loads required by Chapter 2, Part 6. One or more of the following systems shall be installed to relieve explosion, where applicable:

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(a) Lightweight materials in walls

- (b) Light fastening devices with hatch covers
- (c) Light fastening with outward opening swing doors in exterior walls
- (d) Nonbearing walls with light ties

The venting devices shall discharge vertically or horizontally directly to an unoccupied yard having a width of not less than 16 m on the same plot.

The releasing devices shall be so located that the discharge end shall not be less than 3 m vertically and 6 m horizontally from window openings or exits in the same or adjoining buildings.

2.14.11 Special Hazard

Chimneys, vents and ventilation ducts shall be of noncombustible materials.

All boilers, central heating plants, electrical rooms or hot water supply boiler shall be separated from the rest of the occupancies or uses by not less than 2 hour fire resistive construction.

The devices that generate a spark, flame or glow capable of igniting gasoline shall not be installed or used within 0.5 m of the floor.

Equipment or machinery that produces or emits combustible or explosive dust or fibers shall be provided with an approved dust collecting and exhaust system.

The equipment or systems that are used to collect or process or convey combustible dust or fibers shall be installed with explosion venting or containment system.

2.15 REQUIREMENTS FOR OCCUPANCY K—GARAGE BUILDINGS

Buildings shall be classified as Occupancy K in accordance with Sec 2.1.15.

Exception: Non-separated use mentioned in Sec 2.3.1.

2.15.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy K shall be limited to the type of construction set forth in Table 3.2.4 and Sec 2.4.4.2 and shall comply with the other provisions of Sec 1.8 Chapter 1 Part 3, Appendix F and Sec 2.4.2 to meet the requirements and limitations of height and area. With the exceptions mentioned in Sec 2.4.3, all garage floors shall be constructed with not less than 4 hour fire resistance materials.

2.15.1.1 Floors: The floors and spaces where motor vehicles are stored, repaired or operated shall be of noncombustible, liquid-tight construction.

Exception: In floors and areas where no repair works are carried out may be surfaced or waterproofed with asphaltic paving materials.

2.15.1.2 Spill Control: The floors containing hazardous repair or other works shall be recessed a minimum of 100 mm so as to prevent flow of liquids to adjoining areas.

2.15.1.3 Drainage: The buildings and areas shall be provided with approved drainage system to direct the flow of liquids to an approved location or room or area designed to provide secondary containment of the hazardous materials and fire protection water.

The drains shall be designed with adequate slope and section to carry the design discharge of the sprinkler system. The material used in the drains shall be suitable for drainage of the storage materials.

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The quality of discharged liquids must attain approved level before discharging into the public sewer or natural stream or river.

2.15.1.4 Smoke and Heat Vents: Smoke and heat vents shall be provided in areas or rooms containing hazardous materials exceeding the exempt amount of Table 3.2.5.

2.15.2 Location on Property

Buildings of Occupancy K shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.15.3 Access and Exit Facilities and Emergency Escapes

Facilities for access and exit and emergency escape shall comply with the provisions set forth in Sec 1.6 Chapter 1 Part 3, Chapter 3 Part 4 and Appendix F.

2.15.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy K shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Chapters 1 and 3, Part 8.

2.15.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3 Part 4.

2.15.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.16 REQUIREMENTS FOR OCCUPANCY L – UTILITY BUILDINGS

Buildings shall be classified as Occupancy L in accordance with Sec 2.1.16.

2.16.1 Construction, Height and Allowable Area

The buildings or parts thereof classified as Occupancy L shall be limited to the type of construction set forth in Table 3.2.4 and Sec 2.4.3, and shall comply with the provisions of Sec 1.8 Chapter 1 Part 3, and Sec 2.4.2 to meet the requirements and limitations of height and area.

2.16.2 Location on Property

Buildings of Occupancy L shall comply with the requirements for location on property and fire resistive exterior walls and openings as specified in Sec 2.4.1.

2.16.3 Access and Exit Facilities and Egress System

Facilities for access and exit and egress system shall comply with the provisions set forth in Sec 1.6 Chapter 1 Part 3 and Chapter 3 Part 4.

2.16.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy L shall conform to the provisions of Sec 1.16 Chapter 1 Part 3, Chapters 1 and 3, Part 8.

2.16.5 Shaft and Enclosure

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with Chapter 3 Part 4.

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2.16.6 Fire Detector, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

2.16.7 Special Hazard

2.16.7.1 Since the nature of use of this occupancy involves hazard, special consideration for maintenance and operational safety must be ensured. Depending upon the degree of hazard involved, this occupancy type may have separate and isolated structure.

2.16.7.2 Chimneys and vents and ventilation ducts shall be of noncombustible materials.

All boilers, central heating plants, electrical rooms or hot water supply boiler shall be separated from the rest of the occupancies or uses by not less than 2 hour fire resistive construction.

The devices that generate a spark, flame or glow capable of igniting gasoline shall not be installed or used within 0.5 m of the floor.

Equipment or machinery that produces or emits combustible or explosive dust or fibers shall be provided with an approved dust collecting and exhaust system.

The equipment or system that is used to collect or process or convey combustible dust or fibers shall be installed

with explosion venting or containment system.

2.17 REQUIREMENTS FOR OCCUPANCY M – MISCELLANEOUS BUILDINGS

Buildings shall be classified as Occupancy M in accordance with Sec 2.1.17.

2.17.1 General

The buildings or parts thereof classified as Occupancy M shall be limited to the type of construction set forth in Table 3.2.4 and shall comply with the requirements of Sections 1.8 and 2.4.2 to meet the requirements of height and area limitations.

Any building or portion thereof that exceeds the limitations provided in this Chapter shall be classified in the occupancy group other than M that it most nearly resembles.

2.17.2 Location on Property

The location on property for Occupancy M shall conform to Sec 2.4.1.

2.17.3 Access and Exit Facilities and Emergency Escapes

Access and exit facilities for Occupancy M shall comply with the specification set in Sec 1.6 Chapter 3, Part 4.

2.17.4 Lighting, Ventilation and Sanitation

All buildings or part of a building classified as Occupancy M shall conform to the provisions of Sec 1.16 Chapters 1 and 3, Part 8.

2.17.5 Shaft and Exit Enclosures

Elevator shafts, vent shafts and other vertical openings shall be enclosed with a construction of at least 4 hour fire resistance. Exit requirements shall comply with the requirements of Chapter 3, Part 4.

2.17.6 Fire Detection, Alarm, Evacuation and Extinguishment System

All buildings shall conform to regulations set forth in Part 4 of this Code.

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Table 3.2.6: A-Z List of Occupancy Classification

Use or Occupancy	Brief Description	Occupancy Class/Sub-class
------------------	-------------------	---------------------------

A	G or J depending on nature of materials involved	
---	--	--

	Adhesives manufacture Excluding manufacture of basic components...	
--	--	--

G		
---	--	--

	Advertising displays manufacture... Including repairs...	G
--	--	---

	Agricultural machinery	
--	------------------------	--

	manufacture, Without nuisance or sales limitation	H
--	---	---

	Agriculture Small farm house, (limited to storage quantity)	F
--	---	---

	Agricultural Large farm house, storage quantity unlimited...	H or J
--	--	--------

	Small grain processing unit, (limited to quantity)	G
--	--	---

	Aircraft manufacture (including Large grain processing unit, quantity unlimited... parts)...	G or J depending on nature of
--	--	-------------------------------

	Airports... materials and process involved	
--	--	--

	MIXED USE (depending on	
--	-------------------------	--

	Amusement parks, children's BNBC 2015 FINAL DRAFT(See children's amusement parks) detail requirement)	
--	---	--

	Amusement park activities... -	
--	--------------------------------	--

	Animal Animal hospitals...	I
--	----------------------------	---

	Animal pound (for stray and lost animal)...	F
--	---	---

	Antique stores... Animal crematorium...	H
--	---	---

	Apartments Killing establishments, for retail sales ...	G
--	---	---

Slaughtering, processing and packing... F
Apartment hotels... G
Apparel (see residential) F
Appliances in walkup buildings...
In high rises... A
Arenas, auditoriums, or stadiums in housing complex... A
Art Galleries A
(See clothing) A5
Art goods manufacture, religious Electrical appliance Manufacturing...
temple or church, excluding foundry Television, radio, phonograph or household G
operations... appliance stores, (Limited as to floor areas)... F
Art metal craft shops... Television, radio, phonograph or household
Art needle work... appliance stores, (Unlimited)... F
Household appliance repair shops...
See Assembly (Limited as to capacity)... F
See Assembly (Unlimited)... I
Commercial (sales included) I
With exhibition open to public viewing for limited F
period (sales included) I

Six occupants or less... G

More than six occupants (see industrial) F
Non-separated use to A1 and
A2 Occupancy

G

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Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Artist's supply stores... F
Asphalt or asphalt products Manufacture... J
Assembly Large assembly with fixed seats I1
Small assembly with fixed seats I2
Athletic equipment manufacture... Large assembly without fixed seats I3
Athletic goods stores... Small assembly without fixed seats I4
Auctions rooms, open to public... For sport facilities I5
Auditoriums G
Automatic laundries See assembly F
Automobiles I
Dead Storage... I
Automotive service stations Driving Schools... G
Awnings Glass or mirror shops... H
Washing... E
Bakeries Manufacture, including parts, or engine rebuilding... F
Rental establishments... K
Banks, Repairs, body... J
Banquet halls... Repairs, without body repairs... K

Bar, alcoholic Sales open or enclosed... K
Barber shops... Seat cover or convertible top establishments, selling K
Barns or installation... K
Showrooms, no repair services.... F
Supply stores, no repair services....
Tire sales establishments, limited to quantity... K
Tire sales establishments, unlimited... F
Wrecking establishments... F
Limited as to total area... J
Unlimited.... G
Custom shops K
Manufacture, with no limitation on production or on K
floor area ... H
G
B
non-separated use to main
Home-made, six or less occupants (baking included) occupancy

Large scale, more than six occupants (baking G
included)
Sales only F
Including drive-in banks... E
I
I
F
H

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Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Barracks (See residential) A4
Baths, steam... I
Beaches, commercial ... Bottling works ...
Beauty parlors... Manufacture, Alcoholic ... Not applicable
Beverages Non-alcoholic ... F
Manufacture ... G
Bicycle Rental or repair shops ... J
Sales... G
Billiard parlors G
Blacksmith shops small scale (limited to six occupants), repair or F
making F
Blueprinting establishments Unlimited... I
Boarding houses drawing printing F
Borstals (See residential)
Boatels G
Boats or ships Bailer works at port or dock G
Breaking A
Bone distillation... Building or repair, for boats less than 200 ft. in C
Botanical garden structures length... A
Book Building or repair, for boats 200 ft. or more in J

length... J
 Bottling works, for all beverages... Docks, for small pleasure boats ... J
 Bowling alleys... Fuel sales, open or enclosed
 Breweries... Un- restricted as to location... J
 Brick manufacture... Restricted as to location...
 Rentals opened or enclosed... Not applicable
 Sales opened or enclosed...
 Showrooms, with no repair services... F
 Storage, repair, or painting, including the incidental J
 sales of boats, boat parts, or accessories, with F
 restrictions on boat size and setbacks... F
 F
 Binding (see printing) G
 Hand binding or tooling...
 Store.... G or J depending on process or
 material used
 Limited as to number of lanes...
 Unlimited... M

G
 F
 G
 I
 I
 G
 J

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Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Brush or broom manufacture... G
 Building materials sales open or enclosed, limited as to lot area ... F
 Yards, for sales, storage, or handling, open or F
 Bungalow enclosed, unlimited as to lot area except in the case
 Business of lumber yards ... A
 (See residential) B1
 Bus stations Offices B2
 Research and testing laboratories B3
 Bus stops Essential services K (bus area) and I (passenger
 Business machines With less than 10 berths... area)

Business schools or colleges ... With 10 or more berths... MIXED (as per detail
 Buying house (garments) see Bus stations requirement including K and I)
 Café Manufacture...
 Small, repair shops... G
 Cafeteria Stores, sales, or rentals... F
 Camera and photo equipment F
 Camps, overnight or outdoor day ... storage restricted to sample B
 Candy stores E

Canneries, including food products C
 Canteen Non-separated use to main
 Canvas or canvas products Six persons or less Occupancy
 manufacture...
 Cargo terminal More than six persons (see mercantile) F
 With commercial kitchen MIXED (G and I)
 Carnivals, temporary... Without commercial kitchen
 Carpentry shops ... Manufacture... I
 Carpet G
 With or without cooking facility MIXED (A, I and other
 Carport depending on the nature of use)
 containing low fire-risk materials F
 containing moderate fire-risk materials J
 containing high fire-risk materials I
 G2
 Cleaning establishments....
 H
 Manufacture... H
 Carpet, rug, linoleum or other floor covering stores J
 Unlimited ... I5
 Roofed wall less shelter for car G
 J or G depending on the nature
 Automated mechanical parking of materials involved
 G
 F

K or H depending on the
 nature of use

K or H depending on the
 nature of use

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Catering establishments... Commercial kitchen G

Office E

Cattle shed, stables Storage, open or enclosed ... H

Cement manufacture ... Storage for temporary structure's fabrication J

Cemeteries... material

Ceramic products ... H

Manufacture G2

Chamber, doctors' or dentists', H

(outpatient only) Display and sales G or J based on nature of

Charcoal manufacture... 50 or less occupants material used

Chemicals above 50 occupants F

E

Child care home Compounding or packaging... D

Child care institution G

Children's amusement parks Manufacture... G or J depending on nature of

materials involved

Churches, with fixed pews Small... G or J depending on nature of

Cigar stores... Medium size... materials involved

Cinema hall Large size.... C

Cineplex Unlimited as to size... C

Circuses, temporary... (See Assembly with fixed seats) I

Class room I

Clay manufacture ... (See Assembly with fixed seats) I

Clay pits... (See Assembly with fixed seats) I

Cleaning or cleaning and dyeing (See Assembly) I

establishments School, college or university F

Clinics I

(See dry cleaning).... I

Coaching centre With inpatient I

Cold storage Only outpatient, limited to quantity (see chambers, B

Composite textile mill doctors' or dentists') G

Only outpatient, unlimited Not applicable

With diagnostic facilities (see diagnostic facilities)...

Government community clinic D

(See educational facilities)

D

E

B

H

G or J depending on nature of

material and process used

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General Building Requirements, Control and Regulation

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Cottage industries Small, fifty or less workers...(see industrial facilities) G1

Large, more than fifty workers... (see industrial

Clock facilities) G1 or G2 depending on the

Clothing nature of material and process

Manufacture... used

Clubs Non-commercial (members Stores or repair shops...

only) Accessory stores G

Custom manufacture or altering for retail... F

Clubs, for public use Manufacture... F

F

Clubs, Sporting Rental establishments... G or J depending on nature of

Coal Store, Limited as to floor area... the material involved

Store, Unlimited...

Coin stores... Including accommodation F

Condensed and powdered milk Night-club F

Coke products All types except those with outdoor swimming F

Colleges or universities pools... MIXED (A and I)

Colony, government or non- Excluding accommodation I

government Including accommodation

I

Products manufacture... MIXED (I and A or other

Sales, open or enclosed, Limited as to plot area... occupancies depending upon

Unlimited (see coal storage) nature of use)

Storage, open or enclosed ... MIXED (I and A or other

occupancies depending upon

Manufacture... nature of use)

Manufacture...

See educational facilities J

J

J

J

F

J

J

B

MIXED (A and other occupancies

depending on use)

Commercial building (see business and/ or mercantile) K

Commercial parking garages or plots (See garages) MIXED (G and I)

Community centers... With commercial kitchen

Without commercial kitchen I

Concrete batching G

Concrete products manufacture Manufacture, including repairs.... G

Construction machinery G

Container terminal H or J (According to the hazard

classification regulation of the

port authority)

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class

Contractors' establishments Electrical, glazing, heating, painting, paper hanging, F
plumbing, roofing, or ventilating

Not applicable

Convalescent homes Contractors' yards...

Convents (See nursing homes) MIXED (A, B and I)

Cork products G

Cosmetics or toiletries Manufacture... J

Costume rental establishments... Manufacture... F

Cottage, tourist A5

Cotton ginning or cotton wadding or (See residential) J

liner manufacture...

Court houses... I

Crate manufacture G or J depending on the
material and process involved

Crematoriums Animals.

Cultural center Human. J

BNBC 2015 FINAL DRAFT MIXED (J and I)

D Mixed (depending on detail requirement)

Dance halls Public

Dance School I

Dance studios (see studios) A

Day camps, outdoor

Day care Centre With six or less children I

Non-separated use to

Decorator's establishment More than six children Residential Occupancy Office

Defense Buildings, for critical Storage, separated C national defense capabilities E

Delicatessen stores (See food stores) H or J depending upon the

Dental Instruments manufacture... material involved

Laboratories (See laboratories, medical or dental) Not Applicable

Department stores... not exceeding 300 m² more than 300 m² F

Diagnostic facilities, medical Outpatients only G

Diaper supply establishments...

Disinfectants manufacture... Attached to hospital F1

Dispensaries See drug store F2

Universities or colleges (above 12 grade) D

Dormitories Schools (12 grade or below) H

Manufacture... G

Drafting instruments L

Dressmaking shops, custom... F

A

C

G

F

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General Building Requirements, Control and Regulation

Use or Occupancy Brief Description Occupancy Class/Sub-class

Drinking places, non-alcoholic

Drive-in theaters... (See cafe) I

Drug stores... F

Dry cleaning or clothes pressing Limited as to floor area, solvents and machine G or J depending on the establishments capacity... process and quantity of

Dry cleaning or cleaning and dyeing material used establishments Without restrictions... G or J depending on the

Dry Cleaning, using other than process and quantity of flammable liquids in cleaning or material used dyeing operations

Dry goods stores G

Dumps Limited as to floor area... F

Dyeing facilities/ industries Unlimited... F

Not applicable
Eating or drinking places J
BNBC 2015 FINAL DRAFT
Eco park structures E I
Educational facilities I
With restrictions on entertainment (see Assembly)
Electric Without restrictions on entertainment or dancing but I
limited to location in hotels (see Assembly) MIXED (depending upon the
Electrical Appliance Without restrictions (See assembly) nature of use)

Electronics manufacturing Up to higher secondary level B1
Electrolysis works Training and above-higher-secondary education B2
Electrotyping or stereotyping Pre-school facilities B3
Power or steam generating plants ... G
Embassy or High-commission or Substations, Public transit or railroad G
Consulate Substations, as part of public distribution system G
Engine Substations, low to medium voltage step down, at L
Engraving or photo-engraving consumers' end
Manufacture ... G or J depending upon the
process or material to be used
Stores (including television, radio, phonograph or
household appliances) F

Contractors (See contractors' establishments) G

Equipment assembly, not including electrical
machinery...

Supplies, manufacturing..... G
J
Limited to quantity J
Unlimited (see printing) F
G
including rebuilding or reconditioning MIXED (depending on detail
Limited to quantity requirement)
J
F

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class
Excelsior manufacture Unlimited (see printing) G
Exhibition hall J
Exterminators See assembly I
See pest control F
Fabric stores
Factory F F
G or J (depending on process
Fairs, temporary Bulk processing, washing, curing, or dyeing and material involved)
Feathers Products manufacture, except washing , curing or

dyeing MIXED (I and F)
Felt Bulk processing, washing, curing, or dyeing J
Products manufacture, except washing, curing or J
Fertilizer manufacture dyeing
Field hospital, temporary G
With provision for ambulance access (to parks and G
play grounds)
BNBC 2015 FINAL DRAFT J
E

Filling stations (See refueling station) B
Manufacture G
Film, photographic E
(see residential) G
Fire Stations In walkup buildings... F
In high rises...
Fish products, packing or processing in housing complex A
A
Fishing tackle or equipment rental A
or sales MIXED (A and other
Flats occupancies)
F
Florist shops Products processing, except meat slaughtering or G
Food preparation of fish for packing
F
Stores, including supermarkets, grocery stores, meat
markets, or delicatessen stores

Foundries Ferrous or non-ferrous G or J (depending on process
(See colleges or universities) and material involved)
Fraternity houses See storage and hazardous buildings
Freight depot H and/or J
Frozen food lockers Limited up to exempted quantity J
Fuel briquettes manufacture Unlimited, See coal storage or petroleum storage G
Fuel sales, open or enclosed F
Goods manufacture, not including tanning or dyeing J
Funeral establishments I
Fungicides manufacture G
Fur G

Tanning, curing, finishing, or dyeing... J

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Part 3
General Building Requirements, Control and Regulation

Use or Occupancy Brief Description Occupancy Class/Sub-class
Furniture Custom shop, floor area of 100 m² or less F

Custom shop, floor area over 100 m² G

Manufacture... J or G depending upon nature
 of materials involved
 Store, Limited as to floor area...
 Store, Unlimited ... F
 F
 Furriers shops, custom G F
 Freight depot H or J depending on the nature
 Parking garage of material involved
 Garages
 Private garage K1
 Garbage incineration or reduction K2
 Garden shed Repair garage and show-rooms K3
 Garden supply stores G
 Gardens, truck BNBC 2015 FINAL DRAFT(See agriculture) M
 Garments industries F
 Gas, fuel Manufacture...
 Distribution regulatory system (DRS) G
 Gas manufacture for Medical purpose J
 Hot-works (welding) G
 Gasoline service stations (See refueling stations) J
 Gelatin manufacture J
 Generating plants, electric or steam Cutting shops...
 Gift stores Manufacture... G
 Glass Products manufacture from previously manufactured G
 glass... F
 Glazing contractor's establishment (See contractors' establishments) F
 Glue manufacture G
 Godown See storage buildings G
 Golf Courses...
 Courses, miniature..... F
 Grain Driving ranges G
 Milling or processing....
 Graphite or graphite products Storage... Not applicable
 Gravel pits Manufacture... I
 Grocery stores I
 Group homes Segregation of occupants on the basis of age group J
 and disabilities (See institutional) J
 G

 Not applicable
 F
 C

 Gypsum production industry J

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class
 Gymnasiums Less than 300 occupants I
 300 or more occupants I

Hair Commercial without spectator gallery (max 50 occupants) G
 Hall, for incidental show (picture, G drama, theatre...) H
 Hardware G
 Bulk processing, washing, curing, or dyeing I
 Hazardous buildings Products manufacture (except washing, curing, or dyeing) G
 Health centers F
 Products manufacture, custom G
 (See assembly) F
 J1
 Manufacture... J2
 Stores... J3
 Bodies manufacture... J4
 Repair shops... D
 Explosion-hazard building E
 Chemical-hazard building E or D (depending upon the Biological-hazard building facilities)
 Nuclear-hazard building D1
 With inpatient D2
 Without inpatient (not more than 50 occupants) I
 Government operated health centers
 BNBC 2015 FINAL DRAFT F
 Healthcare facilities Normal medical facilities
 Emergency medical facilities G
 Health club G
 Heating contractor's establishment (See contractors' establishments)
 Heat, ventilation and air- Without repair facilities... Non-separated use of conditioning equipment showrooms Occupancy A

 Heliports See embassy G
 Hemp products manufacture... of the old and infirm (see institution) D
 High Commission of mentally disabled (see institution) D
 Home for care Not more than 6 occupants D
 D
 Home office D
 A
 Hosiery manufacture As part of disaster preparedness program C
 Hospital, except animal hospital Casualty unit A
 Emergency unit
 Hostels Non-profit or voluntary, and related facilities...
 Hotels Proprietary and related facilities...
 For adults
 For children
 Transient...

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Part 3
 General Building Requirements, Control and Regulation

Use or Occupancy Brief Description Occupancy Class/Sub-class

Apartment hotel A

Household Starred hotel

Appliance repair shops... MIXED

Housing, complex multi-storied Appliance stores (See appliances television, radio, F

Housing, cluster phonograph, or household appliance stores) F

Housing, low-income

Housing, minimum standard I MIXED (see appendix)

Housing, rehabilitation MIXED (see appendix)

Manufacture, dry or natural..... MIXED (see appendix)

Ice cream stores... MIXED (see appendix)

Ice MIXED (see appendix)

Incineration or reduction of BNBC 2015 FINAL DRAFTSales, open or enclosed Limited as to lot area... F
garbage, offal, or dead animals... Unlimited G or J (depending on the

Indoor facility, for amusement park process or material used)

Industrial buildings Low-hazard Industries

Moderate-hazard Industries F

Infirmaries F

Ink or inked ribbon manufacture G

Inns See residential I

Insecticides manufacture G1

G2

Institution For care of children C

Custodial, for physically capable adults G or J depending on nature of

Institutions, philanthropic or non- Custodial, for physically incapable adults materials involved
profit Penal or mental, for children A

Interior decorating establishments Penal or mental, for adults G or J depending on nature of
With sleeping accommodations..... materials involved

Irradiation plant Without sleeping accommodations... C1

Jail Limited as to floor area for processing, servicing, or C2

Jewelry repairs C3

C4

Junk Yards Unlimited, see furniture, textiles or upholstering C5

A

J

F

see prisons

F

Manufacture... J

Costume... G

G

From precious metals... G

F

Shops... Not applicable

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class

Jute products manufacture... G or J (depending on quantity

For children (see assembly) or process)

Juvenile correctional center

K H

Kennels B

Kindergarten See educational facilities G2

Knitwear industries

L E

Laboratories

Medical or dental, for research or testing, with (G or J) and H depending on limitations on objectionable effects... process or material used in

Research, experimental, or testing, unlimited... compliance with safety standards

Radiological laboratory, see radiological facilities

Pathological laboratory G (in compliance with safety

Microbiological laboratory, for diagnostic facility standards)

G or J depending on process or

Microbiological laboratory, for research material used in compliance with safety standards

Microbiological laboratory, for academic facility G or J depending on process or BNBC 2015 FINAL DRAFT material used in compliance

Lampblack manufacture... see public toilet with safety standards

Laundries, with no limitations on Tanning, curing, finishing or dyeing... G or J depending on process or type of operation... Goods stores... material used in compliance

Laundry establishments, hand or Products manufacture... with safety standards

automatic self-service... Reading area (see assembly)

Lavatory, public Stack area (see storage) G

Leather Reading and stack area combined G

For children (see institutional)

Libraries... For adults (see residential) G

Lillah boarding Manufacture... J

Stores (See carpet stores)... F

Linen supply establishments... G

Linoleum Storage, more than six castles I

Slaughtering or preparation for packing... H

Liquor stores, package... MIXED (I and H)

Livestock C

A

J

F

H

G

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Part 3

General Building Requirements, Control and Regulation

Use or Occupancy Brief Description Occupancy Class/Sub-class

Loan offices... E

Locksmith shops... See residential F

Lodging Manufacture... A

Luggage Stores... G

Lumber Processing or woodwork, bulk... F

Sales, Limited as to lot area G

Machine Sales, Unlimited... G

Machinery Yard, Limited as to lot area... G

Yard, Unlimited... G

G

M

G

Shops including tool, die or pattern making... G

Tools manufacture... G or J depending on material

Manufacture or repair, Heavy... and process

BNBC 2015 FINAL DRAFT G or J depending on material

Miscellaneous or electrical equipment... and process

F

Rental or sales establishments... F

Repair shops... H

F

Machines, business (See business machines) F

F

Madrasa (See institution) J

J

Manure storage

F

Markets Retail, including meat (See mercantile) F

G

Wholesale, produce or meat (See mercantile) G

G

Masseurs F

G

Matches manufacture

E

Mattress manufacture, rebuilding or Markets, Retail (See food stores)...

renovating E

Meat I

Markets, Wholesale... J

J

Medical Slaughtering or preparation for packing...

Appliances, Custom manufacture...

Appliances, Manufacture...

Stores...

Instruments, manufacture...

Laboratories (See laboratories, medical)

Offices or group medical centers, Limited as to location within building...

Meeting halls Offices or group medical centers, Unlimited...

Mess houses See Assembly

Metal Fabrication industry (See residential)

Metal Assembly industry

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class

Metals manufacture Alloys or foil, miscellaneous... G

Casting or foundry products, heavy.... G

Metal institution Finishing, plating, grinding, sharpening, polishing, G

Metal hospitals cleaning, rust proofing, heat treatment, or similar

Mercantile processes... G

Mill Ores reduction or refining... G

Products treatment or processing... G

Reduction, refining, smelting, or alloying... G

Stamping or extrusion... G

Treatment or processing... D

Without detention facilities C

(See institution) F1

Small shops and markets F2

Large shops and markets F3

Refueling station G or J (depending on material

(See industrial and/ or hazardous buildings) or process)

BNBC 2015 FINAL DRAFT J

Mill works, and woodworking,
wood distillation and particle boards F

manufacturing G

Millinery shops G

M1

Mining machinery manufacture Including repairs... M2

MIXED

Mirror silvering shops F

Miscellaneous buildings Special structures G

I

Fences, tanks and towers A

MIXED (G and other

Monasteries Occupancies as required)

G

Monument Sales establishments, with incidental processing to G
order... G

Works, with no limitations on processing... F

K

Mosque (See assembly)

H

Motels (See residential) K

K

Motion picture production and Manufacture... I
filming facilities I

Motorcycles F

Repairs, body...

Repairs, except body repairs...

Sales open or enclosed...

Showrooms, with no repair services(See garage)

Motor freight stations See truck terminals

Motor vehicles Dead storage...

Moving or storage offices, Limited as to storage

Unlimited

Movie theatre See assembly

Museums See assembly

Music stores

Music studios See studios

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General Building Requirements, Control and Regulation

Use or Occupancy Brief Description Occupancy Class/Sub-class

Musical instruments Manufacture, Excluding pianos and organs... G1
G2

Newspaper publishing Including pianos and organs... G1

Newsstands, open or closed Repair shops... MIXED (G and E)

Novelty products manufacture G

Novitiates... N E

Nuclear medicine facilities F

Nuclear plant Printing G

Nurseries Office A

Nursing homes

See institution J

Nursery schools see radiological facilities

Oakum products manufacture.... C or D depending on the type

Office equipment or machinery See agriculture of occupants and nature of use
repair shops... Philanthropic or non-profit... C or D depending on the type

Office or business machine stores of occupants and nature of use
Offices BNBC 2015 FINAL DRAFTPrivate
See pre-school B
Offices, small
O G
Oil cloth manufacture... F
Oil sales, open and enclosed
sales or rental F
Old home E
Optical General E
Orphanage
Optician or optometrist Business, professional or Governmental...(see E
establishments business occupancy) E
Orthopedic Dental, medical, or osteopathic (See medical offices)
Wholesale, with storage restricted to samples (see Non-separated use of
Osteopathic offices business occupancy) Occupancy A
Architect's/ engineer's/ consultant's (Limited to six E
occupants)
Architect's/ engineer's/ consultant's (more than six J
occupants) F
J
Limited as to lot area.....
C
Unlimited (See petroleum or petroleum products G
storage)... G
See institution C
F
Equipment manufacture...
Goods manufacture...

See institution

Appliances, Custom manufacture... G

Manufacture... G

Stores... F

Instruments, manufacture... G

(See medical offices)

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class

Packing or crating establishments P G2

Packing materials manufacture.... G2

Pagoda See Prayer hall

Paint Manufacture... J

Stores, limited to quantity... F

Painting contractors Stores, unlimited... H

Paper (See contractors' establishments)
 Mills (See wood pulp or fiber)... G
 Paper-hanging contractors Products manufacture... G
 Parish houses Stock companies... H
 Parks, public or private... (See contractors' establishments)
 A
 Park structures With provision for emergency vehicle access as part Not applicable
 Parking garages, public of disaster preparedness program
 Parking lots, public M
 Passenger stations and terminals See garage, parking K
 See garage, parking K
 Small, passenger station MIXED (depending on nature
 BNBC 2015 FINAL DRAFT of use)
 Large, passenger station or terminal MIXED (depending on nature
 of use)
 Passenger and freight terminal MIXED (depending on nature
 of use)
 Peat storage compounding only, not including soap manufacture H
 Perfumed or perfumed soaps J

 Pest control Exempted quantity only F
 Pet shops F
 Petrol pump See refueling station F
 Petroleum or petroleum products Refining... J
 Storage and handling... J
 Pharmaceutical products G or J depending on nature of
 manufacture Repair shops... materials used
 Philanthropic, religious or non-profit Stores (See appliances)... MIXED (depending on nature
 activities Binding limited in quantity... of use)
 Phonograph Developing or printing establishment, Retail F
 Developing or printing establishment, Wholesale, F
 Photocopying and book binding Limited as to floor area F
 Photographic Developing or printing establishment, Wholesale, F
 Unlimited H
 Equipment, Manufacture (film)
 Equipment, Manufacture (except film) H
 Stores
 Studios J
 Supply stores (limited to exempted quantity) G
 F
 F
 F

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General Building Requirements, Control and Regulation

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class
 Photostatting establishments F
 Physical culture establishments Products, manufacture..... I
 Picture framing stores Raw, manufacture..... F

Plants, Industrial (See printing) G
 Plants, Refrigeration With provision for emergency vehicle access as part G
 Plastics of disaster preparedness program J
 (See parking lots, public) J
 Plate making Contractors' establishments
 Playgrounds Equipment manufacturer (See tools or hardware I
 manufacturing)
 Plots, parking Showrooms, without repair facilities... F
 Plumbing
 Storage (live) F
 Police Stations Killing establishments, for retail sales on the same E
 Pool halls zoning lot only... I
 Porcelain products manufacture Packing or slaughtering... G
 Post offices E
 Poultry As part of national grid power distribution system H
 At consumer's end G
 Power plant See assembly
 Power stations Optical equipment, clocks, or similar products... G
 Medical, dental, or drafting instruments, optical G
 Prayer hall goods, or similar products... E
 Precision instruments manufacture See educational L
 I
 Pre-school facilities See printing G
 Press club, for journalist See educational G
 Press, printing Custom...
 Primary schools Limited as to floor area... I
 Printing Unlimited...
 G
 Printing, publishing, dyeing and See jail G
 printing industries G
 Prisons With detention facilities (see institution) J
 Produce or meat markets,
 wholesale With printing C
 Psychiatric sanatoria Without printing F
 Public auction rooms Water or sewage (for city supply system)
 Public transit yards Dedicated to consumer MIXED (F and/or I)
 Publishing Not applicable
 G
 Pumping stations E
 G
 U

Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Quarter, Staff

Racetracks Q A or Mixed (See appendix)

Radio

Government or non-government I

Radio station F

Radiological facilities, medical R F

Radioactive waste disposal services Non-separated use to main

Railroad Appliance repair shops... Occupancy

Stores... E

Rail station Studios, with less than six occupants

Record stores Studios, without transmission tower... M

Recreation centers, non-commercial Studios, with transmission tower(see radio station) Mixed (depending on the type

Recreation piers Towers, non-accessory... of use)

Recreational vehicles manufacturing

Rectories In compliance with the standard of atomic energy D

Reducing salons commission

Reformatories J

Refreshments stand, drive-in... Equipment manufacture, including railroad cars or G or J depending on the

Refrigerating plants locomotives... material and hot-work used

Refueling station Passenger stations...

Refuse incinerators Right-of-way... I

Religious or church art goods Substations... Not applicable

manufacture..... Small or medium size...

Research establishment Large... G

Residences Railroads, including rights-of-way, freight terminals, G
yards or appurtenances, or facilities or services used Not applicable
or required in railroad operations, but not including
passenger stations... Mixed (depending on the type
of use)

See assembly

F

See institutional facilities I

I

Petroleum product storage within exempted quantity J

A

dealing with non-hazard or low hazard materials only I

Single-family detached...

One-family semi-detached or two-family detached or I
semi-detached... G
Boarding or rooming houses... E
Rest homes (See nursing homes) J
G

E
A
A
A

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Part 3 General Building Requirements, Control and Regulation

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Residential Single family dwelling A1
Two family dwelling A2
Rest Houses Flats or apartments A3
Restaurant Mess, boarding house, dormitories and hostels A4
Hotels and lodging houses A5
Reviewing stand
Riding academies, open or enclosed Dining area I
Roofing contractors' establishments Performing area, limited I
Rooming houses Kitchen and storage L
Rubber I
See residential E and H
Rug stores Processing or manufacture, natural or synthetic F
Products manufacture (excluding all natural or A
Sail-making establishments synthetic rubber processing) J
Salvage storage (See carpet stores) J
Sand pits
Saloon, hair dressing S F
Sanatoriums H
With detention facilities (see institution) Not applicable
Sawmills Without detention facilities F
Scenery construction C
School (see educational) Dormitories, for children D
Nursery, kindergarten, elementary or secondary G
schools G
Trade or other schools for adults, limited as to C
objectionable effects... B
Trade schools for adults, unlimited....
For physically challenged, without accommodation B
For mentally challenged, without accommodation
B
Scrap metal, paper and rag storage See educational B
For 50 or more occupants, See assembly B
Secondary school (see housing)
H

Seed stores B
F
Seminar halls I
Seminaries B
Settlement houses MIXED (A and other Occupancy
depending on the nature of use
Sewage Disposal plants... G
Pumping stations... G
Sewing machine stores, selling F
household machines only.....
Ship chandlers, candle shops F

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy BNBC 2015 FINAL DRAFT Brief Description Occupancy Class/Sub-class

Ship or boat building or repair yards For ships 200 ft. in length or over.... G

Shipping, waterfront Manufacture...

Shoes Repair shops... Not applicable

Stores... G or J depending on the

Shops see definition process and material involved

Shop-house Limited as to floor area... F

Unlimited... F

Sign painting shops F or G (depending on the

Indoor... process and material involved)

Silk processing and spinning Outdoor... mixed occupancy (A and F) or

Silo, for storage of grain (A, F and G)

Silver plating shops, custom... Manufacture, including fat rendering... G

Silverware manufacture, plate or Packaging only... G

sterling J

Sisal products manufacture (See hostel) H

Skating rinks, roller G

Indoor or outdoor, with access for emergency vehicle G

Slag piles as part of disaster preparedness program

Slaughtering of animals or poultry... see quarter, staff J

Soap or detergents Rail, bus, air and water way I

I

Soldering shops... Miscellaneous fabrication or assembly (without hot- Not applicable

Solvent extracting... work)... G

Sorority houses Structural products manufacture... J

Sports centre G

Sporting equipment manufacture. G

Sporting goods stores... J

Stable for horses... A

Stadiums I

G

Staff quarter F

Stamp stores... H

Station I

Stationary stores... F
Statuary, mannequins, figurines, MIXED (I and other Occupancy
religious or church art goods depending on the nature of use
manufacture, excluding foundry
operations... F
Steel products G

Stock yards or slaughtering of G
animals or poultry
Stone processing or stone products J
G

G

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Use or Occupancy Brief Description Occupancy Class/Sub-class
Storage buildings Low-fire-risk storage H1
Moderate-fire-risk storage H2
Storage facilities Wholesale (see storage buildings)... H
Offices, limited to quantity
Stores For cotton/jute/ paper/textile Non-separated use
Students' halls of residence See definition J
For children F
Studios For adults C
Music, dancing, or theatrical... A
Sugar Radio... (see radio studio) I
Super market Television, with spectator...
Swimming pools Television, without spectator... MIXED (I, E or G)
MIXED (depending on nature of
Table tennis halls... Production and Refining... material and process involved)
Tailor shops, custom...
Tanning (See leather or fur)... BNBC 2015 FINAL DRAFTSee mercantile J
Tapestries manufacture... F
Tar products manufacture... Commercial... I
Taxidermist shops... I
Telegraph offices... Non-Commercial (See clubs)....
Telephone exchanges or other I
communications equipment T F
structures... J
Television See assembly G
G
Television station F
E
Temple E
Tennis courts, indoor....
Terminal facilities at river crossings Repair shops... F
for access to electric, gas, or steam Stores (See appliances)... F
lines... Studios (see television studios)

Test laboratory Towers, non-accessory... M
Textiles See business MIXED (E3 with other
Occupancies according to
Textile industries and jute mills See prayer hall... detail requirement)
Theater
I
G

involving low hazard material E
Bleaching (see industrial)... G
Products manufacture (see industrial)... G
G
Spinning, weaving, manufacturing, dyeing, printing,
knit goods, yarn, thread, or cordage (see industrial)... J

including canvas, cotton cloth, bagging burlap, carpet I
and rags (see industrial)
See assembly

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class
Theaters, drive-in..... (See studios)
Theatrical studios without spectator G
Tile Manufacture G
Tire sales establishments Including installation services, Limited to quantity F
Including installation services, unlimited quantity J
Tobacco Curing or manufacture, or tobacco products J
manufacture....
Toilet, public Stores (retail)... F
Toiletries manufacture L
See industries G or J depending on the
Tool or hardware manufacture... See storage material and process involved
Topsoil storage... See residential
Tourist cabins... G
Towel supply establishments... Manufacture... H
Toys Stores... A
Limited as to objectionable effects (see educational) F
Trade or other schools for adults G
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B

Trade expositions Unlimited (see educational)... B
Trailer, truck, bus Limited as to rated capacity...
Unlimited... I
Training center Manufacture, including parts...
I
Transit substations Repairs, body...
Transport terminal G or J depending on the
Sales open or enclosed... material and process involved

Travel agency Showrooms, with no repair services....
 Travel bureaus lecture based, limited to quantity(see educational G or J depending on the
 Truck facilities) material and process involved
 vocational or demonstrative (see educational
 facilities) F
 Small or medium size... F
 Large... E1 or B2
 Small or medium size...
 B2
 Large...
 G
 (see business) G
 (see business) MIXED depending on nature of
 Manufacture (including parts) or engine rebuilding... use
 MIXED depending on nature of
 Repairs, body... use
 Repairs, except body repairs... E
 Sales open or enclosed... E
 Showrooms, with no repair services... G or J depending on the
 Trucking terminals or motor freight stations, Limited material and process involved
 as to lot area... G
 Trucking terminals or motor freight stations, G
 Unlimited... F
 F

K1

K1

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Use or Occupancy Brief Description Occupancy Class/Sub-class

Tutorial homes More than six occupants (see educational) B

Turpentine manufacture.... J

Typewriter stores... F

Typewriter or other small business F

machine repair shops...

Typography (See printing)

Umbrellas U

University Manufacture... G

Upholstery F

Repair shops... B2

Utility J

See educational facilities J

Variety stores

Manufacturing

Varnish manufacture

Vehicles Bulk, including shops not dealing directly with consumers...

Venetian blind, window shade, or awning Shops dealing directly with consumers, retail... F

L

Ventilating contractors V

Ventilating equipment showrooms F

Video games shop Limited as to floor area... F

Vihara, Buddhist Unlimited... J

H

Wallpaper stores Dead storage of motor... G

Warehouses Manufacture, children's... K

Storage, commercial or public utility, open or

Watch or clock stores or repair enclosed...

shops BNBC 2015 FINAL DRAFT

Watch making Custom shops, limited as to floor area... F

Waterfront shipping Manufacture, with no limitation on production or on J or G depending upon nature

Water pumping stations floor area... of materials involved

(See contractors' establishments)

Water tank tower Without repair facilities..... F

Wax products manufacture... F

Weaving, hand... with occasional or regular assembly F
mixed use

W

H

Limited to quantity H or J (depending on the
nature of material stored)

F

At distributor's end G

At consumer's end Not applicable

Up to six hand-weaving machines G

More than six hand-weaving machines L

M

G

Non- separated use to main

Occupancy

G

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Classification of Buildings Based on Occupancy Chapter 2

Use or Occupancy Brief Description Occupancy Class/Sub-class

Wedding chapels... See assembly I

Arc welding only G

Welding shops...

Gas welding within exempted quantity G or J depending upon the
quantity of material and process

Welfare centers...

Wholesale establishments H or J depending upon the nature of material
Wholesale offices or showrooms, with storage restricted to samples... E

Window manufacture Custom shops, limited as to floor area... G
Window shades F
Manufacture, without limitation on production or on floor area... G

Wood Bulk processing or woodworking... G
Distillation... G
Products manufacture... G
Pulp or fiber, reduction or processing, including paper mill operations....
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Wool scouring or pulling... Sales, open or enclosed, Limited as to lot area... F
Workshops Unlimited (See lumber yards)... F
Woodworking shops, custom... J or G depending upon nature
X-ray facilities of materials involved
With hot-works G
Yard Without hot-works J
Yard, ship G
Yarn, manufacturing X
Not applicable
Zoo structures See radiological facilities
G or J depending on the
Y quantity (see Table 3.2.5)

See ship or boat building or repair yards M

Z

** The occupancy classification for any project, not included in this list, shall be determined through the following process:

- i. The functional requirements of the unidentified occupancy shall be compared with the Occupancy use type, classification, sub classification categories and descriptions to match with the given occupancies to find the most similar Occupancy,
- ii. If process (i) fails to determine the Occupancy, the project will be referred to the Board of Appeal constituted as per directives of Part 2 Chapter 2. The Board of Appeal shall determine the Occupancy, and
- iii. The decision of Board of Appeal shall be considered as an explanatory material of this Code and shall be added as addendum to this Code. For any future projects of similar nature this addendum will suffice and need not be referred to the Board of Appeal again.

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Chapter 3

CLASSIFICATION OF BUILDING CONSTRUCTION TYPES BASED ON FIRE

RESISTANCE

3.1 GENERAL

3.1.1 Classification by Type of Construction

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For the purpose of this Code, every room or space of a building or a building itself hereafter altered or erected shall be classified in one specific type of construction as grouped as follows:

GROUP I: Noncombustible, subdivision:

Type I-A: 4 hour fire protected

Type I-B: 3 hour fire protected

Type I-C: 2 hour fire protected

Type I-D: 1 hour fire protected

Type I-E: Unprotected

GROUP II: Combustible subdivision:

Type II-A: Heavy timber

Type II-B: Protected wood joist

Type II-C: Unprotected wood joist

Type II-D: Protected wood frame

Type II-E: Unprotected wood frame

The fire resistance ratings of various types of construction for structural and nonstructural members are specified in Tables 3.3.1 (a) and (b). For hazardous Occupancies involving an exceptionally high degree of fire risk or an exceptionally high concentration of combustible or flammable content, the Authority may increase the requirement of Table 3.3.1 (a).

Buildings having a height of more than 33 m shall be constructed with noncombustible materials.

The fire resistance ratings of various building components shall conform to ASTM standards.

No building or portion thereof shall be designated a given construction type unless it fully conforms to the minimum requirements for that Construction type.

When a type of construction is utilized which is superior than the type of construction required by this Code, there shall be no requirement to upgrade the rest of the construction to comply to that higher type of construction and the designated construction type shall be that of the lesser classification, unless all of the requirements for the higher classification are met.

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3.1.2 Group I: Non-Combustible Construction

Buildings or portion thereof in Non-combustible Construction Group I are those in which the walls, exit-ways, shafts, structural members, floors, and roofs are constructed of non-combustible materials and assemblies having fire-resistance ratings specified in Table 3.3.1 (a). The Non-combustible group consists of Construction Type I-A, I-B, I-C, I-D and I-E.

3.1.2.1 Construction Type I-A

This construction type includes buildings in which the bearing walls and other major structural elements are generally of four-hour-fire-resistance rating.

3.1.2.2 Construction Type I-B

This construction type includes buildings in which the bearing walls and other major structural elements are generally of three-hour-fire-resistance rating.

3.1.2.3 Construction Type I-C

This construction type includes buildings in which the bearing walls and other major structural elements are generally of two-hour-fire-resistance rating.

3.1.2.4 Construction Type I-D

This construction type includes buildings in which the bearing walls and other major structural elements are generally of one-hour-fire-resistance rating.

3.1.2.5 Construction Type I-E

This construction type includes buildings in which the bearing walls and other major structural elements generally have no fire-resistance rating.

3.1.3 Group II: Combustible Construction

Buildings or portion thereof in Combustible Construction Group II are those in which the walls, exit-ways, shafts,

structural members, floors, and roofs are constructed wholly or partly of combustible materials having fire-resistance ratings specified in Table 3.3.1 (b). The Non-combustible group consists of Construction Type II-A, II-B, II-C, II-D and II-E.

3.1.3.1 Construction Type II-A

This Construction type includes heavy timber construction in which fire-resistance is attained by-

- (a) Limiting the minimum sizes of wood structural members and the minimum thickness and composition of wood floors and roofs;
- (b) Avoiding concealed spaces under floors and roofs or by providing fire-stopping protection for these spaces; and
- (c) Using fastening, construction details, and adhesives for structural members as required by this Chapter and Part 4.
- (d) The minimum dimensions for framing members shall be prescribed in this Chapter and Part 4, except that members are protected to provide a fire-resistance rating of at least one hour need not comply with this requirement.

3.1.3.2 Construction Type II-B

This Construction type includes buildings and portion thereof in which

- (a) Exterior walls, fire walls, exit-ways, and shaft enclosures are of non-combustible materials having the required fire-resistance ratings; and
- (b) The floors, roofs and interior framing are wholly or partly of wood of smaller dimensions than required for type II-A construction, or are of other combustible or non-combustible materials, having the required fire-resistance rating.

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Classification of Building Construction Types Based on Fire Resistance Chapter 3

Table 3.3.1 (a): Fire Rating for Construction Group I: Non-Combustible

Exterior wall Construction TYPE	-I-A TYPE	-I-B TYPE	-I-C TYPE	-I-D TYPE	-I-E
with Fire Element Ratings	Exterior Ratings	Exterior Ratings	Exterior Ratings	Exterior Ratings	Exterior
Separation Exterior Wall in Hours	Openinga,b in Hours	Openinga,b in Hours	Openinga,b in Hours	Openinga,b in Hours	Openinga,b in
Distance of Hours	Openinga,b				

0.9m or less Bearing 4 N.P 3 N.P 2 N.P 2 N.P 2 N.P

Non-bearingf 2 2 2 2 2

More than 0.9m Bearing 4 3 2 2 2

but less than Non-bearingf 2 as per 2 as per 2 as per 2 as per 2 as per
4.5m provisions provisions provisions provisions provisions of

4.5m or more Bearing 4 of this 3 of this 2 of this 1 of this 0 this Code
but less than Code Code Code Code

9.0m Non-bearingf 1½ 1½ 1 1 0

9.0m or more Bearing 4 N.L 3 N.L 2 N.L 1 N.L 0 N.L
Non-bearingf 0 0 0 0 0

Interior bearing walls and 4 3 2 1 0g,i
bearing partitions

Enclosure of vertical exitse, exit

passageways, hoistways and 2 2 2 2 2
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shafts

Fire divisions and fire barrier See Table 3.2.1 and provisions of this Code
Walls or partitions or ceiling slab

Columnsk, Supporting one 3 2 1½ 1 0g,i
girders, floor 4 321 0g,i
trusses (other
than roof Supporting
trusses) and more than one
framing floorl

Structural members supporting Structural members shall have the same fire resistance rating of wall to be supported,
but not less than rating

walls required by the construction classification.

Floor construction including 3 2 1½ 1 0g,i
beams

Roof 4.5m or less in

construction, height above

including floor to lowest 3 1½ 1i 1i 0g,i
2c,i or 1d,i 1½c,i or 1d,i 1i 1i 0g,i
beams, member of 2c,i or 0d,g,i 1½c,i or 1d,g,i 1c,i or 0d,g,i 1c,i or 0d,g,i 0g,i

trusses and ceiling

framing 4.5m to 6m in
including height above
arches, floor to lowest
domes, member of
shells, cable ceiling
supported

roofs and 6m or more in
roof decksh height above

floor to lowest

member of

ceiling

Shafts (other than exits) and 2 2 2 2
elevator hoistways

Fire separation wall and party 4 2 2 2
wall

Access corridor leading to fire 1 1 1 1
exits

Noncombustible Material ; N. P Not Permitted ; N. L No Limit

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General Building Requirements, Control and Regulation

Table 3.3.1 (b): Fire Rating for Construction Group II: Combustible

Exterior wall Construction TYPE -II-A TYPE -II-B TYPE -II-C TYPE -II-D TYPE -II-E
with Fire Element

Separation

Distance of Exterior Wall Ratings Exterior Ratings Exterior Ratings Exterior Ratings Exterior Ratings Exterior
in Hours Openinga,b in Hours Openinga,b in Hours Openinga,b in Hours Openinga,b in Hours Openinga,b

0.9m or less Bearing 2 2 2 2 2

N.P N.P N.P N.P N.P

Non-bearingf 2 2 2 2 2

More than 0.9m Bearing 2 2 2 1 1

but less than Non-bearingf 2 as per 2 as per 2 as per 1 as per 1 as per

4.5m Bearing 2 provisions 2 provisions 2 provisions 1 provisions 0 provisions of

4.5m or more of this of this of this of this this Code

but less than Code Code Code Code

9.0m Non-bearingf 2 2 2 1 0

Bearing 1 1½ 1½ 1 0

9.0m or more N.L N.L N.L N.L N.L

Non-bearingf 0 0 0 0 0

Interior bearing walls and 2 1 0 1 0
bearing partitions

Enclosure of vertical exitse, exit

passageways, hoistways and
shafts
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Fire divisions and fire barrier Walls See Table 3.2.1 and provisions of this Code
or partitions or ceiling slab

Columns, Supporting one as per provisions of 1 0 or 1j 1 0
this Code 1 0 or 1j 1 0
girders, trusses floor
as per provisions of
(other than Supporting this Code
roof trusses) more than one
and framing floor

Structural members supporting 3 2½ 2 1½ 1
walls

Floor construction including as per provisions of 1 0 or 1j 1 0
beams this Code

Roof 4.5m or less in

construction, height above floor as per provisions of 3/4 0 3/4 0
0
including to lowest member this Code 0

beams, of ceiling

trusses and 4.5m to 6m in

framing height above floor as per provisions of

including to lowest member this Code 3/4 0 3/4
arches,
domes, shells, of ceiling

cable 6m or more in as per provisions of 3/4 0 3/4
supported height above floor this Code
roofs and roof to lowest member
decksh of ceiling

Shafts (other than exits) and 2 2 2 2 2
elevator hoistways

Fire separation wall and party 4 2 2 2 2
wall

Access corridor leading to fire 1 1 1 1 1
exits

Noncombustible Material ; N. P Not Permitted ; N. L No Limit

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Notes:BNBC 2015 FINAL DRAFT

a Requirements of protected exterior openings shall not apply to religious assembly. [Protected openings within an exterior

separation of 0.9m or less are permitted for buildings classified in Occupancy Groups A provided, however said openings do not exceed in total area of 25% of the façade of the storey in which they are located. The openings however, may not be credited towards meeting any of the mandatory natural light and ventilation as per provisions of this Code. Protection of openings with an exterior separation of 0.9 m to 9 m shall not be required for A-1, A-2 and A-3 Occupancy groups] or to

buildings classified in Occupancy groups J, G and H additional requirements for exterior walls and exterior wall openings as per provisions of this Code.

b Upon special application, the area development authorities may permit exterior wall openings to be constructed in excess of the permitted area established by this Table if such openings at the time of their construction are located at least 18m in a

direct line from any neighboring building except as otherwise permitted in footnote f. Such additional openings may not

however be credited toward meeting any of the mandatory natural light and ventilation requirements of Sec 1.19 Chapter

Part 3 of this Code. If any neighboring building is later altered or constructed to come within the above distance limitation,

the affected exterior openings shall immediately be closed with construction meeting the fire-resistance rating requirements

for exterior wall construction of the building in which they are located.

c Applies to occupancy groups J, G and H

d Applies to occupancy groups J, G and H

e See Provisions of this Code for additional impact resistance requirements applicable to certain stair enclosures and for certain

exceptions to stair enclosure requirements.

f When two or more buildings are constructed on the Plot and the combined floor area of the buildings does not exceed the

limits established by this Code for any of the buildings, no fire-resistance rating shall be required for non-bearing portions of

the exterior walls of those buildings facing each other, and there shall be no limitation on the permitted amount of exterior openings.

g Fire retardant treated wood complying with the requirements of this Code may be used.

h Tabulated ratings apply to buildings over one storey in height. In one storey building, roof construction may be of material

having zero hour fire-resistance rating.

i Materials which are not non-combustible as defined in this Code may be used in nonbearing construction elements as per

provisions for this Code.

1 Materials having a structural base of non-combustible materials as defined in this Code, and having a surface not over 3.2

mm thick which when tested in accordance with the provisions of this Code has a flame spread rating not higher than 50

(fifty).

2 Materials which when tested in accordance with the provisions of this Code have a surface flame spread rating not higher

than twenty five without evidence of continued progressive combustion, and which are of such composition that surface

which would be exposed by cutting through the material in any way would not have a flame spread ratings higher than

twenty-five without evidence of continued progressive combustion.

j Applies to the construction of the street floor and all construction below the level of the street floor in building or spaces

classified in occupancy group A-3 except where the space below the street floor does not exceed five feet in height.

k Columns supporting the roof of a one-story building shall have the same fire-resistance rating as required for a column

supporting one floor in a building of the same construction class.

l Members supporting loads of not more than two floors or one floor and a roof need not have a fire-resistance rating greater

than the floor construction fire-resistance requirement in buildings classified in occupancy groups B, C and A-3, not including

unsprinklered spaces of other occupancies, and in fully sprinklered buildings in occupancy groups E and A-5.

3.1.3.3 Construction Type II-C

This Construction type includes buildings and portion thereof in which

(a) Exterior walls, fire walls, exit ways, and shaft enclosures are of non-combustible materials having the required fire-resistance ratings; and

(b) The floors, roofs and interior framing are wholly or partly of wood of smaller dimensions than required for type II-A construction, or are of other combustible or non-combustible materials, having no required fire-resistance rating.

3.1.3.4 Construction Type II-D

This Construction type includes buildings and portion thereof in which exterior walls, bearing walls, floors, roofs, and interior framings are generally of wood or other combustible materials having the required fire-resistance ratings.

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3.1.3.5 Construction Type II-E

This Construction type includes buildings and portion thereof in which

(a) The exterior walls are generally of wood or other combustible materials having the required fire-resistance ratings, and

(b) In which the bearing walls, floors, roofs, and interior framing are of wood or other combustible materials, generally having no fire-resistance ratings.

3.1.4 Separated Occupancy and Construction

When two or more occupancies accommodated in a building, each such occupancy shall be separated according to the provisions specified in Sec 2.3 Chapter 2 Part 3 and Table 3.2.1.

When two or more types of construction used within a building, the entire building shall be subject to the most restrictive construction type and shall comply with FAR restrictions as per provisions of this Code.

However if the Occupancies within the different Types of Construction are completely separated by construction that meets the fire-resistance rating requirements for fire separation listed in Table 3.2.1 of Chapter 1 Part 3 then each Occupancy so separated may, for the purpose of this Code, be considered as separate building section.

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3.1.4.1 Restriction for mixed construction

In buildings of mixed construction, no structural element shall be supported by construction having a lower fire-resistance rating than that required for the element being supported.

3.1.5 Fire Zones

The planning and development authority of the city, township, municipality or region where this Code is intended to be implemented shall divide the area under their jurisdiction into distinct fire zones. The basis for this zoning shall be the fire hazard inherent in the buildings and the degree of safety desired for the occupancy accommodated therein. The number of zones in an area shall depend on its size and the strategies undertaken for its development.

3.1.5.1 Fire Zone 1

The following occupancy groups shall comprise this zone:

Occupancy A: Residential
Occupancy F: Mercantile
Occupancy B: Educational
Occupancy H: Livestock Storage Building
Occupancy C: Institutional for Care
Occupancy I: Assembly
Occupancy D: Health Care
Occupancy K: K1 and K2 Parking
Occupancy E: Offices
Occupancy M: Miscellaneous Buildings

3.1.5.2 Fire Zone 2

The following occupancy groups shall comprise this zone:

Occupancy G: Industrial Buildings
Occupancy H: Storage Buildings
Occupancy K: K3 Parking

3.1.5.3 Fire Zone 3

The only occupancy falling in this zone shall be Occupancy J, Hazardous Buildings.

Classification of Building Construction Types Based on Fire Resistance Chapter 3

3.1.5.4 Change in Fire Zone BoundariesBNBC 2015 FINAL DRAFT

The demarcations of fire zones may be changed or new occupancies may be included in any fire zone through the same procedure as for promulgating new rules or ordinances or both.

3.1.5.5 Buildings on overlapping fire zones

Buildings falling on more than one fire zones shall be considered to be situated on the zone in which the major portion of the building falls. If a building is divided equally between more than one fire zones, it shall be considered as falling in the fire zone having more hazardous occupancy buildings.

3.1.5.6 Restrictions on temporary constructions

Permission may be granted by the Authority for temporary constructions only in fire zones 1 and 2 and not in fire zone 3. Such temporary constructions shall adhere to the conditions of the permission and shall be demolished and removed completely after the expiry of the duration of the permission unless it is extended by the Authority or a new permission is obtained.

3.1.6 Permissible Types of Construction for Various Occupancies

3.1.6.1 New buildings

Types of constructions permitted for various buildings on the basis of fire zones are specified in Table 3.2.4.

3.1.6.2 Existing buildings

Existing buildings in any fire zone need not comply with the provision of this Code for type of construction unless they are altered or in the opinion of the Authority they constitute a hazard to the safety to the occupants of the buildings or the adjacent properties.

3.1.7 Exterior Walls

The fire resistance rating of the exterior walls shall conform to the provisions set forth in Table 3.2.2 and Sec 3.2.3.

3.1.8 Basement Floor

Basement floor of a building shall be enclosed with a one hour fire resistive construction. Doors in such constructions shall be made of noncombustible materials.

3.1.9 Restricting Horizontal and Vertical Spread of Fire

Generally walls restrict horizontal movement and slabs restrict vertical movement of fire.

3.1.9.1 Interior or barrier or enclosure wall

Propagation of fire, smoke, gas or fume through the openings or shafts or penetrations of fire resistive floors and walls shall be restricted by sealing with an approved material which shall have a fire resistance rating at least equal to that of the floor-wall assembly. The sealing material shall be capable of preventing passage of flame and hot gases sufficient to ignite cotton waste when tested in accordance with ASTM E119.

3.1.9.2 Exterior walls

Permitted unprotected openings in the exterior wall in two consecutive floors lying within 1.5 m laterally or vertically shall be separated with flame barriers as similar as sunshades or cornices or projected wall at least 750 mm from the external face of the exterior wall. The flame barrier shall have a fire resistance rating of not less than three-fourths hour.

3.1.10 Exceptions to Fire Resistance Requirements

The provisions of this Section are exceptions to the occupation separation requirements of Table 3.2.1.

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3.1.10.1 Fixed partitions

(a) Stores and Offices: In such cases where offices, stores and similar places occupied by one tenant are separated by non-load bearing walls that do not form a corridor serving an occupant load, the partition walls may be constructed of any one of the following:

(i) Noncombustible materials;

(ii) Fire retardant treated wood;

(iii) One hour fire resistive construction;

(iv) Wood panels or similar light construction up to three fourths the height of the room in which placed; and

(v) Wood panels or similar light construction more than three-fourths the height of the room in which placed with not less than upper one fourth of the partition constructed of glass.

(b) Hotels and Apartments: In such cases where non-load bearing walls act as interior partitions in individual dwelling units in apartment houses and guest rooms or suites in hotels when such dwelling units, guest rooms or suites are separated from each other and from corridors by not less than one-hour fire-resistive construction, the partition walls may be constructed of any one of the following:

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(i) Noncombustible materials of fire retardant treated wood in buildings of any type of construction; or

(ii) Combustible framing with noncombustible materials applied to the framing in buildings of Type II construction.

(c) Folding, Portable or Movable Partitions: Folding, portable or movable partitions need not have a fire resistance rating if the following conditions are satisfied:

(i) Required exits are not blocked without providing alternative conforming exits;

(ii) Tracks, guides or other approved methods are used to restrict their locations; and

(iii) Flammability shall be limited to materials having a flame-spread classification as set forth in Table 3.3.2 for rooms or areas.

Table 3.3.2: Flame Spread Classification

Class Flame Spread Index

I 0-25

II 26-75

III 76-200

(d) Walls Fronting on Streets or Yards: For walls fronting on a street or yard having a width of at least 12 m, certain elements of the wall may be constructed as follows regardless of their fire-resistive requirements:

(i) Bulkheads below show windows, show window frames, aprons and show-cases may be of combustible materials provided the height of such construction does not exceed 5 m above grade.

(ii) Wood veneer of boards not less than 25 mm in nominal thickness or exterior type panels not less than 10 mm in nominal thickness may be used in walls provided:

- the veneer does not extend beyond 5 m above grade; and
- The veneer is placed either directly against noncombustible surface or furred out from such surfaces not to exceed 40 mm with all concealed spaces fire blocked.

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(e) Trim: Wood may be used to construct trim, picture moulds, chair rails, baseboards, handrails and show window backing. If there is no requirement for using fire protected construction, unprotected wood doors and windows may be used.

(f) Loading Platform: Noncombustible construction of heavy timber may be used for exterior loading platforms with wood floors not less than 50 mm in nominal thickness. Such wood construction shall not be carried through the exterior walls.

(g) Insulating Boards: Combustible finished boards may be used under finished flooring.

3.1.11 Shaft Enclosures

3.1.11.1 General

Construction requirement for shafts through floors shall conform to the provisions of Tables 3.3.1 (a) and (b).

3.1.11.2 Extent of enclosures

Shaft enclosures shall extend from the lowest floor opening through successive floor openings and shall be enclosed at the top and bottom.

Exceptions:

(a) Shafts need not be enclosed at the top if it extends through or to the underside of the roof sheathing, deck or slab.

(b) Noncombustible ducts carrying vapours, dusts or combustion products may penetrate the enclosure at the bottom.

(c) Shafts need not be enclosed at the bottom when protected by fire dampers conforming to "Test Methods for Fire Dampers and Ceiling Dampers", installed at the lowest floor level within the shaft enclosure.

3.1.11.3 Special provision

In groups other than Occupancies C and D, openings which penetrate only one floor and are not connected with any other floor or basement and which are not concealed within building construction assemblies need not be enclosed.

3.1.11.4 Protection of openings

Openings in shaft enclosures shall be protected with a self-closing or an automatic-closing fire assembly having a fire resistance rating of

(a) one hour for one hour fire resistive walls

(b) one and one-half hours for two hour fire resistive walls

3.1.11.5 Rubbish and linen chute termination rooms:

Rubbish and linen chute shall terminate in rooms separate from the remaining of the building having the same fire resistance as required for shafts in Table 3.3.1 (a) and (b) but not less than one hour.

3.1.12 Expansion and Contraction Joints

Expansion and contraction joints provided to accommodate expansion, contraction, wind or seismic movement shall be protected with an approved material having the same degree of fire resistance as that of the wall or floor in which it is installed.

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3.1.13 Weather Protection

3.1.13.1 Weather resistive barrier:

All weather exposed surfaces shall have a weather barrier to protect the interior wall from dampening. Such weather barriers shall have a fire resistance rating of at least equal to that of the wall or floor on which it is applied. Weather resistive barrier need not be used in the following cases:

(i) When exterior covering is of approved waterproof panels

(ii) In back plastered construction

(iii) When there is no human occupancy

(iv) Over water repellent panel sheathing

(v) Under approved paper backed metal or wire fabric lath

(vi) Behind lath and Portland cement plaster applied to the underside of roof and eave projections

3.1.13.2 Flashing and counter flashing

Exterior openings exposed to the weather shall be flashed to make them weather proof. There shall be copings with all parapets. Corrosion resistant metals shall be used for flashing, counter flashing and coping.

3.1.13.3 Waterproofing weather-exposed areas

Waterproofing shall be applied to exposed surfaces like balconies, external stairways and landings.

3.1.13.4 Damp-proofing foundation walls

Outside of foundation walls enclosing a basement floor below finished grade shall be damp-proofed from outside.

3.1.14 Members Carrying Walls

All members carrying masonry or concrete walls shall be fire protected as specified in Table 3.3.1 (a) and (b).

3.1.15 Parapets

Parapets constructed on exterior wall of a building shall have the same degree of fire resistance required for the wall upon which they are erected and there shall be noncombustible faces on the side adjacent to the roof surface for the uppermost 405 mm including counter flashing and coping materials. The height of the parapet shall be at least 750 mm from the upper surface of the roof.

3.1.16 Projections

Sunshades, cornices, projected balconies and overhanging beyond walls of Type I construction shall be of noncombustible materials. Projections from walls of Type II may be of combustible or noncombustible materials.

3.1.17 Guards and Stoppers

3.1.17.1 Guards

Guards or Guardrails shall be provided to protect edges of floor, roof, roof openings, stairways, landings and ramps, balconies or terraces and certain wall, which are elevated more than 750 mm above the grade and as per provisions of this Code.

3.1.17.2 Stoppers

Stopper shall be provided in open parking garages located more than 450 mm above the adjacent grade or back to back parking stall. The height of the stopper shall be at least 300 mm and it shall be positioned at outer edges of a car parking stall.

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3.1.18 Insulation

The provisions of this Section are applicable to thermal and acoustical insulations located on or within floor-ceiling and roof ceiling assemblies, crawl spaces, walls, partitions and insulation on pipes and tubing.

Materials used for such insulation and covering shall have a flame spread rating not more than 25 and a smoke density not more than 450.

3.1.19 Atrium

3.1.19.1 General

Atrium may be provided in all groups other than Occupancy J (Hazardous Buildings). Such atrium shall have a minimum opening and are as specified in Table 3.3.3.

Table 3.3.3: Atrium Opening and Area

Height in Stories Minimum Clear Opening¹ (m) Minimum Area (m²)

40
2-4 6

5-7 9 90
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8 or more 12 160

1 The specified dimensions are the diameters of inscribed circles whose centers fall on a common axis for the full height of the atrium.

3.1.19.2 Smoke control system

A mechanically operated air-handling system shall be installed to exhaust the smoke either entering or developed within the atrium.

(a) Exhaust Openings: The location of the exhaust openings shall be in the ceiling or in a smoke trap area immediately adjacent to the ceiling of the atrium above the top of the highest portion of door openings into the atrium.

(b) Supply Openings: Supply openings designed for a minimum of 50 percent of the exhaust volume shall be located at the lowest level of the atrium. Supply air may be introduced by gravity provided the height of the atrium is not more than 18 m and smoke control is established. For atria having height greater than 18 m, supply air shall be introduced mechanically from the floor of the atrium and directed vertically toward the exhaust outlets. Supplemental air supply may be introduced at upper levels in atrium over six storeys in height or when tenant spaces above the second storey are open to the atrium.

(c) Automatic Operation: The smoke control system for the atrium shall be activated automatically by the automatic sprinkler system or smoke detectors installed within the atrium or areas open to the atrium.

(d) Manual Operation: The smoke control system shall also be manually operable for use by the fire department. The smoke control system may be separate from or integrated with other air handling systems. Air handling systems interfering with the smoke control system shall be shut down automatically when the smoke control system is activated.

(e) Smoke Detector Location: Smoke detectors which will automatically operate the smoke control system of the atrium shall be accessible for maintenance, testing and servicing. Their locations shall be as follows:

(i) At the atrium ceiling, spaced in accordance with the manufacturer's instructions.

(ii) On the underside of projections into the atrium, in accordance with the manufacturer's instructions.

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(iii) Around the perimeter of the atrium opening on all floors open to the atrium. These detectors shall be spaced no more than 9 m on centre and shall be located within 5 m of the atrium opening.

(iv) If projected beam type smoke detectors are used, they shall be installed in accordance with manufacturer's instructions.

(f) Enclosure of Atrium: A atrium shall be separated from the adjacent spaces with fire resistive separation of at least one hour.

Fire windows may be provided in fixed glazed openings when the window has a fire resistive rating of at least three-fourths hour and the area of the opening does not exceed 25 percent of the wall common to the atrium and the room into which the opening is provided.

3.1.20 Mezzanine Floors

Construction of a mezzanine floor shall conform to the requirements of the main floor in which it is constructed but the fire resistance rating need not exceed one hour for unenclosed mezzanines.

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Chapter 4

ENERGY EFFICIENCY AND SUSTAINABILITY

4.1 SCOPE

The purpose of including this Chapter in the Code is to enhance the design and construction of buildings through the use of building concepts having a positive environmental impact and encourage sustainable construction practices, allowing efficiency and conservation of energy, water and building materials, and to promote resource efficiency.

In addition to the clauses stipulated here, all Codes and standards relevant to a building occupancy as set forth in other Sections of this Code will be applicable during implementation.

Design and drawings will be submitted to indicate the location, nature and scope of the proposed energy efficient/sustainable feature. These shall indicate compliance to the provisions of this Code, and will be supplied by the relevant design professionals, e.g. electrical engineers, mechanical engineers, plumbing engineers, etc., supporting architectural drawings.

4.1.1 Rationale for Sustainable/Green Buildings

Climate change is an established phenomenon affecting the environment globally and it is recognized that buildings and the built environment play a vital role in the process, impacting on the natural environment and the quality of life. Sustainable development concepts and approaches applied to the design, construction and operation of buildings or to any built environment can enhance both the economic and environmental benefits of the community in Bangladesh and around the world. Energy efficiency and sustainability is not an individual issue rather an integrated and inseparable part of the building design and construction process. The benefits of sustainable design principles include resource and energy efficiency, healthy buildings and materials, ecologically and socially sensitive land use and strengthened local economics and the communities, objectives vital for future development of Bangladesh.

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4.2 DEFINITIONS

DAYLIGHT ZONE An area with a depth of 5 m parallel to any glazed external wall.

EMERGENCY Lighting used for emergency spaces and functions, e.g. in fire stairs, for egress path

LIGHTING signage.

GREY WATER Waste water generated from wash hand basins, showers and baths, Grey water often excludes discharge from laundry, dishwashers and kitchen sinks due to the high nutrient levels. It differs from the discharge of WC's which is designated sewage or black water to indicate it contains human waste.

REGULARLY All the main areas in the buildings that are used on a frequent basis, such as living OCCUPIED SPACE rooms, bedrooms, classrooms, lobbies, meeting rooms, hall rooms and office spaces. Service spaces like toilets, bathrooms, corridors and stores will not be considered as frequently occupied areas.

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WINDOW TO WALL The window-to-wall ratio of a building is the percentage of its facade taken up by light-RATIO OF BUILDING transmitting glazing surfaces, including windows and translucent surfaces such as glass (WWRB) bricks. It does not include glass surfaces used ornamentally or as cladding, which do not provide transparency to the interior. Only facade surfaces are counted in the ratio, and not roof surfaces.

LIGHTING POWER Average total lighting power installed divided by the total occupied area.
DENSITY (LPD)

SHADING The ratio of solar heat gain at normal incidence through glazing to that occurring COEFFICIENT (SC) through 1/8 inch thick clear, double-strength glass. Shading coefficient, as used herein, does not include interior, exterior, or integral shading devices.

SOLAR HEAT GAIN An indicator of glazing performance is the amount of heat admitted through the glass COEFFICIENT vis-à-vis the total heat incident on the glass by virtue of direct solar radiation. The unit is (SHGC) a simple fraction or percentage.

U-VALUE (THERMAL Heat transmission in unit time through unit area of a material or construction and the TRANSMITTANCE) boundary air films, induced by unit temperature difference between the environments

on each side. Units of U-value are W/m²/ok

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VISIBLE LIGHT Amount of light transmitted through glazing, expressed as a simple fraction or TRANSMITTANCE percentage
(VLT)

4.3 SITE SUSTAINABILITY

This Section deals with sites to ensure energy efficiency through passive and low energy architectural features and management of resources.

4.3.1 Mandatory Unpaved Area

Fifty (50) percent of mandatory open space shall be permeable on sites of all occupancy categories. The

permeable area shall not remain bare generating dust, but will have green cover or be treated with perforated paving ($\geq 50\%$), organic mulch, charcoal, etc.

4.3.2 Site Drainage and Run-Off Coefficient

Designs shall indicate site drainage considerations along with flash flooding and erosion prevention measures for sites above 1340 m² in area. As excessive paving is largely responsible for fast water run-off and flash flooding, design shall indicate measures taken to make paving permeable. The net run-off from a site shall be a maximum of sixty (60) percent. The following method will be used for the calculations, in conjunction with Table 3.4.1:

$$\text{Total Perviousness on Open Area of Site (A}_p\text{)} = A_1 \times C_1 + A_2 \times C_2 + \dots \quad (3.4.1)$$

Where, A₁, A₂, etc., being the areas of various surfaces, e.g. Pavements, roads, vegetation, etc., with different run-off coefficients C₁, C₂, C₃ etc., shown in the Table 3.4.1.

4.3.3 Vegetation Plan

For sites above three (3) acres, it is mandatory for a vegetation plan to be submitted along with the site plan and Irrigation Plan, where priority shall be given to native plants in the selection for planting.

4.3.4 Irrigation Plan

4.3.4.1 For sites above ten (10) acres, an irrigation plan with construction details shall be submitted with the site plan, where considerations shall include for management of rainwater.

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4.3.4.2 For these sites a retention pond of $\geq 3\%$ of site area shall be provided. This shall include any existing natural water body within the site.

Table 3.4.1: Run-Off Coefficient's of Various Surfaces Run-Off Coefficient, C
Surface Type 0.95

Roofs, conventional

Green Roofs (soil/growing medium depth ≥ 300 mm) 0.45

Concrete paving 0.95

Gravel 0.75

Brick paving 0.85

Vegetation:

1-3% 0.20

3-10% 0.25

>10% 0.30

Turf Slopes:

0-1%BNBC 2015 FINAL DRAFT 0.25

1-3% 0.35

3-10% 0.40

> 10% 0.45

4.3.5 Rain Water Harvesting System

4.3.5.1 Buildings of total floor area > 4000 m² shall have its own rain water harvesting system as discussed in Chapter 7 Part 8 and installed complying with Section 7.13 Part 8, of this Code. The reservoir capacity shall be a multiple of the area of Ground Coverage of the building and a rain collection coefficient of 0.073.

4.3.5.2 The rainwater reservoir may be placed under the roof or at lower levels, including underground.

4.4 EPVLEVNE BNIBLIUB

4.4.1 Window to Wall Ratio

4.4.1.1 For mechanically ventilated and cooled buildings of all occupancies, other than Hazardous and Storage, the Window to Wall ratio of building (WWRB), will be determined in conjunction with the glazing performance, as indicated by the Solar Heat Gain Coefficient (SHGC) or Shading Coefficient (SC) of the glass used. The relationship is given in Figure 3.4.1 and Table 3.4.2.

Figure 3.4.1 Selection of glazing SHGC based on WWR 3-97
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Table 3.4.2 Selection of Glazing SHGC Based on WWR in Tabular Format

WWR SHGC SC

10 0.85 0.98

20 0.6 0.69

30 0.5 0.57

40 0.4 0.46

50 0.35 0.4

60 0.33 0.38

70 0.31 0.36

80 0.3 0.34

90 0.27 0.31

4.4.1.2 In all of the above cases, the Visible Light Transmittance (VLT) of the glazed element shall not be lower than thirty five (35) percent.

4.4.1.3 For Air-conditioned buildings with external shading, permitted SGHC limit may be adjusted, but the increase shall not exceed values determined by Eq. 3.4.2 below:

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= + (3.4.2)

Where,

is the adjusted solar heat gain coefficient limit for windows with shading

SHGC is the solar heat gain coefficient from Table 3.4.2

A is the SHGC correction factor for the external shading as per Table 3.4.3 or Table 3.4.4: . For a window with overhang and fin, the value of A can be only used either from overhang or from fin.

4.4.1.4 For naturally ventilated buildings, window size shall be based on Sec 4.4.2 Window Openings of this Code and shading shall be provided as per Sec 4.4.3.

4.4.1.5 Window size shall under no circumstances be less than as stipulated under Part 3: Chapter 1, Section 1.17 of this Code.

Table 3.4.3: Correction Factor against Overhang Shading Projection Factor

Overhang Projection Factor SHGC Correction Factor(A)

0.0 0.00

0.1 0.05

0.2 0.09

0.3 0.14

0.4 0.19

0.5 0.24

0.6 0.28

0.7 0.33

0.8 0.38

0.9 0.43

1 or higher 0.47

Projection factor for overhang is the depth of the overhang divided by the height of the window

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Table 3.4.4: Correction Factor against Vertical Shading (fins) Projection Factor
Vertical Shading (Fins) Projection Factor SHGC Correction Factor (A)

0.0	0.00
0.1	0.04
0.2	0.08
0.3	0.12
0.4	0.16
0.5	0.20
0.6	0.24
0.7	0.28
0.8	0.32
0.9	0.36
1 or higher	0.40

Projection factor of fins is the depth/length of fin divided by the width of the window.

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4.4.2 Window Openings

Mechanically ventilated and cooled buildings of all occupancies, other than hazardous, retail and storage, shall have the provision of using natural ventilation for cooling and fresh air, in frequently occupied areas, with a fraction > 4% of the floor area being specified as openable windows. Openable balcony doors can be counted in this calculation. Note if the window area defined under Sec 4.4.1 is less than openable area, then fifty (50) percent of window area should be openable.

4.4.2.1 Naturally ventilated buildings of all occupancies, other than hazardous and storage, shall provide for fifty (50) percent of its window area to be openable.

4.4.2.2 All the openable windows above ground should be designed with safety measures in place such as protection hand rails for child safety.

4.4.2.3 Windows to any regularly occupied space on exterior walls in naturally ventilated buildings shall be shaded conforming to Sec 4.4.3.

4.4.3 Shading

4.4.3.1 For naturally ventilated buildings of all occupancies, horizontal sunshades shall be provided over windows on South, East and West, the depth of which shall be calculated by multiplying the window height with

a factor of 0.234 (Figure 3.4.2). Horizontal louvers can be used instead of sunshades, in which case, depth of louver shall not be less than 0.234 times the gaps between the louvers (Figure 3.4.3).

4.4.3.2 Vertical Shading devices shall be provided on the West, depth of which shall be calculated, by multiplying the gaps between the vertical fins, or the window width if the shades border the window width, with a factor of 0.234 (Figure 3.4.4).

Exceptions:

(a) The above rule shall be relaxed if it can be demonstrated that shading is achieved by existing neighbouring structures.

(b) The north side of all buildings are exempt from the above rules.

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Figure 3.4.2 Horizontal shade: $x \geq 0.234y$

Figure 3.4.3 Horizontal Louvres: relationship between depth (x) and gap (y): $x \geq 0.234y$

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Figure 3.4.4 Vertical shading or louvres: relationship between depth (x) and gap (y): $x \geq 0.234y$

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4.4.4 Roof Insulation and Green Roofing SystemBNBC 2015 FINAL DRAFT

4.4.4.1 Fifty (50) percent of horizontal exposed roof slabs of Buildings of Occupancy B, C, D and E, shall have green roofing system, to manage water run-off from roof tops, to control internal temperatures within the top floors and to reduce the carbon footprint of the building. This shall not include any covered roof surface, e.g. solar panels, solar thermal heaters, machinery for mechanical or electrical systems, water tanks, etc. Stair loft or machine room tops will be exempt from this rule.

(a) The roof slab design shall consider structural support of the green roof system, with growing medium of minimum 300 mm.

(b) The design will indicate protection from dampness and provide a drainage system

4.4.4.2 Horizontal roof slabs, which are not covered by green roofing system, will have roof slabs with insulation, so that the time lag and decrement factor is greater than the other floor slabs of the building.

4.5 ENERGY EFFICIENT BUILDING SYSTEMS

4.5.1 Daylighting and Supplementary Lighting System

4.5.1.1 Window area shall not be less than 14 percent or 1/7th of the total floor area of the building

4.5.1.2 Every regularly occupied space shall contain a minimum percentage of day-lit area along the building perimeter zones, with no window less than an area of 1 m² and will ensure the appropriate stipulations given below.

(a) for rooms that measure less than 8 m in depth, window area shall be at least 20 percent of the area of the external wall of the room,

(b) for rooms that measure between 8 to 14 m in depth, window area shall be at least 30 percent of the area of the external wall of the room and 35 percent of the external wall

(c) for rooms that measure more than 14 m in depth, window area shall be at least 35 percent of the area of the external wall of the room

4.5.1.3 For Buildings of Occupancy A5, B, C, E1 and E2, photoelectric sensors shall be connected to luminaires, to enable dimming or switching off lamps that do not require to be operated, due to the presence of adequate daylight. The photoelectric sensor shall be located approximately at half (½) the depth of day-lit zone.

4.5.1.4 If occupancy sensors are installed in the daylight area, the occupancy sensor shall override the daylight sensor during non-occupancy period.

Exceptions:

(a) Zones with special requirements are exempt from the stipulation of Sec 4.5.1.3. The designer shall justify the reason for exemption.

(b) Hotel guest rooms are exempt.

4.5.2 Lighting Power Density

4.5.2.1 Lighting Power Density (LPD) of the values set in Table 3.4.5 shall be provided for the respective functions within all building occupancies, or as specified.

4.5.2.2 In addition to Sec 4.5.2.1, Illumination values (Lux) as specified in Tables 8.1.5 to 8.1.14 of Part 8 of this Code shall be provided for buildings of the respective occupancies.

4.5.3 Occupancy Sensors

4.5.3.1 In order to limit the use of electricity in the unoccupied areas of buildings, occupancy sensors linked to lighting (except for emergency and security lighting) shall be installed in the public areas of buildings of occupancies specified in Table 3.4.6.

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Table 3.4.5: Maximum Allowable Lighting Power Density for Different Occupancies

Occupancy Maximum LPD (W/m²)

E1 and E2: Offices 9

F1 and F2: Retail/Mercantile 13

A5: Hotels 9

D1: Hospitals 11

A1, A2 and A3: Apartments/residences 7

B: Educational 11

All occupancies: Covered parking* 3

All occupancies: Open / outdoor parking 1.6

* LPD for car parks shall be calculated from the total lighting power divided by the total car park area

Table 3.4.6: Applicability of Occupancy Sensors

Occupancy Applicability

E1 and E2 Offices Meeting rooms and corridors

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A5 Hotels Meeting rooms and corridors

A3 Apartments Covered car parks and corridors

B Educational Covered car parks and corridors

4.5.3.2 For car parks a minimum 2/3rd of the lighting shall be controlled by occupancy sensors.

4.5.3.3 Emergency lighting shall not be connected to occupancy sensors.

4.5.4 Ceiling/ Wall Mounted Fans

4.5.4.1 For naturally ventilated buildings of occupancy A, ceiling/wall mounted fans shall be provided in each regularly occupied space.

4.5.4.2 For buildings of occupancy B, C, D, E and I, ceiling/wall mounted fans shall be provided in each room larger than 25 m², with a minimum of one fan every 25 m².

Exceptions:

(a) Corridors of buildings of all occupancies

(b) ICU, CCU, operating theatres of Hospitals and Clinics

4.5.5 Lift and Escalator Efficiencies

4.5.5.1 Escalators, in buildings of all occupancies, shall be fitted with controls to reduce speed or to stop when no traffic is detected.

4.5.5.2 Such escalators shall be designed with one of the energy saving features as described in i or ii below:

Reduced speed control: The escalator shall change to a slower speed when no activity has been detected for a period of a maximum of three (3) minutes. Detection shall be by photocell activation at the top and bottom landing areas.

Use on demand: The escalator shall shut down when no activity has been detected for a period of a maximum of fifteen (15) minutes, designed with energy efficient soft start technology. The escalator shall start automatically when required; activation shall be by photocells installed in the top and bottom landing areas.

4.5.5.3 Elevators (lift) in buildings of occupancy A5, D1, E1, E2, F1, F2, I1 and I3 occupancies shall be provided with controls to reduce the energy demand, using the following features in traction drive elevators:

(a) AC Variable-Voltage and Variable-Frequency (VVVF) drives on non-hydraulic elevators.

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(b) An average lamp efficacy, across all fittings in the lift car, of >55 lamp lumens/circuit watt, with provision for switching off, when lift is inactive for a period of a maximum of five (5) minutes.

(c) The provision to operate in stand-by condition during off-peak periods, when the lift has been inactive for a period of a maximum of five (5) minutes.

4.5.6 Renewable Energy Options

4.5.6.1 Buildings of occupancy A shall use Solar or other renewable sources of energy to power 3% of the total electric load of the building, applicable to the uses in Sec 4.5.6.3.

4.5.6.2 Buildings of all occupancies other than A, shall use Solar or other renewable sources of energy to power 5% of the lighting and fan loads of the entire building, mandatory to uses in Sec 4.5.6.3.

4.5.6.3 For all occupancies, the solar or other renewable energy connection shall power spaces in the following order of priority: lighting in underground/basement spaces, dark corridors, supplementary lighting, fans, emergency lighting like fire stairs, emergency signage's, egress path lighting, etc.

4.5.7 Heating Ventilation and Air-conditioning (HVAC) System

For conditioned buildings any Heating Ventilation and Air conditioning (HVAC) system planned for installation will meet energy efficiency standards specified in Part 8 of this Code.

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4.6 INTERNAL WATER MANAGEMENT

4.6.1 Reuse of Grey Water

Buildings of occupancy A5, E1 and E2 and I shall reuse grey water for water efficiency and management.

Grey water from wash basin shall be reused in toilet flushing and/or irrigation after filtration to ensure a BOD (Biochemical Oxygen Demand) level <50. Such water shall not be considered potable.

4.6.2 Efficient Fittings in Toilets

Water efficient fittings, including faucets, showerheads and flushes, that use less water for the same function as effectively as standard models, shall be used in buildings of all occupancies. The low flow fixtures shown in Table 3.4.7 shall be used.

Table 3.4.7: Fixture Ratings Quantity (max) Unit
Type of Fixtures Dual Flush (6/4) liters/flushing cycle (full/low)

Water closets

Shower 9.5 liters/min at 551 kPa

Urinals 3 liters/flushing cycle

Hand wash taps 6 liters/min at 417.7 kPa

Kitchen/pantry faucets 6 liters/min at 417.7 kPa

4.6.3 Service Hot Water and Pumping

In order to reduce the energy used for water heating, buildings of occupancy A5 and D1 shall use solar hot water system to supply a minimum of thirty (30) percent of the total building hot water requirements. The solar hot water system can be flat plate solar collectors or vacuum tube solar system, this system must be designed and installed with the backup system or as a per heating for the main hot water system.

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Appendix A

Planning and Development Control

A.1 SCOPEBNBC 2015 FINAL DRAFT

In absence of planning and zoning code in the national level, this Appendix states certain planning guidelines for development control and for environmental and human safety. The guidelines formulated in this Appendix are suggestive.

A.2 LAND USE CLASSIFICATION

Land is a finite resource. An integrated and hierarchical planning from national to local level of this resource is essential to identify and use its potential in compliance with the National Land Use Policy.

Every city, township, municipality or other settlements shall have planning and zoning regulations administered by the authority having jurisdiction to guide the existing and future developments of that settlement in compliance with the National Land Use Policy and with local or regional master planning. Any land-use planning shall clearly classify the following uses:

(a) Permitted land use

- (b) Conditionally permitted land-use and
- (c) Restricted land use

Any such plan shall also include the preservation of open spaces and water bodies as part of the land use planning.

A.3 GENERAL GUIDELINES FOR RESIDENTIAL DENSITY PLANNING

A.3.1 Control of residential density is a fundamental component of effective land use planning, as the relative distribution of population has major implications for all other provisions. In determining Residential density, a coherent view should be considered to achieve integrated land-use, transport, environmental and infrastructural planning.

A.3.2 Along with this integrated approach, the following factors shall also guide the residential density:

- (a) A hierarchy of residential densities should be maintained to ensure diversity of housing needs.
- (b) Residential density of an area shall correspond to the capacity of existing and planned infrastructure and environmental features of that area.
- (c) Densities should be planned in such a way that encourage public transport and reduce travel demand.
- (d) For large cities higher densities around stations and interchanges of rail based public transport system may be encouraged to reduce reliance on road based public transport system.
- (e) Since higher density residential development near high capacity transportation system creates pressure on urban land use planning, careful environmental planning with definitive environmental objectives shall be there for such instances.

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(f) To protect environmentally sensitive areas or areas of historical importance, a low density residential development should be proposed where and as necessary.

(g) In heavily built up areas such as old towns, provision of Transfer of Development Rights (TDR) could be implemented to control over-crowding.

A.3.3 The maximum allowable density of a residential development shall be guided by the Planning Guidelines for a zone or area or locality or township which shall be prepared under and administered by the authority having jurisdiction. Floor Area Ratio (FAR) for any development shall comply with any such planning guidelines. Where such density guideline is not available, the maximum allowable density for a residential development shall be 175 units per hectare.

A.4 GENERAL PLANNING GUIDELINES FOR OPEN SPACE REQUIREMENTS

In a high density context like ours, pressure on land is extreme. Preserving open spaces and maintaining environmental balance become a priority in this context. In any planning process, open space must be planned as a land use in its own right and not as the remainder after providing other land uses. The hierarchy of Recreational open spaces in planning settlements may be as following:

- (a) Local Open Space
- (b) Ward Open Space

(c) Regional Open Space

Authorities having jurisdiction shall determine the extent of the terms 'local', 'ward' and 'region' on the basis of governance structure and the master planning for any particular area. However, in developing any area layout as specified in Sec A.5.2 of this Appendix, provisions for Local open space should be applicable. All open spaces in this hierarchy should act as a connected component of an open space network. The following paragraphs indicate few guidelines on location and space requirements for such open spaces.

A.4.1 Every locality should have Local Open Space which is required to meet primarily the passive recreational needs (e.g. outdoor sitting, jogging/ walking tracks, playgrounds for children etc.) of the population. Such spaces should be located either within the residential neighborhood or somewhere centrally to serve a wider area of more than one neighborhood. Considering the projected future population of a locality, a minimum requirement of 1 m² of Local open space per locality occupant should be allotted. Where possible such open spaces should be at least 500 m².

A.4.2 Every ward in a city or town or union should have Ward Open Space which is required to meet the active recreational needs (e.g. standard facilities for sports) and passive recreational needs of the ward population. Considering the projected future population of a Ward, a minimum requirement of 1 m² Ward Open Space per Ward occupant should be allotted. Where possible such open spaces should be at least 10,000 m² (1 hectare).

A.4.3 Every region should have Regional Open Space which is required to meet wider recreational needs of the population that cannot be served by local or ward open spaces. In metropolitan areas, Ward Open Space may supplement for 50 percent of the Regional Open Space requirement. Conscious planning effort are needed to create/ designate and/ or preserve 'Regional Open Spaces' located close to major public transport routes, taking advantage of natural landscape, waterfront, hill views, forest areas and/or views to special features that may draw visitors from all around. Where possible such open spaces should be at least 50,000 m² (5 hectare).

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A.5 COMMUNITY OPEN SPACE AND AMENITIES

Every plot as specified in Sections A.5.1 and A.5.2 shall have community open space which is required to meet primarily the passive recreational needs (e.g. outdoor sitting, jogging/walking tracks, playgrounds for children etc.) of the population. Such spaces shall be located within the plot boundary. Considering the types of development, the following minimum requirements of community open space and amenities shall be applicable as per guideline of Sections A.5.1 and A.5.2 of this Appendix.

A.5.1 Community Space for a Single Tall Building or Group of Buildings In a Plot

For all residential or residential-cum-business buildings having ten or more storeys, or for all plots on which more than one residential or residential-cum-business buildings are constructed, community built space at the rate of 5 percent of the total floor area shall be provided within the building for use of the occupants of the building solely. Roofs of such buildings shall not be considered as community open spaces.

For residential or residential-cum-business plots measuring more than 0.1 hectare, 10 percent of the area of land or 1 m² per occupant of the plot, whichever is larger, shall be left vacant to be used as children's playground. This playground shall be contiguous and shall have a length not exceeding 2.5 times its width. The playground may extend into the mandatory open space of the plot.

Open space and amenities for residential or residential-cum-business plots measuring more than 0.4 hectare shall be as per guidelines of Sec A.5.2 of this Chapter.

A.5.2 Community Open Space and Amenities in Area Layouts

(a) Residential or Business Areas

In dividing any land measuring a total of 0.4 hectares or more into residential or business plots, community open spaces and amenities shall be reserved for recreational, educational, health care and other purposes depending on the size of the population for which the layout is planned. For planning such open spaces and amenities the guidelines of Sec A.4 of this Appendix and Sec B.3 of Appendix B shall be applicable.

(b) Industrial Areas

In dividing any land measuring a total of 1 hectare or more into industrial plots, 5 percent of the total land area shall be reserved as amenity open space which shall be used as lawn, park or garden. The minimum size of such open space shall be 600 m². When the area of the open space exceeds 1000 m², the area of land in excess of 1000 m² can be used for the construction of buildings for banks, clinics, welfare centers and other common facilities for use of the persons working in the industries.

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A.6 PLOT SIZE

Plot divisions and plot sizes are part of integrated planning decision of detail area plan and shall be determined by the Area Development Authority having jurisdiction. Where no such guideline exists or yet to be undertaken, the following criteria mentioned in Sections A.6.1 to A.6.8 regarding plot size shall be applicable.

A.6.1 Residential Plots

(a) For any future development the minimum size of the plot for Occupancy A1, A2 and A3 shall be 66 m², 133 m² and 200 m² respectively.

The sizes of the plots and the corresponding minimum widths of road frontage of the plots shall be as specified in Table 3.A.1 provided that:

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(i) Plots accessible by link roads shall be considered to have a frontage equal to the width of the link road, and

(ii) Plots of irregular shape abutting the road shall be considered to have a frontage equal to their average width parallel to the road.

(b) The limitations of plot sizes and frontages imposed in Sec A.6.1 (a) above may be waived for approved affordable housing including site and service schemes. Guidelines governing the planning and design of such housing given in Appendix B.

(c) The minimum size of the plot for a group housing development scheme and other special requirements

for group housing developments shall be as specified or approved by the respective city development authority.

(d) For minimum standard transitional housing, government may allow smaller plots following the guidelines mentioned in Appendix B.

Table 3.A.1: Minimum Frontage of Residential Plot

Type of Residential Plot Size (m²) Minimum
Development Frontage (m)

4.5

Approved row type housesBNBC 2015 FINAL DRAFT66 (Minimum size)

Semi-detached houses Over 66 to below 133 8
133 (Minimum size) 8

Over 133 to 200 8-10

Over 200 to 267 10-12

Detached Over 267 to 334 12
Over 267 to 334 12

Over 335 to 669 16

Over 669 24

Note: For plot sizes larger than 133 m² detached house type may be allowed
provided that the site frontage is 12 m or more

A.6.2 Plots for Educational Buildings

The minimum size of plot for educational buildings shall be based on occupant capacity and shall be at the rate of 4 m² per pupil or occupant. With exception for nursery school the minimum plot size required for educational purpose shall be 3950 m² (see Appendix B).

A.6.3 Plots for Assembly Halls, Theatres, Cinema

The minimum size of plot for assembly halls, theatres, cinema halls and other similar buildings where people gather for entertainment or other public functions shall be based on the seating capacity of the building and shall be at the rate of 3 m² per seat. Table 3.A.2 shows the minimum plot size for such function:

Table 3.A.2: Plot Sizes for Assembly Occupancy

Sub-Category Nature of Use or Occupancy Minimum Plot Size

I1 Large assembly with fixed seats 3000 m²

I2 (1000 seats or more)

I3 Small assembly with fixed seats 3 m² per seated person

I4 (less than 1000 seats)

I5 Large assembly without fixed seats 900 m²

(300 or more occupants)

Small assembly without fixed seats 3 m² per seated person

(less than 300 seats)

Sports facilities Related to event and
spectator capacity

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A.6.4 Plots for Community Centers

The size of plot for rural or urban community centers shall be not less than 1300 m² and commensurate with the size of the community.

A.6.5 Business and Mercantile Plots

The minimum size of a business and mercantile plot shall be 200 m² and its road frontage width shall not be less than 10 m.

A.6.6 Industrial Plots

The minimum size of an industrial plot shall be 300 m² and its road frontage width shall not be less than 15 m.

A.6.7 Petrol Filling Stations

The minimum size of the plot for a petrol filling station without service bay or repair workshop shall be 500 m² and its road frontage width shall not be less than 30 m. The minimum size of the plot for a petrol filling station with service bay but without repair workshop shall be 1100 m² and its road frontage width shall not be less than 30 m.

A.6.8 Plots for Other Uses

The minimum sizes of plots for buildings for uses other than those mentioned in Sections A.6.1 to A.6.7 shall be as determined by the Authority having jurisdiction.

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Appendix B

Guidelines for Minimum Standard Housing Development

B.1 GENERALBNBC 2015 FINAL DRAFT

B.1.1 Government bodies or public agencies may designate an area in the master plan for the development of Mass Housing Projects. Generally all such development shall be known as Minimum Standard Housing, which shall be broadly categorized into the following two categories: a) Minimum Standard Community Housing and b) Minimum Standard Transitional Housing. Requirements for master plan and dwelling units in such projects shall have special provisions depending upon the category of development mentioned above.

The guidelines of this Appendix cover the planning and the general building requirements of all such Minimum Standard Housing developments.

B.1.2 A minimum standard community housing is a housing that conforms to the basic minimum requirement regarding dwelling units, community and other facilities according to the provision of this Code. Requirements for community facilities in these housings shall depend upon the size and scale of the community (Sec B.4.2). Dwelling units in all such developments shall be classified as Occupancy A1, A2, A3 or Mixed Occupancy depending upon the type of development (Sec B.3) and degree of mixing with other occupancies within the same structure.

B.1.3 Minimum Standard Transitional Housings are housing facilities on a transient basis before providing its inhabitants with Minimum Standard Community Housing. Ensuring safety, health and sanitation requirements shall be the primary obligation for such housing. Since, it may not be convenient or practicable for the planning and dwelling units in such projects to be in full compliance with all the requirements of this Code, a few exemptions have been made for all such housings in the following Sections of this Appendix. All Transitional Housing, irrespective of its type of development (Sec B.2) shall be group housing. Dwelling units in a transitional housing shall be classified as Occupancy A3, A4 or Mixed Occupancy depending upon the type of development and degree of mixing with other occupancies within the same structure.

B.1.4 Only government bodies or public agencies should be responsible for planning the number and location of the settlements in an approved master plan following the density guidelines of Appendix A and the layout of units within the settlement. The guidelines of this Appendix regarding layout planning are applicable to government bodies or public agencies responsible for such planning.

B.1.5 The guidelines and requirements regarding design and construction of buildings for minimum standard housing in approved layouts are applicable to all government bodies, public agencies, private developers or individual owners who undertake such constructions.

B.2 TYPES OF DEVELOPMENT

The development of minimum standard housing may be any one or a combination of the following types:

- (a) Single unit plots of row type housing
- (b) Multi-storied flats of row type housing

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- (c) Block development as a group housing
- (d) Cluster housing, and
- (e) Site and service schemes

The guidelines for planning and general building requirements shall be applicable to all types of development of minimum standard housing unless exempted as mentioned in this Appendix.

B.2.1 Single Unit Plots of Row Type Housing

Row Type in a housing development is characterized by independent plotted developments for single family dwelling (A1) and shared community facilities. Along with single family detached and semi-detached dwelling, this type of dwelling is used to achieve low-densities in a settlement.

This type of development should be located away from high capacity public transportation system and should be characterized by high car ownership rate.

All such development shall comply with the provisions for parti-wall and general criteria for natural lighting and ventilation as described in Part 3 Chapter 1, Part 6 and Appendix E.

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Figure 3.B.1 Row type development

B.2.2 Multi-Storied Flats of Row Type Housing

Unlike single unit plots of row type development multistoried flats of row type housing are not plotted development. Here the un-demarcated un-divided land is shared by the flat owners within such complex.

Houses or flats or apartments in Multi-storied Row type developments shall share walls with adjacent flat or apartment, provided that they are designed and built at the same period as part of the same project and also that they fulfill the general criteria for natural lighting and ventilation as referred in Part 3, Chapter 1.

Multi-storied row type developments should be permitted for walkup apartments (A3) as well as two family dwelling (A2) with many of the community facilities at lower levels. Such developments are good for medium density settlements and may also be used in mixed use zones.

B.2.3 Block Development as a Group Housing

Block developments are characterized by high-density large scale developments within a block usually surrounded by roads all around and serviced by high capacity transport and utility network.

Large plots of 4048 m² or more, with road access on one side may also be considered as block development if provided with a peripheral access road along its perimeter and also if they are in close proximity to high capacity transport and utility infrastructure network. All such plots may be allowed to attain higher densities than other

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typologies. Such developments are more desirable in the central urban areas emphasizing more dependency on public transportation and less on private transportation. Parking requirements in such typologies shall be less than other typologies.

Block development for Group Housing should be permitted for large scale developments of Apartments (A3) or Mess, Boarding houses, Dormitories and Hostel (A4).

All such residential developments can be mixed with other permitted occupancies to encourage availability of all services within the close proximity and to support growth of local economy. All such developments can be subdivided into following two categories:

(a) Tower Block Development for Group Housing

This includes Flats or Apartments (A3) in a single or multiple high-rise towers within a block/large site with relatively low ground coverage and higher density along with open spaces and community facilities within and around the tower blocks.

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Figure 3.B.2 Tower block development

(b) Perimeter Block Development for Group Housing

Unlike Tower blocks, Perimeter block developments involves one single building or multiple buildings placed along the perimeter of the site to create an internal open space shielded from its surrounding, commonly used as community space. Each housing unit in such developments shall have at least two sides open- one at the internal open space and the other at the external road side.

Depending upon the plot size and population such development may also be permitted to become high-rise development, provided that the internal open space in such development confirms to the criteria for minimum requirements of a courtyard (Part 3, Chapter 1).

B.2.4 Cluster Housing

Cluster type development, as a housing form, is suitable for accommodating low to high density of population within walkup range. Cluster type development for Group Housing should be permitted for all ranges such as for low density development for single family dwelling (A1) and two family dwelling (A2) or for moderate to high density developments of Apartments (A3) or Mess, Boarding houses, Dormitories and Hostel (A4). Details of this typology have been discussed in Appendix D.

B.2.5 Site and Service Schemes

Site and service schemes shall delineate individual plots and provide for the infrastructural needs for the development of a permanent housing. Interim constructions by the allottees should also be permitted. Skeletal structures with a roof on columns and/or developed plinths may be provided if funds are available.

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Sanitation and water supply must be provided in all site and service schemes. A sanitary service core or common water supply and sanitation facilities for planned groups of plots should normally suffice. The developing agency shall install the services before handing over the plots.

Site and service schemes for group housing should be permitted for low density development of single family dwelling (A1) and two family dwelling (A2) and ownership right of such housing shall be non-transferrable.

Figure 3.B.3 Perimeter block development

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Figure 3.B.4 Cluster type development

B.3 PLANNING

B.3.1 A minimum standard housing shall ensure quality living for all its inhabitants. Providing proper environmental quality, social and utility infrastructure, educational facilities, health care and recreational facilities, connectivity to commerce and job locations in a comprehensive planning are pre-conditions to attain that. With increasing urban population and the shortage of developable land, high residential densities shall occur. This multiplies the necessity for the provision of community facilities to ensure the minimum standard of the housing.

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B.3.2 DensityBNBC 2015 FINAL DRAFT

Housing density for an area or locality or settlement is a planning issue and shall be decided by the planning authority in accordance with the Detail Area Plan (DAP). Where such guidelines are unavailable, the gross density of a minimum standard housing shall not be more than 175 units per hectare, considering an average population of 5 persons per dwelling unit. The general distribution of built area and open space shall follow the provisions of Sec B.3.3.

B.3.3 Basic Requirements for Community Facilities and Facilities for Locality

Any minimum standard housing, irrespective of its type of development, should be planned and organized in groups or clusters, where each of the clusters should not exceed 400 dwelling units with an average population of 5 residents per dwelling. Where the number of dwellings is more than that, more than one clusters, each below 400 units, should be formed.

In any housing project, community and facilities for locality are essential. The facilities required for any such project shall depend on the size of the community or communities within a locality. Table 3.B.1 and Table 3.B.2 show the requirements of such facilities for any housing development in reference to their variation of net density and their relation to the threshold population.

B.3.3.1 Open space within a site area

Open space within a site area shall be as defined in Sec 1.8 Chapter 1, Part 3. However for a minimum standard housing, such open space shall also be equal or more than the open to sky space which is an outcome of addition of

(a) Mandatory setback area and

(b) Area requirement for Community Open Space (COS) as per Sec B.3.3.2.

For plots below 4048 m² community open space may overlap with mandatory setback area.

B.3.3.2 Community open space shall not be less than 1 m² per occupant.

B.3.3.3 Community facilities consist of two components:

(a) Community Open Space (COS): Community open space is an undivided contiguous open space within a plot or block or cluster which along with mandatory setback area constitutes the open space of the site.

Depending upon the size of population and land area this space may be used as any or combination of the following uses-

- (i) Lawn
- (ii) Garden
- (iii) Play lot

All such uses shall be exclusive to the residents of that plot or block or cluster.

No paved area, other than the minimum required area for vehicular and pedestrian access to the site, is allowed within this community open space. All such road and walkways shall ensure pedestrian priority and safety and shall not be used as a through circulation.

The following guidelines shall be maintained if the area of the community open space within the site fulfills the criteria mentioned in the first column of Table 3.B.1.

(b) Community Built Space (CBS): Community built space is part of the community facilities dedicated to serve the population within a given site or block or cluster. Depending upon the threshold population, the CBS shall include facilities as per guideline of Table 3.B.2 for a threshold population up to 200 families.

Table 3.B.1: Guideline for Minimum Width for Community Open Space

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Open Space Area (m²) Minimum Width (m) May Accommodate
130 or more 9 Badminton, table tennis etc
700 or more 21 Basketball, badminton etc.

B.3.3.4 Facilities for Locality (FL): Facilities for localities are shared facilities consisting of both Local Open Spaces (LOS) and Local Built Spaces (LBS) located outside the plot boundary but within the locality. The total space requirement of the Facilities for locality shall vary considerably depending upon the requirements of net density, gross density and threshold population of Table 3.B.2.

Table 3.B.2 refers to list of such facilities for a plot/locality/ward/region in relation to population size and space requirement for a settlement.

Table 3.B.2: Threshold Population and Minimum Reference Standard of Facilities for Community and Locality

Facilities Threshold Population Minimum Level Served
to Start the Facilities Reference Standard

General* Plot

Community Open Space (COS) 3 families 1 m² per person Plot

10 families 10 m² room Plot

Management office 20 families 2 m²/ family

Meeting room/ hall Plot

(multi-purpose with storage and 30 families 1 m² per family Plot

washroom facilities) 40 families 0.75 m² per family

Indoor games room BNBC 2015 FINAL DRAFT

Prayer hall

Educational 100-300 families/ 500- Minimum 6 children Plot/ local
Day care center** 1500 persons Local
Minimum 6 Local
Nursery/ kindergarten school 400-600 families/ 2000- classrooms Ward
(age group 3 to under 6 3000 persons
years)** Minimum 3950 m² site Regional
1000-1600 families/ area with minimum
Primary school (age group 7 to 5000-8000 persons site width of 55m Plot/ local
under 11 years)** Plot/ local
1800-2400 families/ Minimum 6950 m² site Ward/ regional
Secondary school (age group 12 9000-12000 persons area with minimum Ward/ regional
to under 17 years) site width of 65m
10,000 families/ 2000 m²- 7000m² site Local
Colleges/ community colleges/ 50000 persons area Local
vocational colleges Local/ ward
Commercial 50 families 4 stores per 200 Ward
Small store/s families (20 m² per
200 families
Medicine store/ dispensary/ store, max)
convenience grocery store/ 2000 families/ 10,000 175 m² per 400
persons families minimum
bakery/ beauty parlor
Super-market 4000 families/ 20,000 400 m² per 300
persons families
Shopping center
300 families 175 m² per 400
Socio-Cultural families
Community welfare center 400 families
Plot size 1300 m²
Places for worship 1000 families minimum.
(Mosques, temples, churches
1000 families 175 m² minimum
etc.)
Community Hall

Library

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Facilities Threshold Population Minimum Level Served
to Start the Facilities Reference Standard Ward
Healthcare Ward
Health center 400 families/ 2000 175 m² per 400
persons families Local
Small clinic Ward
2000 families/ 10,000 Minimum 2200 m²

Services and Utilities persons plot per 10,000 Ward/ regional
Internal roads and walkways persons Local/ ward
Any
Amenities 15 to 20 per cent of
(Garbage disposal, water pump, Any the site area

local electrical substation/ 400 families/ 2000 5 per cent of the site
generator etc.) persons area

Office of local authority, As per planning 175 m² per 400
community police etc. guideline families
Public transport stoppage/
2000 families/ 10,000 At least 1 bus bay with
station*** persons passenger shed
Sports and Recreational
1000 families/ 5,000 1 hectare minimum
Park, water front persons per 10,000 persons
400 m² minimum
Play ground (local level) per 5000

persons
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Children and youth center 2400 families/ 12,000 630 m² minimum per Local/ ward

persons 12000 persons

Gymnasium, Indoor games 1000 families/ 5000 175 m² minimum per Local/ ward

persons 5000 persons

Swimming pool 6000 families/ 30,000 420 m² of water Ward

persons surface/ 30,000

persons

Sports Complex with indoor and 10,000families/ 50,000 0.6 hectare Ward

outdoor facilities persons (ward level) per 50000

persons

* All general facilities shall be accommodated within the plot or block or cluster area. For any housing having a population of 10 families or above, the total built area (excluding community open space) dedicated to such facility/ facilities (depending upon the population size) shall not be less than 1m² per person.

** All such facilities must be a part of integrated planning prioritizing close proximity to the housing units they serve. The distance of such facilities from the serving units should not be more than 0.4 kilometers, All such connecting pathways, street etc. shall be away from major roads and shall have pedestrian priority.

*** Public transport stoppages should be located nearer to health facilities, post-secondary educational institutions and other public buildings and should be supported by public parking facilities nearby.

B.3.4 Size of Plot

B.3.4.1 Minimum standard community housing

All minimum standard community housing shall follow the general guidelines of plot sizes mentioned in Appendix A.

B.3.4.2 Minimum standard transitional housing

All types of minimum standard transitional housing, except site and service type, shall be group housing (A3 or A4 occupancy) and shall abide by the plot size requirement of Appendix A. For Site and Service transitional housing, the authority may allow higher density for larger plot size with close proximity to public transport network provided that such decisions are in compliance with the planning guidelines for the area or locality.

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Site and Service Scheme for Single Room Development: For site and service transitional housing development where a minimum standard house with single room, kitchen, bathing facilities and water closet is expected to develop, the minimum plot size may be reduced to 30 m² with a minimum frontage of 4.1 m. In areas other than metropolitan cities; with population less than 0.5 million, the minimum size of plot for such houses should be 40 m² with a plot frontage of minimum 4.8 m. In dense inner city areas of metropolitan cities with population more than 1.5 million, the Government may decide to have a minimum plot size of 25 m² with a minimum frontage of 4.1 m for such housing.

Site and Service Scheme for Two Room Development: For site and service transitional housing development where a minimum standard house with two rooms, kitchen, bathing facility and water closet is expected to develop, a minimum plot size of 40 m² shall be required. In areas other than metropolitan cities, having a population less than 0.5 million, the minimum size of the plot for such houses should be 60 m².

B.3.5 Internal Roads and Walkways

Pedestrian walkways when provided as means of access shall be at least 3 m wide. Such walkways shall not be longer than 60 m, nor serve more than 10 plots on each side of the path. Other internal roads shall be at least 6 m wide to allow emergency vehicles to enter. The paved portion of such roads, if used for pedestrian movement only, should be at least 2 m wide.

B.4 GENERAL BUILDING REQUIREMENTS

B.4.1 Plinth Coverage

The plinth area coverage of any plot of minimum standard housing shall not exceed 65 percent of the plot area. Plots with higher net density shall have lower plinth area and ground coverage.

Exception: For minimum standard transitional housing

The plinth area coverage of any plot of transitional housing shall not exceed 75 percent of the plot area. There shall be a setback of minimum 1.5 m on the rear side of a plot. There is no requirement for such set back on the sides and front of a plot if facing an internal road.

B.4.2 Height Limitation

The height limitation in such housing will vary according to typology of each development. However, maximum height for minimum standard housing for site and service scheme shall be 10 m. Minimum standard transitional housing of cluster type development and multistoried Row type development shall have a height limitation of maximum 20 m or 6 storied.

B.4.3 Plinth Level

The minimum height of the plinth shall be 300 mm from the surrounding ground level.

B.4.4 Habitable Room

B.4.4.1 All dimension stated in this Section do not include area or dimension required for partition or enclosure wall. Criteria for habitable room shall follow the basic guidelines of Part 3 Chapter 1.

B.4.4.2 Overcrowding

To avoid overcrowding in all habitable rooms in minimum standard housing including transitional housing, a minimum air volume of 9.5 m³ (9.5 cubic meters) per occupant shall be allotted. To calculate such volume no account shall be taken of any space with a height higher than 4.25 m or less than 2.15 m from the floor level of the room.

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Exception: For transitional housingBNBC 2015 FINAL DRAFT

(a) In a flatted development, one roomed dwelling units shall have a multi-purpose room which may include an alcove or space for cooking (as specified in Sec B.4.5). The minimum area of the room shall be 12 m² with a minimum width of 2.5 m.

(b) For dwelling units with two habitable rooms the minimum size of at least one room shall be 9.5 m² with a minimum width of 2.5 m. Other habitable room in the dwelling unit shall have a minimum area of 5 m² with a minimum width of 2 m.

(c) One-roomed dwelling with plan for future extension into a two-roomed house in a staged construction scheme shall satisfy the requirement of (a) and (b) above regarding room sizes. The first room to be built in this type of development shall have a minimum area of 9.5 m² with a minimum width of 2.5 m. The total area of the two rooms after future extension shall be a minimum of 15 m².

(d) All habitable rooms shall have a minimum clear height of 2.75 m. For sloped roofs the average height shall not be less than 2.75 m with a minimum of 2 m at the lowest side.

B.4.5 Kitchen

B.4.5.1 Criteria for kitchen shall follow the basic guidelines of Part 3 Chapter 1.

B.4.5.2 Exception: For minimum standard transitional housing

(a) The size of the cooking alcove or cooking space provided in a multi-purpose room of a one-roomed house shall not be less than 2.25 m² with a minimum width of 1.2 m.

(b) Separate kitchen provided in a two-roomed house shall have a minimum area of 3.25 m² with a minimum width of 1.6 m.

(c) Minimum clear height of the kitchen or cooking space shall be 2.15 m.

B.4.6 Bathroom and Water Closet

B.4.6.1 Independent water closets shall have a minimum width of 0.9 m and a minimum length of 1.15 m. The water closet shall be fitted with a door.

B.4.6.2 Independent bathroom without water closet shall have a minimum width of 1 m and a minimum length of 1.4 m.

B.4.6.3 The minimum size of a combined bathroom and water closet shall be 1.8 m² with a minimum width of 1 m. The bathroom shall be fitted with a door.

B.4.6.4 The minimum clear height of bathrooms and water closets shall be 2.15 m.

B.4.7 Balcony and Corridor

B.4.7.1 The minimum width of individual balcony shall be 0.9 m. Corridors for use of more than one dwelling units shall have a minimum width of 1.2 m.

B.4.8 Stairs

B.4.8.1 Minimum Width: Criteria for minimum width of stairs shall follow basic guidelines of Chapter 1 Part 3.

B.4.8.2 Maximum Rise: Criteria for maximum riser shall follow the basic guidelines of Chapter 1 Part 3.

B.4.8.3 Minimum Tread Depth: Criteria for minimum tread depth shall follow the basic guidelines of Chapter 1 Part 3.

B.4.8.4 Minimum Head Room: Criteria for minimum clearance of head room shall follow the basic guidelines of Chapter 1 Part 3.

B.4.8.5 Landing: Criteria for minimum landing depth shall follow the basic guidelines of Chapter 1 Part 3.

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B.4.9 Water Supply

One water tap or hand tube-well pump per dwelling unit should be provided, if feasible. Each unit of public water hydrants or community hand pumps, if provided in lieu of individual water supply, shall serve not more

than 10 dwelling units and shall not be farther than 15 m from any dwelling unit served.

B.4.10 Lighting and Ventilation

Every room, bathroom and kitchen shall have windows in an external wall opening on a courtyard, a balcony not wider than 2.5 m, or the exterior. The aggregate area of openings in the exterior wall of a habitable room or kitchen shall not be less than 12 percent of the floor area and that for a non-habitable room such as bath room, water closet or stair shall be at least 8 percent of the floor area.

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Appendix C

Special Requirements of Cluster Planning for Housing

C.1 GENERAL

These guidelines cover the planning and general building requirements of different housing developments in cluster typologies as referred in Appendix B. These requirements are applicable to all housing projects of this type taken up by public, private or co-operative agencies.

All cluster housing typologies shall fulfill the criteria regarding minimum area and width requirement of each habitable and non-habitable room as specified by this Code. The construction classification for Cluster Housing shall be of protected type.

C.2 CLUSTER TYPOLOGY

C.2.1 Cluster Type Development

Cluster type development (Figure 3.C.1), as a housing form, is suitable for accommodating low to moderate density of population. However with smaller plot size, it can also attain high density situation as may happen for Transitional Housing.

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Figure 3.C.1 Cluster type Housing 3-121

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C.2.2 Examples of Cluster Typologies

(a) Back-to-Back Cluster — Clusters when joined back to back and/or on sides (Figure 3.C.2).

(b) Closed Clusters - Clusters with only one common entry into cluster open space (Figure 3.C.3).

(c) 'Cul-de-sac' Cluster - Plots/dwelling units when located along a pedestrianised or vehicular 'cul-de-sac' road (Figure 3.C.4).

Figure 3.C.2 Back to back cluster

Figure 3.C.3 Closed cluster
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Figure 3.C.4 Cul-de-sac cluster

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C.2.3 Plot SizeBNBC 2015 FINAL DRAFT

In an integrated cluster planning, the minimum plot size shall comply with the guidelines set in Appendix B (including transitional housing).

C.2.4 Community Facilities

All such housing shall be provided with the requirement of neighbourhood and community facilities required for the population. In such cases, the authority may allow a FAR of 2.00 with 100 percent ground coverage provided that the basic natural lighting and ventilation criteria is met through the two exterior sides, both having exposure to the adjacent neighbourhood spaces.

C.2.5 Group Housing

Group housing may be permitted in the form of cluster housing. However, dwelling units with plinth areas up to 20 m² should have scope for adding a habitable room. Group housing in a cluster should not be more than 15 m in height.

C.2.6 Size of Cluster

In single to two-storeyed structures not more than 20 houses should be grouped in a cluster. Clusters with more dwelling units may create problem relating to identity, encroachment and maintenance.

C.2.7 Size of Cluster Open Space

Minimum dimensions of width of open spaces shall be not less than 6 m or 3/4th of the height of buildings along the cluster open space, whichever is higher. The area of such cluster court shall not be less than 36 m². Group housing around a cluster open space should not be more than 15 m in height.

C.2.8 Setbacks

In any cluster type development at least two sides of each individual dwelling shall have exterior walls and opening. No setback is required in other two sides of such developments. However for compliance of natural lighting and ventilation with this code, light well and ventilation well may be used within a cluster plot.

C.2.9 Right to Build in Sky

Pedestrian paths and vehicular access roads to clusters separating two adjacent clusters may be bridged to provide additional dwelling units. While bridging the pedestrian path way minimum clearance should be one storey height; length of such bridging should be not more than two dwelling units. While bridging the vehicular access roads minimum clearance from ground level shall be 6 m with a vertical clearance of 5 m.

C.2.10 Vehicular Access

A right of way of at least 6 m width with a vertical clearance of 5 m shall be provided up to the entrance to the cluster to facilitate emergency vehicle movement up to cluster.

C.2.11 Pedestrian Paths

Minimum width of pedestrian paths shall be 3 m.

C.2.12 Width of Access between Two Clusters

Built area of dwelling unit within cluster shall have no setbacks from the path or road, space. Hence, the height of the building along the pathway or roads shall be not less than 60 percent of the height of the adjacent building subject to minimum of 3 m in case of pathway and 6 m in case of vehicular access.

C.2.13 Density

Transitional housing shall result in higher densities with low rise structures.

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For a minimum standard housing with one habitable room, one kitchen and one two-fixture toilet and the required enclosure walls as per provision of this Code, a minimum dwelling unit of 23.81 m² is required. However for transitional housing, the size of dwelling units may be reduced up to 18.5 m² to increase density. In all such transitional housing a maximum allowable density shall follow the density guidelines of Appendix B.

C.2.14 Group Toilet for Transitional Housing

Transitional housing may have group toilets at the rate of one water closet, one bath and a washing place in three separate chambers per three families. These shall not be community toilets, as keys to these toilets shall be only with these three families, making them solely responsible for the maintenance and upkeep of these toilets.

C.3 OTHER REQUIREMENTS

C.3.1 Requirements of Building Design

With the exception of clauses mentioned above, requirements of building will be governed by the provision of this Code and good practice. Requirements of fire safety, structural design, building services and plumbing services shall be as specified in this Code.

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Appendix D

Universal Accessibility

D.1 SCOPE

The aim of this Appendix is to set out the fundamental design and construction requirements and guidelines for different occupancy types, accessible to persons with permanent or temporary disabilities. The requirements and guidelines should be applicable for all buildings and facilities as shown in Table 3.D.1 for emergency evacuation provisions of Part 4 shall be applicable.

D.2 TERMINOLOGIES

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D.2.1 Definitions

For the purpose of this Part of the Code, the definitions/terminologies below shall be applicable:

ACCESSIBLE/ ADAPTABLE Refers to a compartment with a water closet, wash basin, grab bars and other WASHROOM essential washroom accessories and with clear floor spaces at fixtures as per provision of this Code which a wheel chair user or any other person with ACCESSIBLE/ ADAPTABLE disability can avail with ease and safety.

WATER CLOSET

COMPARTMENT Refers to a compartment with adequate maneuvering space as per provision of ACCESSIBILITY this Code having a single water closet with grab bars installed to assist persons ACCESSIBLE RAMP with disabilities.

ACCESSIBILITY ROUTE

ADAPTABLE See Part 3 Chapter 1 definition.

AMBULANT DISABLED

See Part 3 Chapter 1 definition.

CIRCULATION PATH

CURB See Part 3 Chapter 1 definition.

CURB RAMP See Part 3 Chapter 1 definition.

GRAB BAR Refers to any person who, with the help of prostheses (artificial limbs)/ orthotic/ crutches/canes/ sticks or any other walking aid, is able to walk on level plain or HANDRAIL AND GUARDS suitably graded steps with handrails complying the provision of this Code.

OPERABLE PART

See 'accessibility route'

Refers to a side barrier between a trafficable surface and adjacent area through level change.

Refers to a short ramp cutting through a curb or built on it to negotiate accessibility between levels, which may have a different gradient as per provisions of this Code than a conventional accessible ramp.

Refers to a bar of certain specification and height as per provision of this Code which is used for assisting to stabilize a person with disability for performing a particular function.

See Part 4 Chapter 3.

Refers to part or component of any equipment, appliance or fixture which is necessary to operate that equipment, appliance or fixture (for example, handle, lever, push-button etc.).

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PERSONS WITH Refer to persons whose mobility and capacity to use a building or part there of or DISABILITIES a facility are affected due to one or more physical and/or sensory disabilities or impairments. For the purpose of this Code, they will be categorized as following:

SYMBOL (a) Wheelchair-bound

WHEELCHAIR USER (b) Ambulant disabled

(c) Hearing impaired and

(d) Visually impaired.

Refers to the international symbol of access for persons with disabilities also known as International wheel-chair symbol.

Refers to a person with disability who is depended on a wheelchair for mobility.

D.3 PROVISIONS FOR ACCESSIBILITY

D.3.1 Barrier-Free Accessibility

The following building occupancies shall require barrier free accessibility for persons with disability in the areas or facilities as specified in Table 3.D.1.

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Table 3.D.1: Requirements of Accessibility for Different Occupancies

Occupancy Type Accessible Areas

Residential buildings A3*, A5, From public footpath and parking areas to the lift lobby, lift, from MIXED lift lobby to all housing units, at least one toilet per housing unit and all communal facilities

Hostels and dormitories A4, MIXED All public areas intended for access by staff, students or visitors and at least one room per every hundred rooms or portion thereof including access to public footpath and parking.

Schools, colleges, universities or other B1-B3, MIXED All areas intended for access by staff, students or public use educational buildings including access to public footpath and parking.

Hospitals, clinics, homes for the aged and D1, D2, C3 All areas intended for access by staff, patients, inmates or public Institutions for the physically challenged use.

Office buildings E1, E3, MIXED All areas intended for access by employees or public including parking and at least one accessible toilet facility in each floor

Small shops and markets, Kitchen markets F1, F3, MIXED From parking and/or public footpath to sales counter service

Large shops and markets F2, MIXED All areas intended for access by employees or public including access to public footpath and parking.

Factories, workshops, industrial buildings G1, G2 All areas intended for access by employees or public use. and administration buildings in depots

Religious buildings, crematoria I1-I4, MIXED All areas intended for access by worshippers or public including access to public footpath and parking.

Restaurants, food-courts, fast food outlets I1-I4, MIXED All areas intended for access by employees or public including and other public eating outlets access to public footpath and parking.

Cinemas, theatres, stadia or other places I1-15, MIXED All areas intended for access by performers and areas prescribed of assembly with permanent seating by this Code for spectators or public use (Sections D.3.2.3 and D.3.2.5) including access to public footpath and parking.

Sports complexes, public gymnasiums and I5 All areas intended for public access with at least one accessible public swimming pools shower compartment and one water closet compartment.

Stations, airports, river-ports, bus MIXED All areas intended for access by employees or public use including terminals, interchanges and other areas prescribed in Sec D.3.2.7. passenger transport terminal

Parking garage, private garage, repair K1-K3 Prescribed areas in accordance to Sections D.24 and D.25. garage and showrooms

Note:*Excluding apartments without lift

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D.3.2 Minimum Accessible ProvisionsBNBC 2015 FINAL DRAFT

D.3.2.1 Mess, dormitories and hostels

In residential occupancies such as mess, dormitories and hostels, at least one room in every 100 rooms or part thereof shall be accessible.

D.3.2.2 Hotels and lodging houses

In room based residential occupancies e.g. Hotels, lodging houses etc. at least one in every 200 guest-rooms or a portion thereof shall be made accessible.

D.3.2.3 Banks, ticketing offices and counter services

Public facilities with counter services, such as, banks, information desk, ticketing offices etc. at least one service counter shall be designated in accordance to the requirements of Sec D.13.

D.3.2.4 Large shops and markets, foyers and public concourses

In large shops and markets such as large departmental stores, shopping mall etc. seats shall be provided for persons with disabilities who are unable to stand or walk for long periods. There shall be at least one accessible toilet per floor connected to the accessible route within such facilities. Seats and free spaces for wheelchair users shall also be required in foyers and concourses of public buildings.

D.3.2.5 Movie theatres, theatres, stadiums or other places of fixed-seat assemblies

Assemblies with permanent fixed seats such as movie-theatres, theatres, stadium, indoor stadium etc. shall have one wheelchair space per every 150 seats or a portion thereof. Such spaces should be located at a level that is easy to access for the wheelchair users. Seat arrangements shall facilitate wheelchair users to sit with their able bodied companion together. All such assemblies shall facilitate accessible counter facilities and toilets for persons with disability within the accessible route.

D.3.2.6 Eating outlets

Eating outlets with fixed seats such as fast food shops, food courts etc. shall have one accessible wheelchair seating per 10 seats or portion thereof. Seat arrangements shall facilitate wheelchair users to sit with their able bodied companion together.

D.3.2.7 Public transport terminals, bus stops, railway stations

All public transport terminals including bus stops and railway stations shall be accessible to persons with disabilities. The waiting areas of all such facilities shall be provided with seats for such persons who are unable to stand for long periods. Aisles for movement in such spaces shall be not less than 1200 mm.

Necessary signs and symbols shall denote the accessible routes and facilities within or outside all such buildings or facilities where 'Tactile indicators' shall guide the passengers from public footpath and accessible parking areas to specific ticket counter, waiting areas, toilets and other service facilities, arrival and departure platforms and to exits.

Doors of all public transports shall be accessible universally. Minimum clearance of all such doors shall be 900 mm. All such public transport should have at least two designated seats per coach near the door reserved for people with disability. A stall for a wheel chair per coach near the door should also be designated with provision for wheel stop blocks, safety bar with safety straps and adequate signage.

In all public railway carriages with toilet or dining facilities, the aisle width within the carriage should be at least 1200 mm.

It is preferable that there should be no level change between the platform level and the deck of the transport in use. However, where such level differences occur, ramp or lift facilities should be available to ensure universal accessibility.

D.4 MINIMUM SPACE ALLOWANCES

D.4.1 Minimum Space Requirement for Wheel Chair Users

Depending upon the nearest obstruction and the direction of movement a wheelchair user shall be considered for two approaches and shall require a minimum of 900 mm x 1200 mm unobstructed floor area as shown in Figure 3.D.1.

To facilitate both parallel and forward approaches for wheelchair users, a minimum clear floor space of 1200 mm x 1200 mm, as shown in Figure 3.D.2.

The minimum clear turning space for a manually operated wheel chair shall be 1500 mm x 1500 mm. For a powered wheel chair the requirement of turning space shall be 2250 mm x 2250 mm.

Where two wheelchairs are required to cross side by side, a minimum accessible clear width of 1800 mm shall be provided. The minimum width of an accessible route shall be 1200 mm, as shown in Figure 3.D.3.

D.4.2 Projection, Protrusion and Obstacles in an Accessible Route

All along the pedestrian areas accessible to persons with disabilities (e.g. walkways, halls, corridors, passageways etc.) any kind of obstacle, projection or protrusion shall be avoided. For all such areas an obstacle or projection or protrusion of 100 mm or less from side walls within the circulation space may be exempted.

When such protrusion is more than 100 mm, the bottom edge of the protruding object shall not be more than 580 mm above the floor level, as illustrated in Figure 3.D.4. Such projections or protrusions shall not reduce the clear width required for an accessible route or maneuvering space; to provide such protruding objects, space shall be provided to accommodate those objects in addition to the required clear width.

The minimum clearance for headroom in all accessible areas such as walkways, halls, corridors, passageways or aisles shall be 2000 mm. Any free standing post or object on or beside an accessible route shall follow the guidelines of Figure 3.D.5.

Figure 3.D.1 Minimum clear floor space

Figure 3.D.2 Minimum clear floor space (both frontal parallel approach)

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Figure 3.D.3 Minimum width of accessible routes

D.5 SURFACE QUALITY OF FLOOR SPACE

D.5.1 General

All pavement or floor surfaces required to be accessible shall be firm, even, slip-resistant and stable. Any change of level of such surfaces shall be negotiated in compliance with Sec D.5.2 or through accessible lifts as per provision of this Code. To assist persons with visual impairment, such floors or their skirting shall have finishes of contrasting color with adjacent walls.

D.5.2 Change in Level

Any change of level in an accessible route shall generally have gradient of at least 1 vertical to 12 horizontal towards the direction of travel. All such slopes shall have special markings with contrasting colors at the top and the bottom of the ramp or on the ramp slope as shown in Figure 3.D.6.

However, for change of vertical level up to 150 mm within any accessible route a steeper slope may be allowed in accordance to Table 3.D.2.

Since for some ambulant disabled persons, steps are convenient and safer to use than ramps, accessibility provision by both ramps and steps should be given.

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Figure 3.D.4 Limit of protruding objects 3-129

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D.5.3 Gratings

For safety of people with disabilities, the elevation of gratings located on an accessible route shall be at the same level and aligned perpendicular to the direction of travel. The gap of such gratings shall not be more than 12 mm at any direction.

D.5.4 Surface Texture

In an accessible route, apart from the general requirement of Sec D.5.1, floor surfaces with tactile indicators shall be required. In such cases dot type surface texture on floor shall indicate a warning, while line type surface texture on floor shall indicate the intended path of travel.

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Figure 3.D.5 Limit for free-standing objects mounted on post

Figure 3.D.6 Markings on an internal ramp

Table 3.D.2: Gradient for Changes in Levels

Maximum Vertical Change of Level (mm)	Maximum Allowable Length (mm)	Maximum Slope Ratio
1 vertical to 8 horizontal		
0 to 75	600	1 vertical to 10 horizontal
1 vertical to 12 horizontal		
more than 75	to 150	1500

More than 150

D.6 APPROACHES

D.6.1 Public Access Ways

The minimum unobstructed width of an accessible public access way such as footpath, corridor, foot over bridge, under pass etc. shall be 1200 mm. All such ways shall have a 1500 mm x 1500 mm space per every 30 m of length to facilitate crossing or turning of users. However for pathways with width of 1500 mm or more no additional width shall be required. The minimum access width shall not be encroached by obstruction or protrusion of any kind and shall comply with provisions of Sec D.4.2.

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D.6.2 Vehicular Approach to BuildingBNBC 2015 FINAL DRAFT

To facilitate persons with disability approaching by vehicles the driveway, walkway and accessible parking surfaces within a site shall either be merged to a common level or be connected by ramp (Sec D.5.2 and Table 3.D.2).

For occupancies mentioned in Sec D.3.2, at least one accessible route leading to an accessible entrance of the building shall be provided from the descending and boarding point of vehicle parking lots for persons with disabilities.

D.6.3 Access to Building

All accessible buildings or facilities as specified in Sec D.3 shall have at least one accessible entrance door, located preferably with the main entrance and connected to an accessible route which shall be minimum 1200 mm wide. All accessible entrance doors shall comply with the provisions of Sec D.8.

D.6.3.1 Directional signs

To direct persons with disabilities to the accessible entrance/directional signs bearing the symbol shall be displayed at all other non-accessible entrances and accessible parking areas.

D.7 ACCESSIBLE ROUTES, CORRIDORS OR PATHS

D.7.1 Length Width and Height

Any accessible route should not be more than 30 m of length at a stretch. Where such routes exceed this limit, provisions of seating preferably with shading shall be required to reduce strain of persons with disability. The minimum width of all accessible routes shall comply with the provisions of Sections D.4 and D.6.1. Where one way accessible check-in or check-out lanes are provided, the minimum width shall be 900 mm. The minimum height or headroom clearance for any accessible route shall be 2000 mm all along its path of travel.

D.7.2 Surface Finishes

All surfaces, edges, ends and corners of surrounding building and finish materials along an accessible route shall be free from sharp edges and shall comply with provisions of Sec D.5.

D.7.3 Obstruction or Protrusion on Accessible Route

An accessible route shall be free from any kind of obstruction or protrusion. The minimum circulation space required for persons with disability in such route shall not be impeded or obstructed by projection or protrusion from side walls, overhead planes or from floor below.

If incase vertical obstacles such as posts, bollards etc. are inevitable on or beside an accessible route there shall be at least 900 mm clearance between them to allow through circulation. Overhead obstacles such as drop beam, signboards, canopies etc. shall have a minimum clearance of 2000 mm from the floor level of the accessible route. All possible obstacles shall have color contrast with their background to ensure clear visibility.

Protrusion from side walls on or beside an accessible route shall follow the guidelines of Sections D.4.1 and D.4.2. Projections or protrusions shall not reduce the clear width requirement for an accessible route; when

such protruding objects shall be there, space shall be provided to accommodate those objects in addition to the required clear width.

D.7.4 Warning for Overhead Hazard

The minimum clear headroom in all accessible areas shall comply with Sec D.4. Whenever the headroom of an area adjoining an accessible route is less than 2000 mm, a detectable guardrail having its detectable edge at or

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below 580 mm from the floor level shall be provided as shown in Figure 3.D.7 to warn persons with visual impairment.

D.7.5 Physical Cue and Tactile Guidance

All accessible routes shall have provisions for physical cues and tactile guidance for persons with disability as per provisions of Sections D.5.4 and D.29.

D.8 ACCESSIBLE DOORS

D.8.1 General

An accessible doorway shall ensure the access of all people with specific provisions for unassisted wheelchair users safely and without inconvenience. For occupancies mentioned in Sec D.3.1, if revolving doors or turnstiles are required an ancillary swing door with a clear opening of minimum 900 mm shall be required to ensure accessibility.

The door threshold should preferably be at the same level with the floor. However if absolutely necessary, the allowed level change shall be maximum 20 mm from the floor level and shall be sloped to allow wheelchair access. All accessible bathroom and toilet doors should swing outwards to facilitate external emergency assistance. Accessible door shall have color contrast with its adjacent walls.

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Figure 3.D.7 Protection from overhead hazard

D.8.2 Width of Accessible Door

A single leaf of any accessible doorway shall be 900 mm minimum measured between the face of the door leaf open at 90° and the face of the opposite jamb as illustrated in Figure 3.D.8. Where doorways have double-leaf at least one operable leaf shall allow 900 mm clearance to ensure accessibility.

D.8.3 Unobstructed Spaces for Operating Doors

All accessible swing doors shall have unobstructed spaces for wheelchair users on both side of the door leaf. In such cases the side, in which the door leaf swings open, shall be known as pull side while the opposite as push side. The requirement of unobstructed spaces in both the sides shall be in compliance with Figure 3.D.9.

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Where two-way swing doors are used in an accessible route, both side shall be considered as pull sides and a vision panel complying with provisions of Sec D.8.5 shall be provided.

D.8.4 Door Operating Hardware

If not automatic, all accessories required for operating an accessible door such as door handles, fasteners, locks etc. shall be manually operable by one hand with ease. The height of all such accessories shall be within the range of 900 mm to 1100 mm from the floor level. Door handles are recommended over door knobs as knobs may be harder to operate for persons with grip difficulties, Figure 3.D.10.

D.8.5 Vision Panels

For the safety of ambulant disables or wheelchair users, all two-way swing doors across any accessible route shall have transparent vision panels as shown in Figure 3.D.11; where the bottom edge of such panels shall not be higher than 800 mm while the top edge of the panel shall not be less than 1500 mm, both measured from the floor level. The width of the viewing panel shall be not less than 150 mm. Such panels shall always be located at the opposite end of the hinged end on a door leaf.

D.8.6 Turnstiles

Whenever a turnstile is placed on an accessible route, an accessible gate with a clear width of at least 900 mm should be provided beside a turnstile, Figure 3.D.12.

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Figure 3.D.8 Clear width of accessible door

Figure 3.D.9 Minimum unobstructed space at doorway 3-133

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Figure 3.D.10 Preference of door handles

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Figure 3.D.11 Dimensions and location of vision panel

Figure 3.D.12 Access provision for turnstiles

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D.9 HANDRAILS AND GRAB BARS

D.9.1 General

Handrails and grab bars are very important safety features for any accessible facility. Therefore all such rails and bars shall be of accurate size and shape, slip-resistant, free of sharp or abrasive finishes and shall firmly hold with the supporting walls or floors or other form of supports. All such handrails shall have continuous gripping

surfaces at a constant height throughout their length so that persons with disability do not lose balance due to loss of grip. There shall not be any sharp edges or corners in a handrail and a grab bar that may pose risk of injury. Handrail and grab bars should have color contrast with the background. Such handrails and grab bars shall not encroach on the minimum clear space for circulation.

D.9.2 Specific Requirements for Handrails and Grab Bars

All handrails in any accessible facility shall have a circular section of 35 mm to 50 mm external diameter or an equivalent gripping surface of any other section. The clearance between such hand rails and its adjacent wall shall be between 40 mm to 60 mm as shown in Figure 3.D.13.

Any recess containing a handrail shall have at least 450 mm clearance above the top of the rail as shown in Figure 3.D.13. Height of such handrails shall be within a range of 850 mm to 950 mm measured from the floor or in case of a stair from the nosing.

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Figure 3.D.13 Handrails

D.9.3 Structural Strength

All hand rails and grab bars in an accessible facility shall be designed and built to resist a force of at least 1.3 kN applied vertically or horizontally.

D.10 CURB RAMPS

D.10.1 General

Curb ramps in an accessible route should be kept within the pedestrian part of the circulation route and should not protrude within the vehicular area. If such protrusion is unavoidable, the curb ramps should be constructed

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with flared sides with gradient specified in Sec D.10.2. Such ramps do not require handrails as long as the level change is not greater than 150 mm.

D.10.2 Gradient, Width and Surface of Curb ramp

The gradient of a curb ramp shall follow the provisions of Table 3.D.2. The width of a curb ramp shall not be less than 900 mm. Where the vertical change of level is greater than 150 mm or the horizontal run is more than 1500 mm, it shall constitute an accessible ramp and shall conform to the requirements of Sec D.11. All surfaces of curb ramps shall be slip-resistant and shall have a detectable warning surface of contrasting color and texture complying with provisions of Sec D.29 for visually impaired persons. Curb ramps with flared sides shall not be steeper than 1:10 and shall follow the specifications shown in Figure 3.D.14.

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Figure 3.D.14 Curb ramp with flared sides

D.10.3 Location of Curb Ramps

All curb ramps should be built within the pedestrian zone and should not protrude to parking or any other vehicular area. However, in locations such as street crossing, road islands, road dividers and so on, curb ramps

shall strictly be located within the pedestrian areas and shall follow the guidelines Figure 3.D.15 and 3.D.16.

D.11 ACCESSIBLE RAMPS

Accessible ramps shall be used to provide connectivity between levels having height difference of more than 150 mm within a facility which are not served by accessible lift facilities. All such ramps shall comply with the provisions of Sections D.4 and D.5.

D.11.1 Gradient, Width and Surface of Accessible Ramp

The gradient of an accessible ramp shall follow the provisions of Table 3.D.2. The width of an accessible ramp shall not be less than 1200 mm. All surfaces of curb ramps shall be slip-resistant and shall have a detectable warning surface of contrasting color and texture complying with provisions of Sec D.29 for visually impaired persons. Where the horizontal run of an accessible ramp exceeds 9.0 m in length, there shall be a landing of at least 1500 mm length with tactile warning surface as shown in Figures 3.D.17 and 3.D.18. All such ramps shall have hand rails on both sides complying with provisions of Sec D.9.

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D.12 ACCESSIBLE STAIRS

D.12.1 General

Stairs cannot provide accessibility for all persons with disability. Therefore stairs can only be an optional requirement for the ambulant disabled along with lifts or ramps. Any such stair or staircase should comply with the requirements of Sections D.12.2 to D.12.4. All handrail of accessible ramp shall have extensions either to floor or to wall as shown in Figure 3.D.19. For safety reason stairs with open risers or risers with projecting nosing as shown in Figure 3.D.20 shall not be considered as accessible stair for ambulant disabled.

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Figure 3.D.15 Location of curb ramp at street crossing

Figure 3.D.16 Location at road dividers 3-137

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Figure 3.D.17 Plan of straight ramp and landing

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Figure 3.D.18 Plan of right-angled ramp and landing

Figure 3.D.19 Hand rail extension (to floor or wall) Figure 3.D.20 Stair detail

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D.12.2 Tread, Riser and Nosing

All continuous flights of steps shall have uniform riser height of maximum 150 mm and tread width of minimum 300 mm. The risers shall be either vertical or receded back as per guidelines of Figure 3.D.21.

All steps should be fitted with contrasting visually detectable non-slip nosing as shown in Figure 3.D.21.

D.12.3 Warning Indicators

Stairs like any other level changes poses risks of accidents to persons with visual impairment. So all stairs in an accessible facility shall have detectable tactile warning strips provided at the top, bottom and intermediate landings in compliance to provisions of Sec D.29, Figures 3.D.21 and 3.D.22.

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Figure 3.D.21 Tactile warning at beginning and ending of stairs and detectable edges

Figure 3.D.22 Tactile warning in staircase 3-139
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D.12.4 Stair Handrails

Stair handrails shall comply with provisions of Sec D.9.2. Such handrails shall be installed on both sides of a stair as shown in Figure 3.D.23 and shall be installed between 800 mm and 900 mm height measured vertically from the pitch line of the steps to the top of the handrails. Stair handrails shall be continuous throughout the entire length of the stair and extend at least 300 mm beyond the top and bottom step as shown in Figure 3.D.23.

D.13 ACCESSIBLE SEATING SPACE AND COUNTER SERVICES

Any accessible seating space for wheelchair users such as work stations, tables, service counters in any building occupancy shall have a clear floor space not less than 900 mm x 1200 mm. Where a forward approach is required, the clear knee space shall be at least 900 mm wide, 480 mm deep and 700 mm high as shown in Figure 3.D.24. Writing surfaces or service counters shall not be more than 800 mm from the floor as shown in Figure 3.D.24.

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Figure 3.D.23 Handrail in stairway

Figure 3.D.24 Forward or side approach to table or counter

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D.14 SANITARY PROVISIONSBNBC 2015 FINAL DRAFT

D.14.1 General

In building occupancies described in Sec D.3, at least one toilet in each floor of a building or 5 percent of total toilets of the building, whichever is large, must be accessible. Among all accessible toilets preferably all or at least one shall be unisex in design provisions. The minimum dimension of an accessible WC compartment shall be 1500 mm x 1750 mm. All such toilets shall preferably have access directly from the accessible route. When they are part of a group of toilets, a clear approach path up to the accessible compartment with minimum of 1200 mm width shall be ensured. All accessible toilets shall have an emergency call button complying with the provisions of Sec D.17.

D.14.2 Fixtures and Accessories of Accessible Toilets

All fixtures in an accessible toilet shall abide by the provisions of this Section along with Sections D.16 and D.20 for minimum dimension, clearance from wall and other accessible clearances and limits along with minimum clear space for wheel chair maneuvering.

D.14.2.1 Accessible wash basin

All accessible basins shall comply with the provisions of Figure 3.D.25.

The faucets and other controls of such basins shall not involve powerful grasping or twisting of wrist and shall preferably be automatic or lever operated. If hot water provisions are there, proper insulation must be made to ensure safety of user.

D.14.2.2 Accessible water closet

The center line of a water closet in an accessible toilet shall maintain a distance of 460 mm to 480 mm from the adjacent sidewall. The front edge of such water closet shall be at least 750 mm away from the rear wall to allow side transfer for wheel chair users. The seating top shall have a height between 450 mm to 480 mm from the floor level. All such water closet shall have a back support to lean against it in the form of a seat lid or a flush tank or an added support. The flushing control if not automatic shall be located on the transfer side of the water closet. Figure 3.D.26 shows the basic requirements for such water closets.

D.14.2.3 Accessible urinals

Where urinals are provided, at least one shall be of wall hung type with a clear floor area of 750 mm x 1200 mm with level floor plane. The rim height of such urinals shall not be more than 400 mm measured from the floor. Any privacy shield on side shall have at least 120 mm clearance from the grab bars as shown in Figure 3.D.27. All such grab bars shall be installed as per provisions of Figure 3.D.27.

D.14.2.4 Washroom accessories

All washroom accessories such as towel rail, soap dispenser, waste bin, hand dryer, mirror, emergency call bell etc. shall be located within close proximity and shall comply with the provisions of Figure 3.D.28 and Sec D.17.

D.14.2.5 Signs at washroom entrances

All accessible toilets shall have clearly visible signs at washroom entrances complying with the provisions of Sections D.26.2 and D.27.

D.15 DOORS OF ACCESSIBLE WASHROOM AND WATER CLOSET COMPARTMENT

Any door of an accessible washroom and water closet compartment in fully open position shall have an unobstructed opening of at least 900 mm. For such doors, pull and push bars, sufficient clearance at both pull

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and push side of the door for wheel chair maneuvering shall be provided in compliance with guidelines of Sec D.8, Figure 3.D.29 to 3.D.31. All doors for accessible washroom and water closet compartments should preferably swing outward.

D.16 GRAB BARS

Any accessible toilet and bathing facility shall be mounted with at least two grab bars for each toilet fixtures except wash basin. The grab bars shall have a cross-sectional area complying with the provisions of Sec D.9. The length of such grab bars shall not be less than 600 mm. When both horizontal and vertical grab bars are required it is preferable that they should be continuous. All such grab bars shall follow the guidelines of Figure 3.D.28.

A horizontal grab bar mounted to the closest side wall of the water closet shall have a length starting from the rear wall and extending at least 450 mm beyond the front edge of the water closet and the same wall shall have a vertical grab bar as illustrated in Figures 3.D.31 to 3.D.33.

A foldable grab bar shall be mounted on the wider transfer side of the compartment as illustrated in Figures 3.D.26 and 3.D.29. keeping a clearance of 380 mm to 400 mm from the center line of the water closet and same height with other grab bars. Foldable grab bars shall not extend more than 100 mm from the front edge of a water closet.

D.17 EMERGENCY CALL BELL

All accessible toilets, water closet compartments and wash rooms shall have a water proof emergency call bell in each compartment. Such emergency call bells shall be either push-button type or pull-chord type located for convenience of use at a height between 600 mm to 650 mm above the floor level. The buzzer of such call bells shall be so located that immediate attendance shall be available quickly.

D.18 INDIVIDUAL WATER CLOSET COMPARTMENT

Any accessible water closet compartment for wheel chair users as required in Sec D.14.1 shall have a minimum internal dimension of 1500 mm x 1750 mm. All such water closet compartments shall comply with the provisions of Sections D.14.2.2, D.15, D.16, D.17, Figures 3.D.26 and 3.D.29.

D.19 WATER CLOSET COMPARTMENT IN PUBLIC TOILET

Any accessible water closet compartment for wheelchair users in a public toilet facility shall have a clear internal dimension of not less than 1500 mm x 1750 mm. All such water closet compartments shall comply with the provisions of Sections D.8, D.14.2.2, D.15, D.16, D.17 and Figure 3.D.30.

D.20 BATH FACILITIES

D.20.1 General

All residential occupancies, where accessible toilets are required by the provisions of Sec D.3, shall be provided with accessible bathing facilities either by providing bathtub complying with Sec D.20.2 or by providing shower stall complying with Sec D.20.3. Sports facilities and public swimming pools that need accessible provisions according to Sec D.3.1 shall also be provided with shower compartments in both male and female areas

complying with Sec D.20.3.

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Figure 3.D.25 Details of accessible wash basin

Figure 3.D.26 Accessible water closet for wheel chair users 3-143
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Figure 3.D.27 Basic dimensions for accessible urinals

Figure 3.D.28 Standard dimensions for wash-room accessories and grab bars

Figure 3.D.29 Water closet compartment for wheel chair users

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Figure 3.D.30 Detail of water closet compartment in group toilet

D.20.2 Accessible Bathtub

Any accessible bathtub shall have a clear floor space of at least 750 mm x 1200 mm along its length as shown in Figure 3.D.31. A seat of at least 250 mm width along the entire length or width of such bathtub as shown in Figure 3.D.31 and shall be required. The floor of accessible bathtubs shall be slip resistant. The base of such bathtubs shall be slip-resistant. All accessible bathing facility shall have grab bars complying with Sec D.9 and with the provisions of Figures 3.D.31 and 3.D.32. Shower heads in such facilities shall be hand-held type with flexible cords and shall comply with the provisions of Figures 3.D.31 and 3.D.32. All other accessories of such facilities shall comply with Sec D.14.2.4.

D.20.3 Accessible Shower Stall

An accessible shower stall shall have internal dimensions of at least 1500 mm x 1500 mm and shall comply with the provisions of Figure 3.D.33. The floor and seat of such accessible shower compartment shall be slip-resistant. The shower heads of such showers shall be hand-held type with flexible cord. All faucets and accessories of such shower compartments shall follow the guidelines of Sec D.14.2 and Figure 3.D.33. All such shower compartments shall have grab bars in compliance with Sec D.9, Sec D.16 and Figure 3.D.33. Any level change of such floor shall not be more than 10 mm and shall be negotiated with a slope ratio of one vertical to two horizontal.

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Figure 3.D.31 Bathtub for persons with disabilities
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Figure 3.D.32 Layout plan for 3 fixture toilet

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Figure 3.D.33 Accessible shower stall for wheelchair user

D.21 KITCHEN FACILITIES

An accessible kitchen may have an open layout (e.g. pass-through type) or a closed layout (e.g. U-shaped). The open layout consists of a straight pass through aisle, which can be entered from both ends and where working top, appliances and cabinets are on two opposing sides as shown in Figure 3.D.34 (A). The clear width of such aisle shall be not less than 1015 mm.

The closed layout requires turning radius of a wheel-chair within the kitchen area resulting in a layout enclosed on three contiguous sides ensuring a minimum clearance of 1525 mm between all opposing cabinets, working tops, appliances and walls, as shown in Figure 3.D.34 (B).

All appliances shall be clearly approachable either by front approach or by parallel approach. Where a forward approach is provided, the clear floor or ground space shall provide knee and toe clearance as per provision of this Code. Knee and toe space under cooking range shall be insulated to prevent burns or abrasions or electrical shock. At least fifty percent of all cabinets and storage spaces shall be accessible as per provision of this Code. The height of the working top, sink, cooking range and all necessary appliances shall follow the guidelines for accessibility of this Code.

D.22 LIFTS

D.22.1 General

Buildings, where lifts are needed as part of requirement by the building authority, should have at least one accessible lift for vertical circulation from the entrance level and serve all levels intended for use by persons with disabilities. Lift lobby for such facilities shall have a minimum dimension of 1500 mm x 1500 mm. The

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minimum size of an accessible lift car shall be 1500 mm x 1725 mm with a clear door opening of not less than 900 mm. Such accessible lifts shall follow the guidelines of Sec D.5 for floor finish, Sec D.9 for horizontal grab bar on back and side walls and the guidelines of Figure 3.D.35. All accessible lift shall have tactile marking and Braille

on all buttons.

Figure 3.D.34 Accessible kitchen clearance
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Figure 3.D.35 Lift for persons with disabilities

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D.23 EATING OUTLETS

D.23.1 General

All eating outlets, with or without fixed seats, as mentioned in Sec D.3 shall have provisions of access for persons with disabilities complying with Sec D.23.2. Any aisle of circulation in such outlets shall be at least 1200 mm wide.

D.23.2 Seating

In an accessible eating outlet, the minimum clear space between seats in the required number of accessible tables shall be 750 mm measured along the edge of the table as shown in Figure 3.D.36. All such tables provided for persons with disabilities shall comply with provisions of Figure 3.D.37. All such tables should be clearly marked with accessibility symbol and shall have directional signage for indicating location.

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Figure 3.D.36 Space requirement for accessible seating Figure 3.D.37 Clearance for accessible seating

D.24 ACCESSIBLE PARKING AREA

D.24.1 Parking Provision

In all occupancies referred in Sec D.3 where vehicle parking is required, the number of accessible parking stalls for vehicles for persons with disabilities shall be in accordance with Table 3.D.3. Such parking lots should be located as nearer as possible to the accessible entrance of the building. Pedestrian accessible routes connecting accessible parking shall be such that it avoids the risk of collision between an ambulatory disabled person and a backing out vehicle in a parking lot. Such parking shall not be occupied by vehicles of persons without disability.

Table 3.D.3: Minimum Number of Accessible Parking Stalls

Number of vehicle park stalls	Number of accessible stalls
For first 50 stalls	1

Next 400 stalls	1 additional stall per 100 parking stalls or portion thereof
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Above 450 stalls	6
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D.24.2 Symbols and Signage

Each accessible parking stall shall be clearly designated with the symbol of access, in accordance with the requirements of Sec D.26.2.

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Such Symbol shall be painted in contrasting color at the center of the accessible parking stall, having a dimension between 1000 mm x 1000 mm to 1500 mm x 1500 mm and complying with provisions of Sec D.26.2. The symbol of accessible parking shall be displayed at all approaches and entrances of parking lot indicating the location of such parking within the lot. Directional signs shall be displayed at every change of direction to direct persons with disabilities or their vehicle to the point of accessible parking stall.

D.25 ACCESSIBLE VEHICLE PARKING STALLS

The minimum dimension of an accessible vehicle parking stall shall be 4800 mm x 3200 mm. All such parking shall be provided on a firm, non-slippery, leveled solid surface and if possible, be covered. Figure 3.D.38 shows the detail of an accessible parking stall.

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Figure 3.D.38 Accessible parking stall and approach

D.25.1 Signage

Any accessible parking lot shall be identified by the symbol of access in accordance with Sec D.26.2. The size and location of all signs should be such that they ensure clear visibility all along the accessible route.

D.26 THE SYMBOL OF ACCESSIBILITY

D.26.1 General

The Symbol of Accessibility is an internationally accepted language that shall be permanently and clearly displayed to indicate and/or direct to the location of various accessible facilities in and around a building. All buildings or facilities mentioned in Sec D.3.1 shall display the required symbol of accessibility in compliance with the guidelines of this Code. Any such signs and symbols shall be simple, short and easy to understand. The text and use of pictographs shall be consistent throughout the building and outdoors in any accessible facility.

D.26.2 Symbol of Access

The form of the symbol of access shall consist a symbolized figure on a wheelchair and a contrasting plain square background as shown in Figure 3.D.39 where the symbolized figure shall be white on a blue background and shall always face to the right.

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Any building that offers accessible facilities shall clearly display the symbol of access at road front. Inside the premise the symbol shall denote the location of the accessible facilities including accessible parking, accessible routes, entry and other accessible services and facilities for persons with disabilities.

D.26.3 Directional Signs

Whenever changes in direction occurs directional signs incorporating the symbol of access similar to Figure 3.D.40 shall be displayed. This shall include main lobbies, passageways and all points where there is a change of direction to direct persons with disabilities to various accessible functions and facilities such as lifts, entrances, toilets, car parks and the like.

Where the location of the designated facility is not obvious or is distant from the approach viewpoints, directional signs incorporating the symbol of access, as shown in Figure 3.D.41, should be placed along the route leading to the facility.

BNBC 2015 FINAL DRAFT Figure 3.D.40 Accessible directional sign
Figure 3.D.39 Symbol of access for persons with disabilities

D.26.4 Service Identification Signs

Every accessible route shall contain service identification signs showing appropriate symbol of accessibility for persons with disabilities, as shown in Figure 3.D.42, to indicate the presence and direction to various service facilities such as entrances, lifts, telephone booths, toilets, vehicle parks, staircases and the like. Tactile pictographic signs shall distinguish between male and female toilets.

Figure 3.D.41 Signs directing to facility

Figure 3.D.42 Service Identification Signs at Destination 3-151
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D.27 SIGNAGE

D.27.1 Specifications for Characters and Symbols

Letters and numbers, when put on signs shall be legible and shall be consistent in font type all along the accessible facility. Only 'CAPITAL LETTER's shall be used in such signage. Braille, if written, shall be located directly below the text or arrow in a signage.

D.27.2 The Size of Symbols

The size of symbols depending upon the distance it is intended to be first viewed from shall vary and shall be in accordance with Table 3.D.4.

Table 3.D.4: Size of symbols varying with distance

Viewing distance (m)	Symbol size (mm)
Up to 7.0	60 x 60

7.0 to 18.0	100 x 100
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Above 18.0	200 x 200 to 450 x 450
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D.27.3 The Height of Letters

The height of letters in signs depending upon the distance it is intended to be viewed from shall vary and shall be determined in accordance with Table 3.D.5.

Table 3.D.5: Height of letters varying with distance

Required viewing distance (m)	Minimum height of letters (mm)
-------------------------------	--------------------------------

1.5	50
-----	----

2.0	60
-----	----

2.5	100
-----	-----

3.0	120
-----	-----

4.5	150
-----	-----

6.0	200
-----	-----

8.0	250
-----	-----

D.27.4 Location of Signs

All signs shall be located such that they are clearly and legibly identifiable from an accessible route. Any change of direction in an accessible route shall always contain necessary directional signs for users. In case of internal signs the center line of the sign shall be at a height within the field of vision and preferably at 1500 mm above the floor level.

D.27.5 Tactile Characters or Symbols

Tactile characters or symbols when used on a sign shall have a size between 16 mm to 50 mm and shall be raised at least 0.8 mm above the background surface. All such signs shall be mounted at a height complying with Sec D.27.4.

D.27.6 Braille and Pictographs

When Braille, the tactile language, is used the Braille dot shall be raised in dome shape from the base and the sign shall be easy to touch and read. The height of all such signs shall comply with Sec D.27.4.

Pictographs, when used shall be supported by equivalent textual description placed directly below it.

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D.28 GRADING OF SLIP RESISTANCE

For the purpose of accessibility, surface materials to be used as floor finishes should be graded for slip resistance in both dry and wet conditions. Table 3.D.6 indicates the slip resistance of some commonly used finish materials.

Table 3.D.6: Slip resistance grading

Grading Co-efficient of surface Example
Very good friction Clay tiles, carpets, dry rubber

More than 0.75

Good Between 0.75 to more than 0.4 Concrete pavers, dry terrazzo tiles, dry marble and granite

Poor to Fair Between 0.4 to 0.2 Wet and polished terrazzo tiles, marble and granite

Very poor Less than 0.2 Wet rubber

D.29 TACTILE GROUND SURFACE INDICATORS

D.29.1 Path of Travel and Mobility

People with different forms of visual impairments can be assisted to find their way independently with the help of some physical or sensory cues e.g. landmarks and mind maps. For such users a predictable, logical and barrier free access route is required. Therefore all such path of travel dedicated to universal accessibility should be designed as free from barriers, hazards or obstructions along with physical and sensory cues for such users.

D.29.2 Physical Cues

Physical cues are designed elements including buildings, walls, ground surfaces, railings, fences and curbs that can act as cues or clues to assist a visually impaired person. Such persons can identify physical cues either by use of a white cane, under foot, or by echo-location. All public buildings referred in Sec D.3 shall have physical cue both inside and outside the building to assist visually impaired persons.

Tactile ground indicators are designed physical cue to convey two important indications to visually impaired persons- a. directional indications and b. caution or warning indications.

Directional indicators, Figure 3.D.43, act as physical cues to guide persons with visual impairment to travel through an accessible route free from obstructions from beginning to end.
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(a) Directional indicator: top view (b) Directional indicator section detail

Figure 3.D.43 Directional indicators on ground of accessible route

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Warning indicators are physical cues for warning users of an adjacent hazard or a destination. Such hazards include but not limit to level changes, change of direction, approaching vehicular roads, obstructions etc.

The pattern and dimensions of warning indicator are shown in Figure 3.D.44 (a) and (b).

Figure 3.D.45 shows the combined use of both directional and warning tactile indicators in an accessible route.

(a) Warning indicator: top viewBNBC 2015 FINAL DRAFT(b) Stud detail

Figure 3.D.44 Warning Indicators on ground of accessible route

Figure 3.D.45 Use of tactile indicators in accessible route

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Appendix E

Building Types, Development Rights and Buildings Abutting Property Lines

E.1 GENERAL

These guidelines cover the planning and general building requirements of different building types such as attached type, detached type, semi-detached type etc. regarding their development rights and rights regarding building on abutting property lines. These requirements are applicable to all occupancy types taken up by public, private or co-operative agencies.

E.2 DEFINITION AND TYPOLOGY

The following are some definitions and diagrams to explain different typologies and terminologies relevant to this Code:

E.2.1 Row Type Building

A row type building abuts two side plot party-lines and is one of a row of buildings on adjoining zoning lots. The end buildings of a row of attached buildings are considered semi-detached buildings if they each have minimum side setback. Here the rest two (non-abutting) sides of the building are surrounded by yards or open areas within the plot confirming at least to minimum setback requirements (Figure 3.E.1).

E.2.2 Semi-detached Building

A semi-detached building is a building that abuts one side on the party-line of a plot and does not abut any other building on any other side of any adjoining plot/s; here the rest three (non-abutting) sides of the building are surrounded by yards or open areas within the plot confirming at least to minimum setback requirements (Figures 3.E.2 and 3.E.3).

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Figure 3.E.1 Row type buildings 3-155

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Figure 3.E.2 Semi-detached building (not abutting neighbouring building)

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Figure 3.E.3 Semi-detached building (abutting neighbouring building)

E.2.3 Detached Building

A detached building is a freestanding building that does not abut any other building on an adjoining plot and where all sides of the building are surrounded by yards or open areas within the plot confirming at least to minimum setback requirements.

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Figure 3.E.4 Detached building

E.3 SPECIAL PROVISIONS FOR CONSTRUCTION OF THE WALL ABUTTING PARTI-LINE/ SITE BOUNDARY LINE

E.3.1 General Requirements

Walls abutting any parti-line shall have no opening.

A parti-wall shall not contain any concealed lines (water, gas, sanitary, electricity etc.).

A parti-wall shall be so constructed that it remains moisture free, leak proof and conforms to the fire safety requirements as referred in Part 4.

A parti-wall shall conform with structural guidelines for earthquakes and pounding gaps given in Chapter 1, Part 6 of this Code. When the adjacent buildings are designed separately, pounding gaps are mandatory. When adjacent buildings are designed and built in an integrated way through plot consolidation, no such gap is required.

E.3.2 Shared Parti-Wall

A parti-wall, if formally (in written form) agreed upon between two adjoining owners, may become a shared wall between the two properties built half on the land of each of the two owners or in such other position as may be agreed between the two owners, with both having equal rights on the use of that wall. In such cases the structural guidelines of this Code shall be abided by both parties to allow future modifications on either side of the party-wall.

E.3.3 Independent Parti-Wall

For all other cases, the owner who intends to build a parti-wall, shall make it wholly on his own land abutting the parti-line or plot boundary line and shall reserve individual right/s (not shared) of use of that wall. Parti

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walls, in such cases, are one or two walls abutting parti-line or having pounding gap as per structural requirement of Part 6 built on same or different times.

E.3.4 Non-Crossing of Parti/Property Line

Under all circumstance, above ground or underground, the foundation/ footing of any wall/ column or any other part of building or services, shall not cross the parti-line or plot demarcation line.

E.3.5 Foundation of Parti-Wall

For all foundation work the safety of the buildings on adjoining land or plot must be ensured. The building owner who intends to erect wall abutting the side parti-line, if necessary shall, at his own expense underpin or otherwise strengthen or safeguard the foundations of the building or structure of the adjoining property.

E.3.6 Structural Independence

Buildings with parti-wall on adjacent plots must be structurally independent. Depending upon the plot frontage and the choice of structural system a parti wall may also be non-structural or non-load bearing wall. Where parti-wall or any part of it is structural, the footing/ foundation provisions must comply with article E.3.4 of this section.

E.3.7 Utility Lines and Drainages

E.3.7.1 Underground or surface lines and drainages

For all underground/concealed utility pipe lines, drains, ducts, etc., the outer edge of such utility pipe lines/ drains/ ducts shall be at least 900 mm inside from the parti-line within the plot to ensure maintenance accessibility without hampering parti-wall or the adjacent neighbor. For all such lines provisions for easy maintenance must be kept beforehand.

Any surface drain/ inspection pit (on finished ground level) shall be at least 250 mm inside from the parti-line within the plot.

E.3.7.2 Vertical utility lines or drainages

Under all circumstances, vertical utility lines/ducts shall not cross the parti line or plot demarcation line. No pipes, gutters, spouts, surface holes or any other type of drainage outlet to the adjoining properties can be given; special measures shall be taken to contain all drainages within the site.

E.3.7.3 Prevention of leakage

Any leakage or infiltration from these lines to neighbouring property must be prevented during and after construction. For such leakages the landowner who owns such utility lines shall be responsible to repair and compensate for any damage thereby.

For two adjacent walls abutting the same property line, the gap in between must be properly sealed.

E.4 OTHER REQUIREMENTS

With the exception of clauses mentioned above, requirements of building will be governed by the provision of this Code and good practice.

Measures must be taken for prevention of infiltration of rain, dust and moistures through joineries of parti-walls with pounding gaps between two adjoined properties. Proper treatment for damp proofing and termite proofing in compliance with Part 6 shall be ensured. Chemical treatment to prevent long term growth of fungi and other microbial forms are recommended on such walls.

A parti-wall shall be a barrier wall in compliance with the guidelines of Part 4 to ensure fire safety of the adjoining property. Other requirements of fire safety, structural design, building services and plumbing services shall be as specified in this Code.

Appendix F

Road Hierarchy, On-Street and Off-Street Parking

F.1 INTRODUCTION

Road is an integral part of a settlement and its land-use planning. For public safety in any new development the hierarchy of road network with measures for gradual traffic calming and adequate safe parking, both on-street and off-street, are of vital importance. Road width and road components, junctions, features of controlling vehicles' speed and turning, forward visibility and visibility splay at junctions are important tools of traffic and speed control.

With increased density and parking demand, on-street parking shall be an important tool to increase overall parking capacity as well as accommodation for service vehicles (e.g. garbage collection vehicle, maintenance vehicles etc.). This measure is also expected to keep the pedestrian walkways free from unauthorized vehicular parking.

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F.2 DEFINITIONS

CARRIAGEWAY Refers to driveway that provides access to the parking place. They do not have parking stalls adjacent to them.

CARRIAGEWAY RAMPS Refers to inclined floors that provide access between two levels.

INSIDE LANE Refers to the innermost lane of a curve ramp, which is nearest to the center point of curve.

INSIDE RADIUS OF LANE Refers to curved carriageway and driveway is the distance measured from the inside curve edge to the center point of the curve.

MAXIMUM GRADIENT Refers to the steepest gradient of ramp measured along the center line of the ramp. Gradient refers to the ratio of the inclination of the ramp (height length).

OUTSIDE LANE OF Refers to any lane positioned after the innermost lane.

CURVED CARRIAGEWAY

PARKING AISLE Refers to an access lane or driveway with adjacent parking stalls.

PARKING ANGLE Refers to the angle measured between the longer side of the parking stall and the line of traffic flow of the aisle.

PARKING STALL Refers to the space required for parking of one vehicle. The space of the stall shall be rectangular. The area of each stall shall be flat and free from curbs and other obstructions.

SINGLE-LANE Refers to a lane where only one vehicle can pass through at any given time.

TRAFFIC FLOW Refers to the direction of vehicle movement.

F.3 ROAD HIERARCHY GUIDELINES FOR NEW DEVELOPMENT

For any new development, at least three hierarchically interlinked road patterns should be followed (Figure 3.F.1): a. primary road, b. secondary road and c. internal/ access/ residential road. Though it is not mandatory to provide wider than regulation pedestrian walkways (with provisions for street furniture), bi-cycle lane and plantation zones parallel to walkways, it is strongly recommended that such provisions should be made, especially at primary and secondary road level, as much as possible.

Primary Road: This refers to a Public way or portion thereof, on which vehicular traffic is given preferential right-of-way, and at the entrance to which from intersecting public ways is required to be in obedience to a traffic signal, stop sign, or yield sign as per traffic code. Primary roads connect settlements/ zones/ sectors with rest of the city, which are capable of and usually are serviced by public transport facility (e.g. Bus service, Tram service etc.). These roads define the edge of the settlement and shall be capable of hosting traffic interchange (e.g. changing from one mode of transport to another). No individual plot should be accessed directly from a primary road (Figure 3.F.2). The right of way of a primary road shall not be less than 18 meter (Table 3.F.1 and Figure 3.F.3).

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Figure 3.F.1 Road hierarchy

Secondary Road: A secondary Road is a collector road or distributor road of low to moderate-capacity, which serve to move traffic from internal/ local streets to primary/arterial road. The flow of a collector road usually consists of a mixture of signaled intersections or traffic circles with primary arterial roads or other collector roads and un-signalized intersection with local/ internal/ residential roads.

A secondary road shall not be less than 13.5 m (Table 3.F.1 and Figure 3.F.4).

Internal/access/residential road: At the bottom of the hierarchy are local/Internal/access streets and roads. These roads have the lowest speed limit, carry low volumes of traffic and often have pedestrian priority. The minimum width of such road will depend on the density of the adjacent plots (Table 3.F.1, Figure 3.F.5).

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BNBC 2015 FINAL DRAFT Figure 3.F.2 Parking beside primary/arterial road

Figure 3.F.3 Minimum dimensions for primary road 3-161
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Figure 3.F.4 Minimum dimensions for secondary road

Figure 3.F.5 Minimum dimensions for Internal/access/local/residential road

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F.4 GUIDELINES FOR PEDESTRIAN WALKWAY

F.4.1 Any pedestrian path should be part of a pedestrian network connecting building users to different facilities and part of a city or a settlement and should enhance pedestrian friendly environment.

F.4.2 Pedestrian path or walkways should be separated and protected from vehicular driveways and any conflict between vehicular and pedestrian crossing shall be designed to ensure pedestrian safety.

Table 3.F.1: Minimum Widths of Public Means of Access to Residential Plots of new development

2-way On-street Pedestrian Bus Lane / Minimum right Minimum right of Minimum right Minimum right vehicular Parking / walkway

Emergency Bus Stop of way/ ROW way/ ROW of way/ ROW of way/ ROW

road Vehicle W (m)

width Option-A* Option-B** Option-C*** Option D****

V (m) P (m)

B (m) V+W (m) V+2W (m) V+P+2W (m)

6

Main/ primary Nil 2 3.5 Nil Nil Nil 18.00

road

(V+2W X

1.25+2B)

Secondary road 5.5 2 2 Nil Nil Nil Nil 13.5

(V+2P+2W)

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Internal/ access 4.8 2 2 Nil 6.8 8.8 10.8 Nil

road

Note:

* For serving residential occupancy A1 and A2, the minimum right of way shall be option A

** For serving residential occupancy of A3 within walkup range the minimum right of way shall be option B

*** For serving residential occupancy of A3 above walkup range , the minimum right of way shall be option C

**** For serving residential occupancy of A3 in mixed use , the minimum right of way shall be option D

F.4.3 The minimum width of a pedestrian walkway which is not enclosed by adjacent walls on both sides shall be 1 m; otherwise the minimum width shall be 1.25 m. However, depending upon the frequency of pedestrian users the recommended minimum width for footpath or walkway shown in Table 3.F.2 may be followed.

F.4.4 All public transport terminal and stoppages shall have dedicated planning for pedestrian users to and from the facilities showing connection to the public pedestrian and vehicular network adjacent to the site. Pedestrian walkways or footpaths in all such facilities shall be of sufficient width to cater the pedestrian need of the facility.

Table 3.F.2: Recommended minimum width of pedestrian walkway based on frequency of use

Peak pedestrian frequency (pedestrian user per minute) Width of walkway Width for street furniture and plantation width Total recommended width

(m) (m) (m)

Up to 60 2.5 1.5 4

Above 60- 80 3.25 1.5 4.75

Above 80- 100 4.0 1.5 5.5

Above 100 5.0 1.5 6.5

F.5 GUIDELINES FOR ON-STREET PARKING

For on-street car parking in any new settlement, the guidelines of Table 3.F.1 shall be the minimum requirement depending upon the type of road and expected traffic density.

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F.5.1 Parking along Primary Road

For primary roads, fast moving uninterrupted traffic flow needs to be ensured. Therefore such roads shall not serve for on-street parking. If, parking besides such primary roads becomes necessary, then an additional carriageway with on-street parking and an additional pedestrian walkway as shown in Figure 3.F.6 may be planned, keeping the main traffic flow uninterrupted.

F.5.2 Parking along Non-Primary Roads

On-street parking should normally only be considered on local distributors and roads lower in the hierarchy. On such roads, on-street parking spaces may be provided where off-street facilities are inadequate to meet demand and where provision would not adversely affect the flow of traffic. On-street spaces should generally cater for short term parking needs and parking meters may be installed to encourage such usage.

F.5.3 Parking for Service Vehicles

In most situations, it will not be necessary to provide parking spaces specifically for service vehicles, such as delivery vans, which are normally stationary for a relatively short time. If such parking bays are considered necessary, other vehicles may need to be prevented from using the spaces by regulation and enforcement.

F.5.4 Omission and Conversion of Existing Parking

Omission and conversion of existing parking spaces shall not be permitted if it results in parking deficiency for

the occupancy type. That is, after omission and conversion, the remaining number of parking spaces must be sufficient to meet the minimum requirement of the existing, proposed and approved development.

F.5.5 Parking Design Considerations

Any parking space design will consider the following two factors:

- (a) Minimum parking requirement ascertained for each type of occupancy
- (b) Parking layout for the required number of parking (Figures 3.5.7 to 3.F.13)

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Figure 3.F.6 Provision for on-street parking beside primary road

F.6 MINIMUM REQUIREMENT FOR OFF-STREET PARKING

The number of minimum parking spaces required shall be based on the total floor area of the building and shall depend on its occupancy type and number of users. The following tables (Table 3.F.3) shall form the basis for computation of minimum parking requirement:

Table 3.F.3: Off-street parking requirements for different occupancies

Occupancy type/use Minimum off-street parking requirements

Residential (occupancy type-A) 1 car parking

Small private dwellings/ row house with plot size not more than 134 m²

Small private dwellings/ row house with plot size 2 car parking
134-268 m²

Multi-family housing with flats/ apartments with gross 1 car parking/unit + 5% guest parking
area more than 200 m²

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Residential (occupancy type-A) Flats/ apartments with gross area more than 140 m² 2 car parking per 3 units
to 200 m²

Flats/ apartments with gross area more than 90 m² 1 car parking per 2 units
to 140 m²

Flats/ apartments with gross area more than 60 m² 1 car parking per 4 units
to 90 m²

Flats/ apartments with gross area up to 60 m² 1 car parking per 8 units

Flats/ apartments with gross area up to 90 m² (in 1 motorcycle parking per 5 units
addition to required car parking)

Hotels (star category) 1 car parking per 5 guest rooms

Hotels (other category) 1 car parking per 200 m² gross area

Others 1 car parking per 300 m² gross area

The minimum parking requirements for all residential occupancies within 500 m radius of MRT or BRT stations shall be 25 percent of the calculated requirement from above

Educational (Occupancy type-B) 1 car parking per 200 m² gross area

Educational (Occupancy type-B) Kindergarten, primary schools, high schools, For plots with 25 m or more frontages, an colleges, tertiary educational institution, training uninterrupted dropping bay of at least 25 m centers, universities and other educational length and 4.25 m width shall be given at institutions ground level within the school premises.

For plots with less than 25 m frontage, an uninterrupted dropping bay with length equal to total frontage of the plot and 4.25 m width shall be given at ground level within the school premises

At primary and secondary schools there should be a minimum of 3 lay-bys for school buses within the school boundary

Institutional and Institutional Type (Occupancy type-C) 1 car parking per 200 m² gross area
Health care Type
(Occupancy type-C Hospitals, clinics (Occupancy type-D) 1 car parking per 5 beds

and D) Medical diagnostic centers 1 car parking per 100 m² gross area
1 car parking per 200 m² gross area
Others (outdoor treatment facilities, collective practice of physicians etc)

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Business and Mercantile Occupancy type/use Minimum off-street parking
(Occupancy type-E and F) requirements

Mercantile (Occupancy type-F)

Shops, department store 1 car parking per 200 m² gross area

1 loading/ unloading bay of heavy goods

Restaurants vehicle per 2000 m² gross area or portion

Business (Occupancy type E) and Offices thereof

Others

1 car parking per 100 m² gross area

1 car parking per 200 m² gross area

1 car parking per 200 m² gross area

Industrial Industries (Occupancy type-G) For all such installations, at least 1 truck (Occupancy type-G) Storage (Occupancy type-H) parking along with loading unloading bay and at least 1 car parking.

and Storage

(Occupancy type-H) For administrative or sales centers within these installations, 1 car parking per 200 m² for such parts only are required

Assembly (Occupancy type- I)

Cinema

Theatre, auditorium

Sports facilities

Transportation terminals, airports, railway stations, etc (Occupancy I or MIXED)

Assembly (Occupancy type- I) BNBC 2015 FINAL DRAFT 1 car parking per 40 seats

Wedding/ party center (Occupancy I or MIXED)

1 car parking per 20 seats

Religious Up to 300 m² 1 car parking per 200 seats
structure More than 300 m²

1 car parking per 50 m² gross area

Others

1 car parking per 25 m² gross area

For plots with 25 m or more frontage, an uninterrupted dropping bay of at least 25 m length and 4.25 m width shall be given at ground level within the school premises

At least 1 car parking

1 car parking per 50 m² gross area

1 car parking per 200 m² gross area

Hazardous Hazardous (J1 and J2) For all such installations, at least 1 truck (Occupancy type- parking along with loading unloading bay and at least 1 car parking.

J)

For administrative purpose within these installations, 1 car parking per 200 m² for such parts only are required

Note:

For mixed-use situation, parking requirement shall be calculated by adding up the individual parking requirements of each types based on their use area per floor and respective parking ratio for each type.

For different types of flats/apartments within the same complex, parking requirements shall be determined by determining requirement for each type separately and then adding them together.

Fractional results in parking calculation shall be considered as 1 (one) full parking space.

With recommendation from the permitting authority parking requirement for low income residential areas may be reduced.

For flats with area less than 90 m², parking requirement of 1/3rd requirement of cars can be calculated by combining cars and motorcycles in the ratio of 1 car to 2 motorcycles.

For any building type, at least 1 (one) car parking shall be required.

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F.7 CAR PARKING LAYOUT GUIDELINES

F.7.1 Parking Stalls

Parking stall is a rectangular space with defined length and width, where the length is subject to variation depending on its relationship with the aisle, Figure 3.F.7.

For perpendicular or angular parking, the minimum dimensions required of a car parking stall shall be:

Stall width: 2400 mm

Stall length: 4800 mm

For parallel parking minimum dimensions required of a car parking stall shall be:

Stall width: 2000 mm

Stall length: 6000 mm

For parallel parking, where cars cannot be parked by reversing, minimum stall length shall be 7200 mm; the floor of each stall shall be flat and free from curbs and other interferences.

Where parallel parking stalls have frontal obstruction or perpendicular parking stalls have side obstruction, the stall sizes will vary in accordance with guidelines of Figure 3.F.8.

F.7.2 Minimum Width of Driveway

The minimum width of parking aisle or driveway shall follow the requirements of Table 3.F.4.

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Figure 3.F.5 Parking stall requirements 3-167

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Figure 3.F.8 Parking stall size variation due to obstructions

Table 3.F.4: Minimum width of Parking Aisle/Driveway

Parking Angle to One Way Traffic Two Way Traffic

Bays on One or Both Side

Aisle Bay on One Side Bays on Both Side

0° (parallel) 3600 3600

30° 3600 4200

45° 4200 4800 6000

60° 4800 4800

90° (perpendicular) 6000 6000

F.7.3 Minimum Dimension for Carriageway Ramps

Carriageway ramps are sloped driveway connecting and providing access between two levels for vehicles. For safe maneuvering of vehicle on carriageway ramp guidelines of the subsections as under shall be followed.

F.7.3.1 Width of carriageway ramp

The width of a carriageway ramp shall comply with the guidelines of Table 3.F.5 and Figure 3.F.9.

Table 3.F.5: Minimum width of Carriageway Ramps

Type of Carriageway Ramp Single Lane Dual Lane

3600 mm 6000 mm (3000 mm/lane)

(a) Width of straight
carriageway ramp

(b) Width of lane of curved 4200 mm 3600 mm for inside 3300 mm for outside
carriageway ramp lane lane

(c) Inside radius of curved 4500 mm
carriageway ramp

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Figure 3.F.9 Carriageway ramp width

F.7.3.2 Carriageway ramp gradient

Ramp gradient specify the slope of a ramp expressed either in percentage or in ratio and calculated as follows:

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Floor-to-floor height X 100

Ramp gradient (slope)% =

Ramp length along the horizontal plane

For same gradient on ramps, as shown in Figure 3.F.10 (a), the maximum slope shall be 12.5 percent (or 1:8).
Ramp gradient shall be measured along the center line of the ramp.

For change of gradient on ramp, as shown in Figure 3.F.10 (b), this slope may be increased up to maximum 20 percent, with transition slopes on both end that are sloped at half of the slope of the main ramp.

F.7.3.3 Parking ramp

When sloped parking stalls are directly approached from a same sloped ramp it is known as parking ramp and

the maximum gradient of such ramps shall be 5 percent (or 1:20).

F.7.4 Minimum Headroom

The height clearance from parking level floor to the bottom of the ceiling above shall be 2400 mm minimum. However, for downward projection from overhead ceiling (e.g. beams, direction signs, sprinkler heads, electrical fittings etc.) the clearance shall be minimum 2200 mm. Figure 3.F.11 shows the variable gradient of ramps used for calculating changing gradients.

(a)

(b) 3-169

Figure 3.F.10 Ramps with (a) Same gradient; (b) Change in gradient

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Figure 3.F.11 Relationship between floor-to-floor height, ramp gradient and ramp length

F.8 MOTORCYCLE PARKING PROVISIONS

F.8.1 Motorcycle Parking Stall Dimensions

The minimum stall length and stall width of motorcycle parking shall be 2400 mm and 1000 mm respectively.

F.8.2 Stall Location

Motor-cycle parking stalls can be provided at corners or any available space within the parking area provided that they do not obstruct movement of other vehicles and pedestrians.

F.9 PROVISIONS FOR LARGE VEHICLES

For other vehicles the minimum dimension of parking stall, headroom clearance, carriageway width and turning radius shall be in compliance with Table 3.F.6.

Table 3.F.6: Minimum Requirements for Large Vehicle Parking and Maneuvering

Type of Vehicle	Stall Length	Stall Width	Stall Headroom	Minimum carriageway	Inside Maximum turning radius
-----------------	--------------	-------------	----------------	---------------------	-------------------------------

Light goods vehicles	7 m	3.5 m	3.6 m	4.5 m (single straight lane)	
e.g. pickup, vans etc.	5.5 m			(single curve lane)	
	7.4 m			(dual straight lane)	

Mini buses	8m	3.0 m	3.3 m	4.5 m (single straight lane)	1:12
	12 m	3.5 m	3.8 m	7.5 m (single curve lane)	
Buses	7.4 m			(dual straight lane)	6.0 m
	11 m	3.5 m	4.7 m		
Heavy goods vehicle					
e.g. trucks					

Articulated vehicles 16 m 3.5 m 4.7 m 4.5 m (single straight lane) 1:15
e.g. container carriers, 9.0 m (single curve lane)
trailers etc. 7.4 m (dual straight lane)

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F.10 PROVISIONS FOR CAR LIFT AND MECHANIZED PARKING

F.10.1 General

To connect between different levels with vehicular access, car lifts can be used instead of a carriageway ramps. However, where a site is so constrained that it is not technically feasible to place a conventional ramp to connect between levels, mechanized parking may be installed. All such parking shall require queuing space as per provisions of this Code.

F.10.2 Guidelines for car lifts in a parking

A car lift shall have two openings, allowing entry of a car from one direction and exit of the car to the opposite direction. After entry to a facility or a building having car lifts, a minimum queuing space for at least 15 percent of the total parking shall be provided within the site. On departure from site, at least one holding bay having equal space of a parking stall shall be provided within the site (Figures 3.F.12 and 3.F.13).

The internal dimension of all such lifts shall not be less than 2600 mm x 6200 mm with a minimum discharge capacity of 30 vehicles per hour. For every 50 vehicles 1 car lift shall be installed. To reduce queue at least two lifts shall be installed in a facility or a building. Maximum number of parking using car lifts shall not exceed 200.

F.10.3 Guidelines for Mechanized Parking

A mechanized parking may involve stacking system or lateral displacement system or a combination of both. The approach driveway width for a mechanized parking shall be at least 3.6 meter for one-way traffic and 6.0 meter for two-way traffic. After entry to a facility or a building having mechanized parking, a minimum queuing space for at least 5 percent of the total parking shall be provided within the site.

Mechanized parking varies widely in type and specification; and shall be installed according to its manufacturer's specifications. In doing so and during its operation it shall not compromise the safety of the building or the users in any way.

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Figure 3.F.12 Queuing space and loading from and unloading to same road 3-171
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Figure 3.F.13 Queuing space and loading from and unloading to different roads
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FIRE
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Chapter 1

GENERAL PROVISIONS

1.1 SCOPE

This Part of the Code prescribes regulations for safeguarding life and property in the use or occupancy of buildings or premises from the hazards of smoke and fire, and explosions. The provisions of this Part include general requirements of fire protection, precautionary requirements, means of egress, equipment and in-built facilities standard installations required for firefighting, and firefighting arrangements required for various occupancy groups

1.2 TERMINOLOGY BNBC 2015 FINAL DRAFT

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 Part 1, the meaning specified in this Part shall govern for interpretation of the provisions of this Part.

ALARM CONTROL It consists of a circuit, controls, relays, switches and associated system which receive UNIT signals from alarm initiating devices and transmit to alarm signalling devices

ALARM INITIATING

DEVICE An equipment operated manually or automatically which, when activated, initiates an

ALARM SIGNAL alarm through an alarm signalling device.

ALARM SIGNAL Signals of audible or visual in nature, indicating the existence of a fire and/or smoke
DEVICE condition. Audible devices may be bells, horns, chimes, speakers or similar devices.
ALARM SYSTEM Visual Alarms is a strobe light emitting bright white light with approved insanity.

ALARM ZONE The equipment that produces the alarm signal.

ANNUNCIATOR

It is a combination of compatible devices, which when activated with necessary

AUTOMATIC FIRE electrical energy can produce an alarm in the event of fire.

DETECTING AND

ALARM SYSTEM It describes a defined area of the building or buildings for alarm initiating locations.

AUTOMATIC Equipment capable of indicating the zone or area of a building from which an alarm

SPRINKLER SYSTEM has been initiated or the location of such devices and the operational condition of
alarm circuit of the system.

AUTOMATIC HIGH

VELOCITY WATER These include all types of fire detecting and alarm signalling devices which activate

SPRAY SYSTEM themselves during a fire without manual intervention. The equipment/devices include

BUILDING temperature sensitive fuses, thermostat, fluid filled tubes and electronic devices which
can detect a fire and transmit automatic alarm signals.

The system consists of an array of pipe-works fitted with fusible solder or glass bulb.

This system shall activate at a predetermined temperature and the required water
shall be fed to the system from any source. In the event of fire or smoke the system
shall activate automatically by sensing the temperature of fire and discharge water to
extinguish. These devices also actuate an audible alarm automatically.

This system applies water in the form of a conical spray consisting of droplets of water
discharged at high velocity through specially designed projectors to extinguish fire by
emulsification, cooling and smothering.

Any structure used or intended for supporting or sheltering any use or occupancy.

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Fire Protection

Part 4

Fire Protection

BUILDING, EXISTING A building erected or officially authorized prior to the effective date of the adoption of
this edition of the Code by the agency of jurisdiction.

CARBON DIOXIDE This installation consists of a group of one or more cylinders of carbon dioxide,
EXTINGUISHING interconnected by a manifold and feeding into a system of high pressure distribution
SYSTEM pipe work fitted with special discharge nozzles.

COMBUSTIBLE Any material which burns and enhances the magnitude of fire.

MATERIAL

DRY-CHEMICAL This system consists of specially designed pipe works and discharge nozzles linked to
EXTINGUISHING the dry powder containers and gaseous cylinders which are automatically/ manually
SYSTEM operated in case of fire.

DRY RISER A riser or standpipe system is normally kept empty of water, but is capable to discharge water within 45 seconds and its installation is equivalent to wet-riser system.

ELEVATOR A system, including a vertical series of elevator lobbies and associated elevator lobby EVACUATION doors, an elevator shaft(s), and a machine room(s), that provides protection from fire SYSTEM effects for elevator passengers, people waiting to use elevators, and elevator equipment so that elevators can be used safely for egress.

ELEVATOR LOBBY A space from which people directly enter an elevator car(s) and to which people directly leave an elevator car(s).

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EXTERIOR STAIRWAY A stairway in which at least one side have openings more than 50% in an Exterior wall in such a way that there shall be no accumulation of smoke during fire.

FIRE BARRIER A fire-resistance-rated wall inside a building, designed to restrict the spread of smoke and fire. Opening in that wall, shall be protected by fire protected doors or windows.

FIRE COMPARTMENT A space within a building that is enclosed by fire barriers on all sides, including the top and the bottom to limit the transfer of fire.

FIRE DAMPER A device installed in air ducts or air transfer openings or any openings designed to close automatically upon detection of fire or smoke.

FIRE DOOR See Fire door assembly

FIRE DOOR ASSEMBLY Any combination of door leaf, frame, hardware and all other accessories that together provide a specific degree of fire and smoke protection to the opening where it is placed.

FIRE RESISTANCE RATING It expressed as a period of time and denotes the property of a building construction material or elements and/or construction as a whole during which the materials or elements or constructions are (a) resistant to collapse due to fire, (b) resistant to flame penetration and (c) resistant to excessive temperature rise to the unexposed surface.

FIRE SEPARATION Refers to a fire-resistance-wall or slab between two buildings or two spaces to protect spread of smokes or fire vertically and horizontally.

FIRE TOWER Refers to a stairway open or enclosed, detached and isolated from any building by a distance and can be approached from various floors of a building or buildings by connecting passage only.

FLOOR AREA, GROSS The floor area within the inside perimeter of the outside or exterior walls of the building under consideration with no deduction for hallways, stairs, closets, thickness of interior walls, columns, or other features.

FLOOR AREA, NET The floor area within the inside perimeter of the outside or exterior walls of the building under consideration with deduction for hallways, stairs, closets, thickness of interior walls, columns, or other features or spaces not used for human occupancy.

FOAM EXTINGUISHING SYSTEM This system discharge foam to extinguish special fires.

EXTINGUISHING
SYSTEM

HORIZONTAL EXIT Crossing a fire barrier of a building or connecting building in the same level shall be treated as horizontal exit.

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INTERIOR STAIRWAY A designated area on ground or on water or on a portion of a building for helicopter landing or takeoff without servicing, repairing and refueling facilities.

INTERIOR STAIRWAY A stairway within a building envelope.

PARTY WALL A fire resistance rated wall where openings are protected, which is constructed from the ground level and continued up to at least 1m above the roof of a building to restrict the spread of a fire.

PUBLIC WAY A Street, alley, or other similar parcel of land essentially open to the outside air deeded, dedicated, or otherwise permanently appropriated for building users or for public use or a single loaded corridor that is one lateral side opened to outer air, designed in such a way that there shall be no accumulation of smoke in case of fire. This corridor may be placed at any level of a building having a clear width and height of not less than 3 meter having guards and connected to the exit termination or refuge areas by exterior or enclosed stairs shall be treated as public way.

ROOF REFUGE AREA When occupants are relocated at the flat roof of a building which are not connected with any means of exit shall be treated as isolated refuge area and must have provisions for placing of leaders of fire department excess vehicles.

SMOKE DETECTOR A devise capable of sensing visible or invisible particles produced during combustion.

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TRAVEL DISTANCE Straight line distance between the remotest point of a space of a floor and the exit access door placed thereof.

TRAVEL PATH Length of a passage from the remotest point of a space up to the exit access door placed thereof.

VENTILATION Natural or mechanical intake of fresh air from outside and removal of inside air of an enclosed space.

VESTIBULE A compartment provided with two or more doors with smoke lock system where the intended purpose is to prevent continuous and unobstructed passage by allowing the release of only one door at a time.

VENT, FIRE A system which activates itself automatically or manually during a fire or can be activated manually to release the heat and smoke generated by the fire and smoke.

RAMP A walking surface that has a slope steeper than 1 in 20 and accessible ramps are not steeper than 1 in 12.

WET-CHEMICAL A system where a solution of water and potassium carbonate and/or potassium EXTINGUISHING acetate based chemical forms the extinguishing agent.
SYSTEM

WET RISER STAND A vertical pipe or consists of an array of pipes installed vertically in a building having

PIPE SYSTEM landing valves with appropriate outlets at various levels of a building containing charged water at a specified pressure for fire extinguishing purposes.

1.3 GENERAL REQUIREMENTS

The provisions of this Section shall specify the general requirements in respect of height and area limitations, open space requirements and access facilities for the fire service, which are to be provided for a building to protect it from potential fire hazards.

1.3.1 Height and Area Limitations

The height and area limitations of all buildings and structures shall be governed by the occupancy group classification, floor area ratio and type of construction, which are specified in Part 3 of this Code.

1.3.2 Open Space or Fire Separation Requirement

For the purpose of applying the provisions of open space or fire separation requirements of a building at its side, rear and frontages in Part 3 of this Code shall be followed.

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1.3.3 Access Facilities for Fire Service

The access facilities for fire service vehicles and engines shall meet provisions provided in Part 3 of this Code.

1.4 FIRE DRILL

Fire drills based on fire order shall be arranged to train the occupants of a building in first-aid firefighting, relocation and orderly evacuation. The occupants shall be made thoroughly conversant with fire order, firefighting, and relocation and evacuation procedures in the event of an emergency. The guidelines of fire drill, relocation and evacuation procedure are given in Appendix A.

1.5 FIRE TESTS AND FIRE RESISTANCE RATING

The fire resistance rating of individual building construction components shall be determined by standard materials testing procedure as detailed below.

(a) The fire resistance ratings of building assemblies and structural elements shall be determined in accordance with ASTM E 119.

(b) The construction materials which are intended to be classified as non-combustible shall be tested in accordance with ASTM E 136.

(c) Flame resistance rating of all materials used for interior finish and trim shall be tested in accordance with ASTM E 84.

(d) The fire door assemblies shall conform to the test requirements of ASTM E 152.

(e) The fire windows and fire shutters shall meet the test requirements of ASTM E 163.

(f) The fire resistances rating of structural elements, which are widely used in Bangladesh, are provided in Table 4.1.1 below, as a guideline. These ratings shall be used unless tests conducted in accordance with the above to indicate higher fire resistance ratings, in which case the higher values may be used.

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Table 4.1.1: Fire Resistance Rating of Common Construction Elements

Structural Element Fire Resistance Rating

SOLID CLAY BRICK WALLS

Thickness: 75 mm 0.75 hours

125 mm 1.50 hours

250 mm 5.00 hours

RC WALLS 3.00 hours

Thickness: 150 mm 4.00 hours

5.00 hours

200 mm 6.00 hours

250 mm

300 mm

RC SLABS 1.00 hours

Thickness: 100 mm with 13 mm clear cover 2.50 hours

3.75 hours

150 mm with 19 mm clear cover 5.00 hours

200 mm with 19 mm clear cover

250 mm with 25 mm clear cover

RC COLUMNS (1:2:4) 3.00 hours

250 mm x 250 mm with 25 mm clear cover 4.00 hours

300 mm x 300 mm with 25 mm clear cover 6.00 hours

400 mm x 400 mm with 25 mm clear cover 8.00 hours

400 mm x 400 mm with 50 mm clear cover

1.6 RELATED APPENDIX

Appendix A Fire Drill and Evacuation Procedure

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Chapter 2

PRECAUTIONARY REQUIREMENTS

2.1 OCCUPANCY CLASSIFICATION

All buildings shall be classified according to their use or by considering the character of their occupancy. For the purpose of this Code, the occupancy classification groups shall be as follows:

Occupancy A: BNBC 2015 FINAL DRAFT Residential

Occupancy B: Educational

Occupancy C: Institution for care
Occupancy D: Health Care
Occupancy E: Business
Occupancy F: Mercantile
Occupancy G: Industrial
Occupancy H: Storage
Occupancy I: Assembly
Occupancy J: Hazardous
Occupancy K: Garages
Occupancy L: Utilities
Occupancy M: Miscellaneous

The details of occupancy classification of buildings are provided in Part 3 of this Code.

2.2 CLASSIFICATION OF CONSTRUCTION TYPES

For the purpose of this Code, every room or control area or space of a building or a building itself hereafter altered or erected shall be classified in one specific type of construction as grouped as follows:

GROUP I- Non-combustible, subdivided as follows:

Type- I A 4 hour protected

Type- I B 3 hour protected

Type- I C 2 hour protected

Type- I D 1 hour protected

Type- I E Unprotected

GROUP II- Combustible, subdivided as follows:

Type- II A Heavy timber

Type- II B Protected wood joist

Type- II C Unprotected wood joist

Type- II D Protected wood frame

Type- II E Unprotected wood frame

The types of construction are based on fire resistance of construction elements, which are detailed in Part 3 of this Code.

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2.3 FIRE ZONES

The development areas of a city, township or municipality or union shall be divided into Fire zones as distinct areas based on the inherent fire hazards of the buildings to be constructed and the degree of safety desired for the occupancy group accommodated therein.

2.4 MIXED OR SEPARATED OR DETACHED OCCUPANCY

Where two or more occupancy types are amalgamated in a floor or in a building shall be designated as mixed occupancy shall be allowed as per provisions of A-Z list of Part 3 and this Code.

Where two or more occupancy types are in groups in a floor or in a building and separated as specified in the Table 3.2.1 of Part 3 and as per provisions of this Code shall be designated as separated Occupancy.

Hazardous occupancy J shall not be allowed as mixed or separated occupancy with any other occupancy classification as per provisions of this Code.

Building structures are isolated by fire separation distances as per provision of this Code shall be designated as detached occupancies.

2.5 OPENINGS IN SEPARATION WALL

Opening means a hole or an aperture in the building envelope or in any wall within the building through which air can pass. Protective type opening means a hole or an aperture shall have open able closures with fire resistive assemblies to restrict air movement.

Separation wall not constructed monolithically or homogeneously and having joints shall be complied with requirements of smoke lock and fire resistance rating as per provisions of this Code.

Vertical solid elements which create a barrier within a space or create a building envelope shall be designated as wall or partitions as per provisions of this Code.

(a) The openings in occupancy separation wall shall conform to the provisions set forth in the Part 3 of this Code.

(b) Openings in fire separating walls and floors shall not exceed the approved limit and the opening shall be of protective type and conform to the approved provisions of this Code.

(c) Fire separation walls shall not have opening exceeding 11.2 m² in area and the aggregate width of all openings at any floor level shall not exceed 25 percent of the length of the wall. When an entire storey floor area has fire separation walls on two opposite sides have openings shall be covered by automatic fire suppression system, the maximum allowable opening may be doubled with a minimum distance of 0.9 m between adjacent openings.

(d) Each protected openings in a fire separation wall shall be limited to 5.6 m² in area with a maximum height of 2.75 m and width of 2.20 m. Wall or floor openings shall be protected with approved fire resisting means conforming to approve standards as per provision of this Code. When openings in floors have protected enclosures or have enclosure walls which form a shaft and have openings on enclosure wall shall be protected by fire assemblies.

(e) Openings of service lines like cables, electrical wirings, telephone cables, plumbing fixture etc. shall be protected by enclosures having an approved fire resistance rating. Medium or low voltage electrical wire running through shaft or ducts shall be either armoured or cased within metal conduits as per provisions of Part 8 of this Code.

(f) All openings in the fire separation walls shall be protected with fire resistance assemblies or automatic fire suppression system as per provisions of this Code.

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2.6 SMOKE AND HEAT VENTS

Interior or indoor air qualities are maintained as good as natural outdoor air qualities as per provisions of this Code through openings in the building envelope shall be designated as Natural Ventilation.

Interior or indoor air qualities are maintained by the means of mechanical devices shall be designated as Mechanical Ventilation. Restricted ventilation means excessive smoke accumulation within a building during fire.

(a) Smoke and heat vents shall be installed in areas of restricted ventilation such as windowless buildings, underground structures, and factories floor spaces of restricted ventilation.

(b) Where exit access travel distance is more than 23 m, smoke and heat vents shall be constructed in accordance with the provisions of this Code.

(c) The vent area and spacing of the vents shall comply with Table 4.2.1.

(d) Closures of natural draft, smoke and heat vents shall be installed in such a way that fire service personnel can open it easily during a fire.

(e) Smoke and heat vents on roof or ceiling or wall shall normally be kept open. In case of closed vents, automatic activation of the openings by heat responsive device rated at 380°C to 1040°C above ambient

shall be a requirement. The releasing mechanism shall be capable of opening the vent fully when the vent is exposed to a time-temperature gradient that reaches an air temperature of 260°C within 5

minutes. The vents shall also be capable of being opened by manual operation.

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(f) Fire Vents requirements for Industrial and Storage Buildings are given in Appendix B of Part 4.

Table 4.2.1: Smoke and Heat Vent Size and Spacing

Use group Hazard Condition Vent Area to Floor Max Spacing of
Area Ratio Vent Centres

Occupancy H1 Low Hazard 1:150 45 m
36 m

Occupancy H2 Moderate Hazard 1:100 22.5 m to 30 m
22.5 m to 30 m

Occupancy J1 High Hazard 1:30 to 1:50 45 m

Occupancy J2, J3, J4 High Hazard 1:30 to 1:50

Occupancy K1, K3 Low Hazard 1:150

2.7 ELECTRICAL, GAS AND HVAC SERVICES

The requirements of the electrical, HVAC and gas services shall meet the provisions of Part 8 of this Code.

(a) Air-conditioning and ventilation systems shall be installed and maintained as per provisions of this Code so that the fire, fumes or smoke do not spread from one area of fire to other area of a building through the ducts or vents.

(b) Properly designed fire dampers shall be installed within the air-conditioning and ventilation ducts, which shall automatically close the flow of air in case of fire.

(c) For large assembly areas, department stores and hotels with more than 100 rooms in a single block, effective means for preventing circulation of smoke through the air-conditioning ducts shall be installed. Such means shall consist of approved smoke sensing control devices, where fuses of dampers may not function during early state of a fire due to insufficient heat as per provisions of this Code.

2.8 SURFACE FINISHES

Materials used to trim or cover the interior and the exterior surfaces of a building have the potential of generating smoke and toxic fumes during a fire and have the potentiality of changing the nature of fire due to its ignitability as fuel. Use of such finish materials shall be classified as per provisions of this Code.

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(a) The fire susceptibility of various types of surface finishes shall be determined in terms of the rate of spread of fire (ASTM E 84). Based on the rate of spread of fire, the surface finish materials shall be classified into three (3) classes:

Class I Surfaces of low flame spread: Flame does not effectively spread more than 300 mm in the first 1.5 minutes with an ultimate value of 600 mm.

Class II Surfaces of medium flame spread: Flame does not spread effectively more than 300 mm and 850 mm in the first 1.5 minutes and 10 minutes respectively.

Class III Surfaces of rapid flame spread: Flame spreads effectively more than 300 mm and 850 mm in the first 1.5 minutes and 10 minutes respectively.

(b) Interior finish of walls and ceilings shall have a flame spread rating not greater than those in Table 4.2.2 for various occupancy classes.

Table 4.2.2: Acceptable Flame Spread Rating Classes of Interior Finish

Occupancy Class/Use Group Vertical Exits and Corridors Providing Rooms or Enclosed
Passage Ways Exit Access Areas

A1 Detached single family dwelling III III III

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A2 Two family dwelling I I II

A3 Flats or Apartment III

A5 Hotels and Lodging Housing III

B Educational III

C1, C2 Institutional, Residential & custodial I I III

C3 Institutional-Incapacitated III

C4 Institutional- Restrained III

D Health Care III

E Business I II II

F Mercantile I II II

G Industrial I II II

H Storage III II III

I1 Large assembly with fixed seats I I I

I2 Small assembly with fixed seats I I I

I3 Large assembly without fixed seats I I I

I4 Small assembly without fixed seats I I I

J Hazardous I II III

Note: Class III may be adopted Instead of Class II where the area is covered by automatic fire suppression system.

2.9 GLAZING ASSEMBLIES

(a) Buildings of construction shall use any one of the following types of glazing using wire glass by electro-copper or equivalent. Building of construction types as designated as unprotected or combustible may use hardwood sashes or frames or both.

(b) Glazing system used partially or as a whole to fulfill fire separations or fire barriers requirements as per provisions of this Code shall be the equivalent of required fire resistance rating. Glazed doors, windows or partitions or wall with appropriate smoke lock along with other safety due to fragility, translucency or transparency shall be correctly installed. Such fire-resistant glazing assembly must function as an integral system together with the frame, beads, bead fixings, glazing materials and frame fixings all working together with compatibilities with the standards installation as per provisions of this Code.

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(c) Wired glass panels shall comply with the following requirements:

(i) Thickness of the glass shall not be less than 6 mm.

(ii) Embedded wire netting mesh in the glass shall not be more than 25 mm mesh.

(iii) The sashes or frames or both shall be entirely made up of iron or any other approved metal. The frame shall be securely fixed into the wall (except panels of internal doors).

(iv) Setting of the panels of glass shall be achieved by rebates or grooves of not less than 6 mm diameter/width or depth keeping due allowance for expansion. The glass shall be secured to the frame by hard metal fastenings. Approved sealants may be used for weather proofing.

(v) Where wired glass panels are labelled as protective openings, they shall conform to the size limitations shown in the Table 4.2.3.

Table 4.2.3: Limitations of Wired Glass Panel sizes in Protective openings

Required Fire Resistance Rating Opening Size

Max Width (m)

Max Height (m) Max Area (m²)

NP

3 hours NP NP

1 1 hour door in exterior walls NP NP NP

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1 1 hour fire rating 0.85 0.25 0.065

2

3 hour fire rating 1.4 1.4 0.85

4

Fire windows 1.4 1.4 0.85

Note: Size limitations are not applicable for Fire Rated Glazing Assemblies.

NP = Not Permitted.

(d) Electro-copper glazing shall comply with the following requirements:

(i) Thickness of the glass shall not be less than 6 mm.

(ii) Not more than 0.4 m² of square glass shall be formed by electro-copper glazing in sectional lights.

(iii) The sashes or frames or both shall be entirely made up of iron or any other approved metal. The frame shall be securely bolted into the wall (except panels and internal doors).

(iv) Setting of the panels of glass shall be achieved by rebates or grooves of not less than 6 mm width or depth keeping due allowance for expansion. The glass shall be secured to the frame by hard metal fastenings. Approved sealants may be used for weather proofing.

(e) Wall opening more than 5 m² shall not be deemed to be effectively protected by wired glass or electro-copper glazing.

(f) Wired glass or electro-copper glazing not exceeding 0.85 m² in area shall be allowed provided it is cased in hard metal and secured to the frames by hard metal hinges not exceeding 60 mm apart and by fastening at top, centre and bottom.

2.10 SKYLIGHTS

(a) Wired glasses used in skylights shall comply with the following requirements:

(i) Thickness of the glass shall not be less than 6 mm;

(ii) Wire netting mesh embedded in the glass shall not be more than 25 mm square;

(iii) The glazing shall be caged in frame of continuous metal divided by bars 750 mm apart centre to centre. The frame and bars shall be iron or other approved metal (or of hard wood covered with sheet metal). The glass shall be secured to the frame by hard metal fastenings. Approved sealants may be used for weather proofing.

(b) Single opening for Skylight more than 5 m² shall not be deemed to be effectively protected by wired glass.

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2.11 FIRE LIFTS

(a) Fire lifts shall be installed as per provisions of this Code. Fire lifts, where installed shall be fully automated from the ground level with all though fire rated and protected wiring and switches and shall have a minimum capacity of 8 persons.

(b) Fire lifts shall be operated and maintained by the inmates of building except during fire. During fire, Firemen shall takeover to operate such lifts.

(c) Fire lifts shall be equipped with approved two way voice communication with the fire command station or control room or security room on the exit termination level of a building.

(d) Number and location of fire lifts in a building shall be decided on the basis of total occupant load, floor area and compartment.

(e) A Lift shaft or bank shall be dedicated to Fire lift.

(f) The speed of the lift shall be such that it can reach the top floor from ground level (non-stop) within 1 minute.

(g) Smoke detectors shall be installed at a distance of 3m from every entry doors of Fire Lifts and links with corresponding lift control panel to prevent lift doors to open in case of fire at any level.

(h) All lifts in tall structure shall be operable during fire. There shall be provisions for firemen to take over the control of lift operation as per provision of this Code.

(i) All stretcher and hospital lifts shall be operable during fire. There shall be provisions for firemen to take over the control of lift operation as per provision of this Code.

(j) Lifts installed for accessibility shall be operable during fire. There shall be provisions for firemen to take over the control of lift operation as per provision of this Code.

(k) Lift lobby shall be connected with at least one fire stair by a means of exit component.

2.12 UTILITIES (OCCUPANCY L) AND EXEMPTED QUANTITIES OF HAZARDOUS MATERIAL

Occupancy type L is a separated occupancy from the main occupancy classifications to provide ancillary electro-mechanical service facilities require a special attention which shall be taken as per provision of this Code. Utilities (Occupancy L) and exempted quantities of hazardous materials for different occupancies are given below:

2.12.1 Occupancy A: Residential

(i) Flammable liquids used for domestic purposes shall be kept adequately sealed in approved containers within the limit of exempted quantity at all times.

(ii) Stoves and heaters using open flame shall be so located at defined space with proper precaution.

(iii) Exhaust fans used in kitchens shall be placed on a peripheral wall of the building or to a duct connected directly to outside and shall be made of non-combustible material. The duct shall not pass through combustible materials.

(iv) Doors leading into a room containing flammable liquids shall be provided with self-closing devices. Appropriate signs identifying the storage materials and requesting the users to keep the door closed shall be marked on both sides of the door.

(v) All outdoor roof top antennas shall be protected by proper lightning arrester.

(vi) Rooms containing boiler shall be separated from the main building by appropriate separation wall with all its openings protected as per provisions detailed in Sec 2.3 of Part 3 and Sec 2.5 of this Chapter.

(vii) Areas or rooms within the building identified as Control Area shall be protected or segregated by appropriate separation wall or by other approved means as per the provisions of this Code.

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2.12.2 Occupancy B: EducationalBNBC 2015 FINAL DRAFT

(i) Control areas containing volatile flammable liquids shall be separated from the adjoining areas in as per provisions of this Code.

(ii) Gas pipeline entering any building shall be equipped with shutoff valves outside the building with conspicuous marking clearly delineating the location as per provisions of Part 8 of this Code.

(iii) The openings of boiler rooms shall be adequately protected by fixed, automatic or self-closing fire assemblies.

2.12.3 Occupancy C: Institutional

Permit shall not be granted for storage or handling of any hazardous material even in control areas, except for

normal use in amounts not exceeding the exempted amounts specified in Chapter 2 of Part 3, in a building or part thereof classified as Occupancy C.

2.12.4 Occupancy D: Health Care

Storage of volatile flammable liquids such as chloroform, ethyl alcohol, mentholated spirit etc. shall be stored in Control Areas and no unauthorized person shall be allowed to handle such liquids.

2.12.5 Occupancy E: Business

(i) Exit aisles or approaches in self-service in a space shall not be obstructed by placing checkout stand with associated railings or barriers on its passage.

(ii) All operations in open air markets, refuelling stations, road side stands for sale of farm products etc. shall be so conducted that unobstructed access to exits are always maintained.

2.12.6 Occupancy F: Mercantile

Provisions are same as those of Sec 2.12.5 (Occupancy E).

2.12.7 Occupancy G: Industrial

(i) Apparatus are not capable to igniting flammable vapour shall be permitted within a control area of a building using or processing or storing volatile flammable liquid. Control Areas of a building using or processing or storing such flammable liquid shall be covered by exhaust ventilation system.

(ii) Boiler rooms and areas containing heating plants shall be separated from the rest of the occupancy as per provisions of this Code.

(iii) Adequate protective measures shall be taken against hazards associated with distribution and use of electricity and gas in accordance with the provisions of Chapters 2 and 8 of Part 8.

(iv) The machine layout shall be congenial to safe fire practice.

2.12.8 Occupancy H: Storage

(i) Apparatus are not capable to igniting flammable vapour shall be permitted within a Control area or part of a building using or storing volatile flammable liquid. Control Areas of a building using or storing such flammable liquid shall be covered by exhaust ventilation system.

(ii) Boiler rooms and areas containing heating plants shall be effectively segregated from the main occupancy.

(iii) Adequate protection shall be taken against hazards associated with distribution and use of electricity and gas in accordance with the provisions of Chapters 2 and 8 of Part 8.

2.12.9 Occupancy I: Assembly

(i) All materials used for decorative purposes in buildings of Occupancy I shall be non-combustible. If fabrics and papers are used for decorative purposes, shall be treated with flame resistant chemicals/materials.

(ii) Rooms and parts of a building containing high pressure boilers, refrigerating machinery, large transformer or other service equipment having explosion potential shall not be located on or adjacent to the defined

exit route. Such rooms shall be effectively cut off from the rest of the building and connected to open air through approved ducts or openings.

(iii) Rooms or parts of a building used for storage of combustible materials such as paints or other items shall be effectively cut off from main assembly building or protected by approved automatic sprinkler system. Such areas shall be away from staircases.

(iv) Legitimate stages having such facilities as fly galleries, gridirons and rigging shall be covered by an automatic sprinkler system above and below such stage areas or spaces. Auxiliary spaces such as dressing rooms, store rooms, and workshops and the proscenium opening shall be effectively covered by fire resistant curtains capable of withstanding a lateral pressure of 4 kN/m². The curtain shall be equipped with self-closing emergency device and when closed shall be tight enough to prevent spread of smoke.

(v) Legitimate stage roof above every theatre using movable scenery or motion picture screen constructed of highly combustible materials shall be fitted with ventilators in or above it. The ventilators shall be operable from the stage floor manually or by fusible links or some approved automatic heat actuated device to give an opening to sky with an area of one-eighth the area of the stage.

(vi) In theatres not protected by automatic fire sprinklers, the proscenium wall using movable scenery of decorations shall be provided with maximum of two openings to enter the stage and each opening shall not be of more than 2 m².

(vii) Film projection apparatus shall be enclosed within fire resistant enclosures.

(viii) Auditoriums of theatres and cinemas shall be installed with vents on roof having vent area equal to the floor area including balconies and galleries, boxes and tiers. Larger numbers of smaller vents shall be preferable over smaller number of larger vents.

2.12.10 Occupancy J: Hazardous

(i) Equipment and machinery in operations, igniting and/or emitting combustible volatile substances shall be installed in a standard environment as recommended in NFPA or equivalent standards.

(ii) Rooms containing boiler or heating plant shall be effectively separated from the main occupancy.

2.12.11 Occupancy K: Garage

As per safety requirement of NFPA or equivalent standard.

2.12.12 Occupancy L: Utility

As per safety requirement of NFPA or equivalent standard.

2.12.13 Occupancy M: Miscellaneous Buildings

As per safety requirement of NFPA or equivalent standard.

2.13 RELATED APPENDIX

Appendix B Fire Protection Considerations for Venting in Industrial and Storage Building

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Chapter 3

MEANS OF EGRESS

3.1 SCOPE BNBC 2015 FINAL DRAFT

The provisions of this Section shall control the design, construction and arrangement of building components to provide a reasonably safe means of egress. Any repair or alteration works within a building shall be prohibited unless the existing means of egress and fire protection system are continuously maintained or a continuous

alternative exits and protection measures are taken to provide an equivalent degree of safety for the occupant and the workers for the total duration of such project.

3.2 COMPONENTS OF MEANS OF EGRESS

3.2.1 A means of egress is an evacuation system with the provisions of reentry for rescuers and fire fighters where a continuous and unobstructed way of exit travel shall be provided from any point within a building to a designated area of refuge for allowable delayed evacuation and ended up with the exit termination by reaching a street abutting building or plot or an safe area which is open to air and designated assemblies for evacuees.

The way of exit travel within a building from any point thereof along a means of egress shall consist of three parts: (1) the exit access, (2) the exit, and (3) the exit discharge

(a) A way or path of evacuation from any point of an area affected due to fire incident leads to a protected entry to another separated area of a building shall be termed as exit access. Straight line distance between the remotest point of an area of incident and the entrance point of a separated area shall be measured and termed as a travel distance.

(b) The exit is a component or a group of components start with a protected opening to evacuate an area of fire incidence and provides a safe entry to a separated area which is component of means of egress and subsequently leads to the exit discharge.

(c) The outer edges or peripheral points of a building from where occupants shall evacuate the building envelope termed as Exit discharges which shall lead evacuees to the terminal points at a safe distance from thereof.

An area or any plot abutting street which is open to air and designated for systematic assemblies of evacuees to complete the process of egress system shall be termed as exit termination.

3.2.2 The parts of the means of egress consist of any of the following exit components:

(a) A doorway, separated or refuge area like smoke and fire proof enclosure, compartment, corridor, passage, ramp, balcony, an exterior or open or interior fire stair, or any combination of these, leads orderly to the exit discharge which offer safety from fire or smoke from the area of incidence.

(b) Horizontal exit shall provide a delayed egress by relocating the occupants from their initial location due to a fire incident to a separated area at same level of a same building or at the same level of adjoining or detached buildings connected through a fire door or a vestibule or a passage or corridors for relocation of evacuees. Receiving areas are capable to accommodate expected evacuees for certain time period, free

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from heat, smoke and aggressive fire, from the area of incidence and shall lead to exit discharges without returning the evacuees to their initial locations.

3.2.3 Generally lifts, escalators and moving walks shall not be regarded as components of means of egress. When they are designed and installed for safe operation during fire shall be included as components of means of egress.

3.2.4 Means of Escape: A way out of a building or structure that does not conform to the formation of means

of egress but does provide a safe way out.

3.3 GENERAL REQUIREMENTS

3.3.1 Design considerations or assumptions:

(a) Fire initiated from only one source in single space shall aggravate within a building or adjacent structures

over a time period.

(b) More than one space or source of fire at the same time shall not be considered.

(c) All Construction Materials by qualities and quantities including surface finish, utilities, fabrications of

movables and immovable, stored materials shall be approved types as per provisions of this Code.

(d) Stability of structural elements or building itself shall be as per provisions of this Code.

(e) Occupants, Rescuers and fire fighters life safety shall be the prime consideration thus egress system

including relocation and fight in place or evacuation and reentry provisions shall be as per provisions of this Code.

(f) Fire suppression and extinguishment arrangement for life safety and minimize property damages shall be performance based as per provisions of this Code.

(g) Provisions of this Part shall be the minimum standard, in excess of these provisions shall not be prevented to design a egress system or to install advance and higher standard of detection and extinguishment equipment or both which shall be approved by the authorities having jurisdiction.

3.3.2 All buildings constructed for human occupancy or control areas or storages shall be provided with adequate exit facilities to permit safe and quick unaided egress of the occupants in the event of fire or other emergency.

3.3.3 Exits shall not be used for any other purpose at any time that would obstruct the intended use of those components during emergency.

3.3.4 Where corridors or passages are components of exits shall not be designed or used as components to supply or return air.

3.3.5 Preferences of levels of walking surfaces in the means of egress shall be more than 1 in 20. Ramps or stairway shall be used in case of changes in elevations of walking surfaces. Fire Zone 1

(a) Abrupt changes not exceeding 130 mm but exceeding 60 mm shall be beveled 1 in 2.

(b) Changes in elevation exceeding 130 mm shall be considered as a change in level.

(c) A stairway in walking surface of the means of egress shall consist of minimum two steps and all of them shall be identical and shall have tread depth not less than 330 mm and height of risers shall not be exceeded more than 230 mm but shall comply tread and riser combination as per provision of this Code.

(d) Changes in levels 530 mm or more in walking surfaces of the means of egress shall be achieved either by a ramp or by a stairway.

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(e) Presence and location of such steps or ramps in the walkways shall be readily apparent. BNBC 2015 FINAL DRAFT

(f) Other than ramp, a slope of walking surfaces along the direction of travel shall not be steeper than 1 in 20 and slope perpendicular to the travel direction shall not be exceeded 1 in 48.

(g) Slope of ramps shall be complied with the accessibility where required as per provisions of this Code.

3.3.6 From the exit access all exits shall be clearly visible. Corridors and passages leading to the exit discharge shall be marked and signposted to guide the evacuees as per provisions of this Code. A space used in darkness

having more than one exits shall be illuminated exits sign as per provision of this Code.

3.3.7 The owner or lessee of all new and existing buildings shall be responsible to provide the safety provisions for all occupants and rescuers and firefighters. If in any existing building, the exit facilities are deemed inadequate in view of the requirements of this Code, the authority having jurisdiction may order to comply with the provisions of this Code.

3.4 GENERAL PROVISIONS OF EXITS

3.4.1 All exits shall be easily discernible and accessible from the areas served by them.

3.4.2 Exit from any room or space shall not open into an adjoining or intervening room or area except where such adjoining room or area is an accessory to the area served, is not a hazardous occupancy. If hazardous or a control area, provide a direct exit to the outside of a building envelope or directly connect with the components of egress system.

3.4.3 No portion of Exits shall pass through a room that may be subject to lock with detachable key or be intervened by a door that may have detachable key operated lock and the door is locked when the building is occupied.

3.4.4 All entry points to the assembly occupancy shall serve as Exits and shall have the total capacity for at least one-half of the total occupant load. Provisions of exits other than entries shall have capacity to evacuate at least two-thirds of occupant from each level of assembly occupancy.

3.4.5 All exits shall be so located and arranged that they shall provide continuous and unobstructed means of egress up to the exit discharge.

3.5 OCCUPANT LOAD

Total occupant load means summation of all occupants of only one level at the pick hour occupancy where maximum occupants are present.

Occupant load shall be considered as per provisions of this Code to design each and every component of means of egress system shall be termed as design occupant load.

3.5.1 Design Occupant Load

The design occupant load for which the component of means of egress is to be provided shall be the highest number computed as per the provisions of (a), (b) and (c) as stated below:

(a) The actual number of occupants for whom the area served by the exits is designed;

(b) Number of occupants shall be computed as prescribed in Table 4.3.1.

(c) The number of occupants in any area shall be computed as per provisions of (a) or (b) as stated above and

in all cases the higher value shall govern the design.

(d) The computation of design occupant load shall be the summation of occupants of a space and the evacuees

of other spaces whose are using the said space as for waiting or passing through in case of emergency to gain an access to a component of means of egress.

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Table 4.3.1: Occupant Load Factor Unit of Floor Area in m² per Occupant*
Occupancy 18 gross

A Residential

B Educational: 2 net
Class room 3.5 net
Preschool

C Institutional 12 gross

D Health Care: 15 gross
In patient areas 10 gross
Out-patient areas

I Assembly: Number of seats designed.
with fixed seats 0.93 net
with movable seats 0.37 net
standing space only 1.5 net
with table and chairs
Passengers that can be unloaded 0.15 net
simultaneously to a terminal or a platform
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E Business: Office Space 3 gross

F Mercantile: 2.3 net
4.6 net
Retail sales Area, Ground floor or
Basement

All other floor

G Industrial 10 gross

H Storage 20 net

K Garages and open parking structures 23 net

L Utility Actual occupant load

M Miscellaneous Building Actual occupant load

* As per Sec 3.5.1(b) of this Chapter, design occupant load shall be calculated and any fraction shall be rounded to next higher integer value. Width of all components of egress system shall satisfy requirements of specified in the Table 4.3.2

3.5.2 Fixed Seats

The occupant load for an assembly or educational area having fixed seats shall be determined by the seating capacity of the area. For fixed seats without dividing arms, the capacity shall be taken as one person for every 500 mm of seat.

3.5.3 Maximum Occupant Load

The design occupant load, need not to be calculated more than one person per 0.3 m² of usable floor space.

3.5.4 Mezzanine Floors

The occupants of a mezzanine floor evacuating through other floors the occupant load shall be added to the receiving floors.

3.5.5 Roofs

A Roof, an open air space used as assembly or refuge area, educational or other types of human occupancy shall be provided with exit facilities as per provisions of this Code.

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3.6 CAPACITY OF EXIT COMPONENTS

3.6.1 The capacity of egress components shall be complied with the occupant load of the area served. The required width of each component shall be computed on the basis of the allotted width per occupant prescribed in Table 4.3.2, subject to the minimum widths of such components specified in Sections 3.7 to 3.12 and the travel distances of such components as per provision of this Code.

Table 4.3.2: Required Width per Occupant

Buildings without Sprinkler System (mm per person)	Buildings thoroughly Sprinkled (mm per person)
Stairways	Ramps & Doors
Corridors	Stairways Ramps & Doors

Corridors

A Residential

B Educational

E Business

F1, F2 Mercantile 8 54 5 44

G Industrial

H Storage

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C1, C2 Institutional 8 54 5 54

C3, C4, C5 Institutional 10 54 8 54

D Health Care 25 18 10 15 12 10

I Assembly 75 7 55

10

F3 Mercantile

J Hazardous 8 54 8 54

K, L, M 8 54 5 44

Note: width of the components of egress shall be divided by value specified in this table to determine the maximum allowable occupant load served by them.

3.7 CORRIDORS AND PASSAGEWAYS

3.7.1 Occupants commencing exit travel along a corridor or a passageway shall be lead to an exit discharge. Length of dead end corridors and passageways and branches thereof shall not be exceeded as per Sec 3.15.4 of this Chapter.

3.7.2 The required width of corridors and passageways shall be calculated on the basis of the occupant load in accordance with the provisions of this Code and shall not be less than as per Sec 3.15.4 of this Chapter.

3.7.3 The minimum ceiling height of the corridors and passageways used as a means of egress shall not be less than 2.4 m.

3.7.4 All exit corridors or passages shall have a fire resistance rating of 1 hour or more as per provisions of this Code.

3.7.5 Protective opening leads to an exit shall be fire doors or fire windows or a fire assembly having a fire resistance rating of at least 20 minutes or more as per provisions of this Code.

(a) Certified Fire resistance rating of Doors shall be in accordance with ASTM E152 without the hose stream test.

(b) Fire resistance rating of the fire door assembly has to perform as required 20, 30, 60, 90, 180 minutes or more shall be leveled A, B, C, D, E and F respectively.

(c) Fire door assembly of any approved materials shall qualify through ASTM E152 without the hose stream test.

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3.8 ASSEMBLY SEATING AND WAITING

(a) Assembly buildings primarily meant for theatrical, operatic performances or cinematic projection shall have the seats securely fastened to the floor with exceptions as permitted in this Code. All seats in balconies and galleries shall be securely fastened to the floor except boxes with level floor and less than 14 seats.

(b) Seats not fixed to the floor shall be permitted in restaurants and such other places provided that 1.25 m² of floor space is allotted for every seat excluding dancing floor and stage. Adequate aisles shall be maintained at all times to reach exits without obstruction when such occupancies are in use.

3.8.1 Assembly buildings which contain seats, tables, equipment or exhibitions or displays shall be provided with aisles, free of obstructions, leading to the exit.

3.8.2 Minimum clear widths of steeped aisles and other means of egress serving assembly seating shall be calculated on the basis of number of seats and in accordance with Table 4.3.3. Interpolation shall be permitted between the specific values shown thereof. The minimum clear width of steeped aisles as found by above calculation shall be modified in accordance with the conditions stated below:

(i) If risers exceed 178 mm in height for steeped aisles the width of the steeped aisles as shown in the table shall be multiplied by factor a,

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Where, $a = 1 + \frac{h - 178}{178}$ (4.3.1)

125

(ii) In the Table 4.3.3 values of steeped aisles not having a handrail within a 760 mm horizontal distance shall be 25 percent wider.

(iii) In Table 4.3.3 values of width of ramps used for ascending and steeper than 1 in 10 slope shall be increased by 10 percent.

Table 4.3.3: Capacity Factors for Assembly Seating

Number of seats within a Clear Width per Seat Served
single assembly space.

Steeped aisles (mm) Passageways, Ramps
and Doorways(mm)

≤ 2,000 7.6 a 5.6

5,000 5.1 a 3.8

10,000 3.3 a 2.5

15,000 2.4 a 1.8

20,000 1.9 a 1.4

≥ 25,000 1.5 a 1.1

3.8.3 The minimum width of level or ramped aisles shall be as specified below:

Seats on both sides of the aisle 1.0 m

Seats on one side of the aisle 0.9 m

3.8.4 The minimum width of stepped aisles shall be as specified below:

Seats on both sides of the aisle 1.2 m

Seats on one side of the aisle 1.0 m

3.8.5 The minimum clear gap between rows, measured as the clear horizontal distance between the back of the row ahead and the nearest projection of the row behind shall be 300 mm. For chairs having automatic or self-rising seats, the measurement shall be made with the seats in the raised position, for non-automatic seats the measurement shall be taken with the seats in the down position.

3.8.6 For rows of seating served by an aisle or doorway at only one end of the row, the path of travel shall not exceed 10 m from any seat to the aisle or doorway. The minimum clear gap between rows shall be increased

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beyond 300 mm specified in Sec 3.8.6 by 15 mm for each seat in excess of 7, but the clear gap need not exceed 550 mm.

3.8.7 In any assembly occupancy spectators are allowed to wait in the lobby or similar space within the building until seats are available. Exits shall be provided for the waiting spaces on the basis of 0.28 m² areas per person waiting space and one wheel chair space for every 100 occupant. Such waiting occupant load shall be added with main assembly load for calculating exit size for the assembly as per provisions of this Code.

3.9 DOORWAYS

One surface of a door leaf which is exposed to a fire incident is the terminal point of exit access and other surface of that said door which is unexposed to that fire incident is the starting point of an exit. A door or an opening protective assembly is an obstruction for occupants to pass through from exit accesses to exits until and unless it is installed as per provisions of this Code.

3.9.1 Each occupant of a room or space shall have access to at least one exit door or exit access assembly. The occupant load per exit door and the travel distance up to that door shall not exceed the values specified in Table 4.3.4.

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3.9.2 Where either the occupant load or the travel distance exceeds the values specified in Table 4.3.4 shall have multiple exit doors to comply the both.

3.9.3 The width of a door shall not be less than 1 m and the height shall be not less than 2 m. Exit doors shall be side swing or pivoted of side hinge type.

3.9.4 No sliding or hanging door shall be used as a means of exit. In pressurized areas and when occupant load is less than 10, restriction of Sec 3.9.3 may be exempted.

3.9.5 All exit access doors shall be of a side-swinging type. When the occupant load exceeds 50 or in a hazardous occupancy, the doors shall swing outward from the room or towards the direction of travel. Swinging of the door shall not constrict the width of the corridor narrower than 0.9 m measured at the most critical position.

3.9.6 Exit doorways shall not open directly on a flight of stairway. A clear area which more than the width of the door leaf as specified in the above Sec 3.9.5 shall be maintained immediately outside the doorway. The floor levels shall be same in the direction of travel as per provisions of this Code.

Table 4.3.4: Maximum Occupant Load and Travel Distance for Spaces with One Exit Door

Occupancy	Maximum Design Occupant Load	Maximum Travel Distance (m)
-----------	------------------------------	-----------------------------

A Residential

C Institutional 12 23

D Health Care

B Educational 50 23
I Assembly
E Business
F Mercantile
G Industrial

H Storage 30 30

J Hazardous 58

3.9.7 Revolving doors shall not be used as a means of exit in assembly, educational or institutional buildings or in spaces with an occupant load of 200 or more. In all other cases revolving doors shall not constitute more

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than half of the total required exit door width and each revolving door with least diameter of 2.7 m shall be credited not more than 50 persons. Exit doors shall be installed in the same wall within proximity of 3m of Revolving doors and shall comply with the following:

3.9.7.1 Revolving doors shall be positioned with a dispersal area at a distance of 3m or more from the foot or top of stairway or escalators or moving walks or lift lobbies.

3.9.7.2 Revolving doors shall stop rotating and stand still in a book-fold position at a force not more than 800 N or when a force is applied not more than 578 N to a wing within 760 mm of outer edge or due to sudden power failure catch automatically released and ready to manual revaluation and that provide a path which shall have aggregate width minimum 910 mm.

3.9.7.3 A manual control switch shall be installed in an approved location.

3.9.7.4 Speed of revolving door shall not exceed the revolution per minute shown below:

Inside Diameter (m)	Speed of Revolving Door	Power-mode	Speed limit
2 (rpm)			
Manual-mode	Speed limit		
(rpm)	11		

12
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2.1 11 10

2.3 11 9

2.4 10 9

2.6 9 8

2.7 9 8

2.9 8 7

38 7

3.9.7.5 All exit doors shall be operable without the using a detachable key from the side they serve to evacuate.

3.10 STAIRWAYS

Change in level in elevations achieved by steps combination of identical risers and treads as per provisions of this Code shall be termed as Stairway irrespective of their locations. Stairways within an envelope shall be termed as Staircase. Exception: stepped aisles with in an assembly.

Width of Stairways shall be a length perpendicular to the direction of travel, a clear distance measured between inner edges of handrails or a clear distance between inner edges of a handrail of exposed side to its opposite and parallel surface measured at a height of inner edge of cross section of that handrail. In case of variation in width measurement the smallest value shall represent the width of a stairway. Required combination of dimensions for risers and treads given in Table 4.3.5.

Required guards and handrails shall continue for the full length of each flight of stairways. Inner turns of handrail of flights shall be at the landings and grasp ability of handrails shall be smooth and continuous, Handrail Brackets or balusters attached to the bottom surface of handrail shall not be considered to be obstructions to grasp ability. Gap between any surface and handrail shall be not less than 63.5 mm.

Stairways serving more than three storey building having capacity more than 10 occupants shall have visual enclosures to avoid any impediments to stair use by persons having fear of height, any arrangement intended to meet this requirement shall be at least 1070 mm in height.

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3.10.1 The required width of exit stairways shall be computed in accordance with the provisions of Sec 3.6, but it shall not be less than the minimum widths specified in Tables 4.3.6 and 4.3.7

3.10.2 The least dimension of landings or platforms in exit stairways shall not be less than the required width of stairway and shall be leveled, except that the landing between two stair flights in a straight run shall not be required to be wider than 1.2 m in the direction of travel.

When two stair flights are not straight or nonparallel to each other, a turning in the path of travel direction occurred which is other than U turn. Landing width shall be the required width of stairway and length of the common landing between such flights shall be one tread depth more lengthen when measured from both edges of stairway from both the flights.

Table 4.3.5: Combination of Risers and Treads

Gradients	Step	Dimensions	Available	Headroom	Handrail	or Maximum
Clearance	of Flight	Guard	Number of			
Grade	Angle of Flight	Tread	Depths	Risers	Height	
(%)	Deg	(mins)	(mm)	(mm)	(mm)	Flights
21	59					
15	75					
12.5	76					
10	84					
7.5	90					
5	97					
2.5	104					
1.25	112					

33.87 18 43 394 133 851 6
37.28 20 27 375 140 2184
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41.07 22 20 356 146

44.44 23 58 343 152
48.07 25 40 2210

330 159

53.06 27 57 311 165 838
57.44 29 52 2235

324 171

63.63 32 28 279 178 2261 Unlimited
69.04 34 37 267 184 2286

75 36 52 254 190 2311

81.57 39 12 241 197 2362

88.88 41 38 229 203 2388 851
216 210 2438
97.05 44 9

103.02 45 51 210 216 2464

107.07 46 57 206 222 2489 864 10
112.5 48 22 203 229 2515

Note: Allowable length of nosing at the outer edge of tread shall not be included in the tread depth measurement.
The
maximum rise of a single flight between landings shall not be exceeded 3658 mm and in case of large assembly
maximum rise of a single flight between landings shall not be exceeded 2438 mm.

Table 4.3.6: Minimum Width of Stairways in Egress System

Occupancy Minimum Width of Each Stairway (mm)

A Residential: A1, A2 As per Table 4.3.6

1120

A3, A4, A5

B Educational 1120

Occupant load up to 130 2235

Occupant load more than 130 but not more 250

D Hospital 2235

Patient area 1120

Staff area

I Assembly: I1, I2, I3, I4, I5 As per provisions of this Code.

All others As per provisions of this Code.

Note: The required number of stairways shall be determined by dividing the calculated total widths of stairways as per sections 3.5, 3.6 and Table 4.3.2 of this Chapter by applicable minimum stair width as specified in this table and any fractions thereof shall be rounded up with the next higher integer. Unit width of stair and multiple even numbers shall be maintained as per provisions this Code.

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Table 4.3.7: Fire Escape Stairs Serving More than 10 Occupants Serving 10 or Fewer Occupants
Element 560 mm between handrails
Clear widths

Minimum horizontal dimension 560 mm
of any landing or platform

Maximum riser height 230 mm

Minimum tread, exclusive of 250 mm
nosing

Tread construction Solid, 13 mm diameter perforation permitted

Winders Not permitted permitted subject to Sec 3.10.7

Spiral Not permitted permitted subject to Sec 3.10.7

Maximum height between 3.70 m
landings

Headroom, minimum 2.00 m

Access to protected openings Door or casement windows, 600 mm x Window providing a clear opening
2000 mm or double-hung windows 70 of at least 500 mm in width, 600
mm x 900 mm clear opening mm in height, and 0.53 m² in area

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Level of access openings Not over 300 mm above floor; steps if higher

Discharge to ground Swinging stair section permitted if approved by authority having jurisdiction

Capacity, number of person 13 mm per person if access by door; 25
mm per person if access by climbing
over window sill 10

Note: The maximum design occupant load for a Fire escape stair shall not be exceeded 50 occupants from any floor level.

3.10.3 The rise and tread dimensions in a stairway shall be identical and the headroom requirements shall conform to the provisions of this Code.

3.10.4 Handrails height on stair shall be not less than 860 mm and not more than 960 mm above the surface of the tread, measured vertically from the top of the rail to the outer edge of the tread. Peripheral diameter of circular cross section of a handrail shall not be less than 32 mm and not more than 50 mm. Any other shape with perimeter dimension of not less than 100 mm, but not more than 160 mm and with the largest cross-sectional dimension not more than 55 mm shall be permitted provided that all edges are rounded to provide a radius of not less than 3 mm. Handrails shall be graspable along their entire length. Additional handrails that are lower or higher than main shall be permitted.

3.10.5 The height of guards shall not be less than 105 mm measured vertically from the top of the guards from the surface of adjacent area to be served by them. When balusters are used in the guards rail shall be used to create a pattern as such size that a sphere 100 mm in diameter shall not pass through any opening up to a height of 860 mm. Riser, tread and the bottom rail of guards formed a triangular opening shall not be of such size that a sphere 150 mm in diameter shall not pass through.

3.10.6 There shall be no variation in excess of 5 mm in depth of adjacent treads or in the height of adjacent risers, and the tolerance between the largest and smallest tread or between the largest and smallest riser is 10 mm in any flight.

3.10.7 Monumental stairs, Circular stairs, Curved stairs, Spirals and winders, stepped and rung ladders, alternate tread devices shall be permitted as per provisions of this Code.

3.10.7.1 When the width of stairways exceeded 4475 mm termed as Monumental or Grand Stairway shall be permitted as per provisions of this Code.

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3.10.7.2 Curved stairs or circular stairs shall be permitted as a component of means of egress as per provisionsBNBC 2015 FINAL DRAFT

of this Code provided that the depth of tread is not less than 280 mm at a point 300 mm from the narrower end of the tread and the smallest radius is not less than twice of stair widths and shall comply with the provisions of this Code.

3.10.7.3 Spiral stairways shall be permitted where occupant load shall not more than five. For spiral stairways the following conditions shall be applicable:

- (a) The clear width of the stairs shall not be less than 660 mm.
- (b) The height of risers shall not exceed 240 mm.
- (c) Headroom shall be not less than 1980 mm.
- (d) Treads shall have a depth not less than 190 mm at a point 300 mm from the narrower edge.
- (e) All treads shall be identical.

3.10.7.4 Winders shall be permitted in stairs where occupant load shall not be more than three.

- (a) Winders shall have a tread depth not less than 150 mm and a tread depth not less than 280 mm at a point 300 mm from the narrowest edge.

(b) The clear width of the stairs shall not be less than 660 mm.

3.10.7.5 Stepped ladders and Rung ladders shall be installed with pitch that exceeds 75 degrees as per standards of ANSI A14.3. The lowest rung of any ladder shall not be more than 300 mm above the level of the surface beneath it.

(a) From towers and elevated platforms around machinery or similar spaces subject to occupancy load not to exceed three persons.

(b) Open structure, observation towers or railroad signals that are designed for occupancy not more than three persons.

3.10.7.6 Alternate tread device

The occupant load shall not exceed three and shall comply with the followings:

(a) Handrail shall be provided on both sides of alternate tread device having clear width not less than 430 mm and not more than 610 mm

(b) Headroom shall not less than 2000 mm and angle of the device shall be between 50 degrees and 68 degrees to horizontal.

(c) The initial tread of the device shall begin at the same elevation as the platform, landing, or floor surfaces and the alternating treads shall not be laterally separated by a distance more than 50 mm.

(d) Treads shall have projected depth not less than 150 mm and each tread providing 240 mm of depth, including overlapping of treads.

(e) The height of the risers shall not exceed 240 mm.

3.10.8 Stairways shall have continuous guards on both side along the direction of travel and a continuous handrail shall be provided with inner edge guard. A stair of width more than 1120 mm but not more than 2235 mm shall have guards and handrails on both of the edges. Inner edge handrails shall be continuous and outer edge handrails shall be along the flights extended up to one tread depth on both the landings. A stair the width exceeds 2235 mm; intermediate handrails shall be installed with similar length of outer edge handrail. Single traffic lane shall be calculated 560 mm in the stairway and two traffic lanes shall be 1120 mm. Widths of stairs shall be multiple of two traffic lane other than width specified in the Table 4.3.6.

3.10.9 All exit stairways shall be constructed by materials that conform to the fire resistance requirements of the type of construction of the building, except that solid wooden handrails shall be permitted for all types of construction.

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3.10.10 An exit stairway shall not be built around a lift shaft unless both of them are located in a smoke proof enclosure and made of a material with fire resistance rating required for the type of construction of smoke proof enclosure.

3.10.11 Exterior stairways used as fire stair shall not be considered as a component of means of egress, unless

they lead directly to the ground or a refuge area, are separated from the building interior by fire resistive assemblies or walls and are constructed by noncombustible materials and free from smoke accumulation.

3.11 RAMPS

3.11.1 Ramp is a sloping surface steeper than 1 in 20 but not steeper than 1 in 8 used by walkers only. Slope of ramps to comply with accessibility requirement shall not be steeper than 1 in 12.

3.11.2 The minimum width of exit ramps shall not be less than that width required for corridors or passages.

3.11.3 The slope of an exit ramp shall not exceed 1 in 8, but for slopes steeper than 1 in 10 the ramp shall be surfaced with approved non-slip material or finished such as to effectively prevent slipping.

3.11.4 Guards and handrails shall be provided on both sides of ramps having slope steeper than 1 in 15.

3.11.5 Ramps shall be straight, in case of changes in the travel direction that shall be made at the level platforms or at the landings except that ramps having a slope steeper than 1 in 12 may be curved at any place.

3.11.6 Length of the sloping portion of ramps shall be at least 915 mm but not more than 9150 mm long between level platforms or landings.

3.11.7 Level platforms or landings shall be at least as wide as the ramps and shall be placed at the bottom, at intermediate levels where required, and at the top of all ramps. Level platform shall be provided on each side of openings into or from ramps having minimum length of 915 mm in the direction of travel and when a door swings on the minimum length of platform or landing shall be 1525 mm.

3.11.8 Doors on ramps shall not be opened on sloping surface shall be complied with the requirements of 3.9 of this Chapter.

3.11.9 Sloping or ramp driveway approaching basements or any parking structures shall not be credited as an exit ramp when slope is steeper than 1 in 8 and not complied with Sec 3.11 of this Chapter. Exits requirement of such basements shall be achieved by stairways or fire lifts within smoke proof enclosure approached by a two doors smoke lock vestibule.

3.12 HORIZONTAL EXITS

3.12.1 The connection between two separated areas of a building or connection between buildings at same level which the horizontal exit serves shall be provided with at least 2 hour fire resistance rated walls, or by an open air balcony or a bridge having protected openings.

3.12.2 The horizontal exits shall be protected from the area of incidence by self-closing fire door.

3.12.3 The width of a horizontal exit access door shall not be less than 1 m.

3.12.4 Changes in level in the elevation along the direction of the horizontal exit shall not be achieved by single step but by ramps which is not steeper than 1 in 12.

3.12.5 Where the horizontal exit serves for only one side, fire door shall swing in along the direction of travel. When horizontal exit serves both the side of separated area, the doors shall have two leaves and each leave dedicated to satisfy direction of travel from assigned area, or there shall be two independent doors assigned for

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two areas each of them serves only one area. When the building is occupied the doors installed in horizontalBNBC
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exit shall be operable at all times without the use of a detachable key.

3.12.6 Horizontal exit relocates occupants to an area which is either a public space or a space used by other occupants and shall be termed as a refuge area. The capacity of the refuge area shall be computed on the basis of net floor area excluding stairways, shafts and spaces allotted to occupants of the receiving end. The required capacity of a refuge area shall be 0.28 m² per healthy occupant and 0.3 m² per wheelchair or 2.8 m² per patients retained in bed for delayed egress or an area equivalent to a passage or a corridor having width to comply the

capacity of evacuees and connected with the components of exits up to exit discharge.

3.13 SMOKE PROOF ENCLOSURE

Any compartment or a room or a control area surrounded by barrier walls within a building structure shall be protected from smoke penetration during a fire incident occurred elsewhere in the building shall be termed as smoke proof enclosure.

A stairway with in an envelope shall be termed as Interior stairway or staircase. Any exterior side having opening of 50 percent or more in such a way that there shall be no smoke accumulation shall be termed as open stair.

3.13.1 An interior stairway conforming to Sec 3.10 and having entry from an exterior balcony or through a ventilated vestibule conform a smoke proof enclosure provided no direct opening or any aperture allowed on the walls of the stair from the building side.

3.13.2 All exit stairways mentioned above shall be protected by a smoke proof enclosure when serving occupants are located in a high rise building.

3.13.3 There shall be provision to access enclosed stairways through vestibule or an open balcony. The minimum width of a vestibule shall be equal to width of connected passages or corridors specified in 3.7 in this Chapter and the minimum length of a vestibule in the direction of travel shall be 1.8 m.

3.13.4 The minimum fire resistance rating of the walls forming a smoke proof enclosure around stairway including the vestibule thereof shall be 4 hours and separated from the area of incidence having no openings other than a fire door for the entry to the vestibule. For fire rating of the door see Chapter 1 Part 3.

3.13.5 All doors in smoke proof enclosure and the vestibule shall be self-closing type or they shall be fitted with automatic closing devices actuated by the fire detection system.

3.13.6 The vestibule shall have adequate natural ventilation. Each vestibule shall have a minimum area of openings of 2 m² divided into two in an exterior wall facing a courtyard, street or public way wider than 6 m. The location of one opening measuring 1.5 m² shall be as high as possible and another shall be 0.5 m² as low as possible.

3.13.7 If the enclosed staircase is windowless, mechanical ventilation shall be installed. If the vestibule is windowless, mechanical ventilation shall also be installed. In addition to ventilation a positive pressure of 50 Pa shall be maintained in the vestibule. This positive pressure must be developed within 30 seconds of the incident of fire. When the staircase and the vestibule are windowless emergency illumination shall be provided.

3.14 NUMBER OF EXITS

3.14.1 The number of exits shall be determined as per provisions of Sec 3.6, Tables 4.3.1, 4.3.2 and 4.3.8 of this Chapter and complying with maximum dead end passage or corridors and maximum travel distance.

3.14.2 Total required widths of exits shall be calculated as per provisions of the Tables 4.3.2 and 4.3.8 shall be divided and distributed at a distance not less than one-third of diagonal distance of space and the travel

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distance and the width of each exit shall comply with the provisions of this Code. The required number of exits in a space as specified below:

Occupant load less than 50 Minimum 1 exit
Occupant load 50 to 500 Minimum 2 exits
Occupant load 501 to 1000 Minimum 3 exits
Occupant load more than 1000 Minimum 4 exits

3.14.3 High rise buildings having a floor area larger than 500 m² on each floor used as educational, institutional, assembly, industrial, storage or a mixed occupancy involving any of these or hazardous occupancy, shall have a minimum of two staircases. These staircases shall comply with the requirements as specified in Sec 3.13 of this Chapter.

3.14.4 Where two accessible means of egress are required, the exits serving such means of egress shall be located at a distance from one another not less than one-half the length of the maximum overall diagonal dimension of the building or area to be served.

BNBC 2015 FINAL DRAFT 3.15 TRAVEL PATH

3.15.1 Travel path shall be measured along the center line of a natural and unobstructed path up to center of an exit access door opening. In case of a stairway exist in the travel path shall be measured along an inclined straight line through the center of outer edge of each tread of a stairway.

3.15.2 Occupant load and components of exits shall be arranged in such a manner that the travel path from any point in the area served shall not be exceeded as listed in the Table 4.3.8.

3.15.3 Unit width shall be 560 mm and fraction of unit width less than 280 mm shall not be credited. Where calculation of total required width give fractional result, next larger integral number of exit units or integral number plus one-half shall be used. Where changes in elevation exist, one-half or less unit of width shall not be permitted.

3.15.4 Capacity of exits shall be measured in unit of width of 560 mm and the number of occupants per unit width shall be determined by the occupancy group and type of exits as listed in Table 4.3.8.

3.15.5 Wherever more than one exit required in a room or in any floor they shall be placed as remote as possible from each other. As far as practicable, exits shall be arranged in such a manner to provide a refuge area or an exit discharge to the occupants irrespective of the direction of travel from any point in an area served.

3.16 MEANS OF EXIT SIGNS AND ILLUMINATION

3.16.1 All required means of exit or exit access in buildings or areas requiring more than one exit shall be signposted. The signs shall be clearly visible at all times, where necessary supplemented by directional signs. All exit doors shall be clearly marked for easy identification.

Exceptions: Building occupancy type A.

3.16.1.1 Location: Exit signs shall be installed at stair enclosure doors, horizontal exits and other required exits from the storey. When two or more exits are required from a room or area, exit signs shall be installed to clearly indicate the direction of egress.

Exceptions:

(i) Main exterior exit doors which obviously and clearly are identifiable as exits need not be signed when

approved by the Building Official.

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(ii) Exit signs are not required for buildings of occupancies A1, A2 and individual units of A3.

(iii) No sign is needed for exits from rooms or areas with an occupant load of less than 50 for occupancy type C.

Table 4.3.8: Determination of Exit and Access Requirements.

Maximum Capacity Ramp, Passage ,
Travel Path Number of Occupancy per unit width of Corridors

(meter) the component

Door openings

Unsprinklered

Occupancy Group/ Full fire resistive or

Classification sprinklered

To outdoors at

Grade

All other Exit

and corridor

doors

Stairs, Escalators

Ramp, Corridors, Exit

passageways,

Horizontal exit

Minimum width

(mm)

Maximum Dead End

(mm)

A1, A2 N.R. N.R. N.R. N.R. N.R. N.R. N.R.

A3, Residential 45 60 50 40 30 50 36 12190

A4,A5 45 60 50 40 30 50 36 12190

B Educational 45 60 100BNBC 2015 FINAL DRAFT 80 60 100 915 12190

C1, C2 Institutional 38 53 50 40 30 50 915 12190

C3, C4, C5 38 53 30 30 15 30 2440 9150

D Health 38 53 30 30 15 30 2440 9150

E Business 60 90 100 80 60 100 1120 15240

F Mercantile 45 60 100 80 60 100 915 15240

G1 Industrial 60 120 100 80 60 100 1120 15240

G2 60 120 100 80 60 100 1120 15240

H1 Storage 30 53 75 60 45 75 915 15240

H2 38 45 75 60 45 75 915 15240

I Assembly 45 60 100 80 60 100 1675 9150

J High Hazard 15 45 50 40 30 50 915 N.P.

Notes:

1. In Hazardous occupancy (occupancy J) Travel Path should be performance based but shall not exceed 15240 mm.
2. N.P. = Not permitted
3. N.R. = No requirement, (except as provided in Table 4.3.5b)
4. Capacity of ramp shall be reduced by twenty five percent when slope is steeper than 1 in 10.
5. Corridors serving classroom area of an educational building. Other corridors shall have a minimum width of 1120 mm.
6. Applies to corridors to patient area. Staff corridors shall have a minimum width of 1120 mm.

3.16.1.2 Graphics: The color and design of lettering, arrows and other symbols on exit signs shall be in high contrast with their background as per NFPA 170. Words on the signs shall be at least 150 mm high with a stroke of not less than 20 mm. For vernacular alphabet and numeric height shall be at least 150 mm with stroke not less than 20 mm.

3.16.1.3 Illumination: Signs shall be internally or externally illuminated by two electric lamps or shall be of self-luminous type. When the luminance on the face of an exit sign is from an external source, it shall have an intensity of not less than 53.8 lux from either lamp. Internally illuminated signs shall provide equivalent luminance.

3.16.1.4 Source of Power: Supply of power to one of the lamps for exit signs shall be provided by the premises wiring system. Power to the other lamp shall be from an on-site generator set which shall be installed in accordance with the provisions of this Code.

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3.16.1.5 Floor-level Exit Signs: For floor-level exit signs additional approved low-level exit signs which are externally or internally illuminated, or self-luminous, shall be provided in all interior exit corridors serving guest rooms of hotels in Occupancy A5. The bottom of the sign shall be 150 mm to 200 mm above the floor level. For exit doors, the sign shall be on the door or adjacent to the door with the closest edge of the sign within 100 mm of the door frame.

3.16.2 Amusement Building Exit Marking: Approved exit direction marking and exit signs shall be provided. Approved low-level exit signs and directional marking shall be located not more than 200 mm above parallel the walking surface and at the exit path.

3.16.3 All exit signs shall be illuminated while in use at night, or during dark periods within the area served, in accordance with the provisions of this Code.

3.16.4 The means of exit and exit access in buildings requiring more than one exit shall be equipped with artificial lighting. The lighting facilities shall satisfy the provisions of this Code.

Chapter 4

EQUIPMENT AND IN-BUILT FACILITIES STANDARDS

4.1 SCOPE

The provisions of this chapter shall control standards of the design, installation and maintenance of equipment and in-built fixed, localized, portable facilities required for firefighting within a building and its premises. The regulations of this chapter shall be applicable for all buildings and the provisions stated herein shall not cover the firefighting requirements outside the building premises.

4.1.1 Extinguishing agents can be water, dry sand, ash, inert gas, dry chemical, and wet chemicals or mixed in nature of approved type. Agents will be selected as per the area have to extinguished.

4.1.2 The gaseous system shall be only used where water or foam cannot be used for fire extinguishing because of the special nature of the contents within the building or areas to be protected.

4.1.3 Fixed type fire protection system means there shall be a pipe circuit to cover full or part of a building and extinguishing agents supplied from a point. Localized fixed system means the system will cover a confined space with a self-extinguishing device fitted with a container ready to discharge automaticity. Portable type means the extinguishers can be hand carried in the site of incidents.

4.1.4 Fire Classification

Fire class A: Fire involving common combustibles such as wood, paper, plastics, clothes etc.

Fire class B: Fire involving flammable liquids and gases, such as gasoline, propane, and solvents.

Fire class C: Fire involving live electrical equipment such as computer, fax machine etc.

Fire class D: Fire involving combustible metals such as magnesium, lithium, aluminum etc.

Fire class K: Fire involving cooking media such as cooking oils and fats.

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4.2 FIXED TYPE FIRE HYDRANT SYSTEM

General area of application shall be Fire class A. Fixed type fire hydrant system comprises of, stand pipes and hose or reel pipes, sprinklers, drenchers or similar devices in appropriate combinations of these and capable of discharging water in an area which to be extinguish.

4.2.1 Water Quantity for Fire Protection

The required flow rate and duration of water for sprinkler or stand pipe system use within the building according to their occupancy classification shall be in accordance with Table 4.4.1 and size of pipes shall be as per provisions of this Code or on the basis of the hydraulic design of the system to maintain flow rate and duration of water discharge.

4.2.2 Water Sources for Fire Protection

Flow rate and duration of discharging water required for interior fire extinguishment of a building shall be supplied from one or any combination of the following sources.

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Table 4.4.1: Fire Protection Flow Requirements

Building Type Sprinkler System Standpipe and Hose System Duration in Minutes for Building Heights

(litre/min.)* (litre/min.)* Up to 51 m 51 m to 102 m Above 102 m

Light hazard- I 1000 1000 30 38 45

Light hazard- II 1900 1900 50 62 75

Ordinary hazard- I 2650 1900 75 95 112

Ordinary hazard - II 3200 1900 75 95 112

Ordinary hazard - III 4800 1900 75 95 112

Notes:

* Values will be for one riser serving floor area of 1000 m².

Light hazard - I : Occupancy groups, A1, A2, A3, E1

Light hazard - II : Occupancy groups, A4, A5, B, C, D, E2, E3, I2, I4,

Ordinary hazard - I : Occupancy groups, I1, I3, I5, F2, F3, G1

Ordinary hazard- II : Occupancy groups, G2, H1

Ordinary hazard- III : Occupancy groups, H2

Extra hazard : Occupancy group J - pressure and flow requirement for this group shall be determined by Fire

Department but shall not be less than required value for Ordinary hazard - III

4.2.2.1 Direct connection to water main

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For continuous water supply (public water supply system or private system) with sufficient quantity and pressure to feed and discharge firefighting equipment during peak demand period, direct connection of firefighting system to the water main may be adopted, Figure 4.4.1. In this case guidelines specified in NFPA 22 are to be followed.

Stand pipe To Sprinkler System (optional)
Hose station

Check Valve Basement

Siamese

Connection

Water Supply Line

Figure 4.4.1 Typical diagram for standpipe and hose system connected directly to the water main

4.2.2.2 Roof gravity tanks

Any elevated structure holding a water reservoir or water tank or in any level within a building and having downward supply pipelines shall be termed as gravity tank only when a water reservoir located on a roof of a building shall be termed as roof gravity tank.

For water supply system with inadequate quantity or pressure during peak demand period but with sufficient pressure to feed roof tank, a roof gravity tank may be provided. In that case any one of the following steps shall be followed.

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(a) If only the static height of the roof gravity tank is used to feed and discharge the firefighting equipment, the height of the roof gravity tank from the top floor must be sufficient to create minimum required pressure at the top floor hydrant point. The minimum pressure at hose outlet for standpipes supplying a 50 mm or larger hose shall be at least 300 kPa. This minimum pressure for standpipe system supplying first aid hose (38 mm nominal) shall be at least 200 kPa. This minimum pressure for combination of sprinkler and hose pipe system shall be 600 kPa. To maintain the above required pressure the vertical distance of the roof gravity tank from the top floor hydrant point shall be at 31 m, 20.5 m and 62 m respectively, Figure 4.4.2.

(b) If the vertical distance between the roof gravity tank and the top floor hydrant point cannot be maintained for gaining required pressure and discharge, fire pump of required size and number shall be installed with standard manufacturer recommended suction and delivery connections, Figures 4.4.3 and 4.4.4.

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Figure 4.4.2 Typical diagram showing required static head of gravity roof tank with adequate domestic and fire reserve

4.2.2.3 Storage tank

In absence of public water supply system, the building premises shall have individual water sources specified in Part 8. For water supply system with inadequate flow or pressure to feed and discharge by firefighting equipment, the building premises may have deep tube well with required flow, water wells, natural water sources or a ground (or underground) tank, roof top tank, swimming pools etc. The capacity of these facilities shall be sufficient to satisfy the flow requirement as specify in Table 4.4.1.

4.2.2.4 Water supply test

After installation of the hydrant system, a flow test shall be conducted to verify the capacity of the discharge system such that the installation can fulfill the minimum capacity (flow and time) as specified in Table 4.4.1. This system shall be periodically inspected, maintained and tested in accordance with NFPA 25.

4.2.2.5 Fire pump

The firefighting equipment shall be directly feed by automatic main fire pump. Centrifugal pump, turbine-type pump (submerged or with vertical shaft) or positive displacement pumps with adequate supply pressure and flow capacity shall be used for water supply during demand. Centrifugal pumps shall not be used where a static suction lift is required.

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Once the pump starts, it shall run continuously until stopped manually. The pump shall be fully operational within 30 seconds after starting. There shall be provision for manual starting where priming is necessary. Automatic priming equipment is necessary to ensure priming at all times. The fire pump shall not be used for other purpose.

Fire pumps shall have the rated capacities as shown in Table 4.4.2. The pump shall be rated at net pressure of 272 kPa or more as per requirement of the firefighting system demand. For pump installation procedure and fittings NFPA 20 shall be followed.

The pump shall be housed in a readily accessible position in a building of non-combustible construction. The pump shall be adequately protected against mechanical damage.

There shall be a provision for secondary fire pump which can be operated by dedicated generator or by an alternate power supply source with adequate control system and in compliance with safety operation during fire. Quality of the pump assembly shall comply with the specification of International Association of Fire. From these generator and alternative power supply source power cannot be utilized for regular use other than (i) fire lift, (ii) stretcher lift, (iii) emergency light, and (iv) alarm system.

(The fire pump is on the roof)

Figure 4.4.3 Typical diagram for gravity roof tank with adequate domestic and fire reserve.

4.2.3 Design Considerations for Standpipe and Hose System

4.2.3.1 The fire protection system shall be designed for their effective use either by amateur or trained firefighting personnel or both.

4.2.3.2 All standpipes in standpipe system shall be sized so that they will provide a minimum flow specified in Table 4.4.1. In standpipe system with more than one standpipe, the supply piping shall be sized for the minimum flow specified in Table 4.4.1 for the first standpipe plus 1000 litre per minute for each additional standpipe. The total number of such additional standpipes shall not be more than 8. All standpipe risers shall be interconnected through check valves of equivalent size to prevent recirculation.

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(The fire pump at the ground level)

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Figure 4.4.4 Typical diagram for gravity roof tank with adequate domestic and fire reserve.

4.2.3.3 The minimum pressure for standpipes supplying a 50 mm or larger diameter hose shall be at least 300 kPa. For standpipe supplying first aid hose (38 mm nominal diameter) may have a minimum pressure of

200 kPa. The maximum pressure at any point of the system shall not exceed 2434 kPa, if the hose connection at 40 mm diameter outlet exceeds 700 kPa approved pressure regulating device shall be installed to maintain the above maximum limits.

4.2.3.4 Diameter of the standpipe termed as size shall comply with flow and capacity requirement of the pump shown in Table 4.4.2 or hydraulically design to provide required flow and pressure at the topmost hydrant point.

Table 4.4.2: Fire Pump Data Minimum Pipe Sizes (Nominal)

Pump Rating mm (inch)

75 (3)

litre/min (gpm) Discharge, 100 (4)

946 (250) 100 (4)

1136 (300) 125 (5)

1514 (400) 125 (5)

1703 (450) 150 (6)

1892 (500) 150 (6)

2839 (750) 200 (8)

3785 (1000) 200 (8)

4731 (1250)

5677 (1500)

4.2.3.5 The water supply required for combined system (for partial automatic sprinkler and Fire Department hose) shall be calculated in accordance with Table 4.4.1 plus an amount equal to the hydraulically calculated sprinkler demand.

4.2.3.6 The system for firefighting purpose may be designed with automatic fire pump with water tank at the ground as shown in Figure 4.4.5.

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4.2.3.7 The water stored in storage tank for firefighting operation shall not be used for other purposes. Accordingly separate water connections should be provided as shown in Figure 4.4.6.

To Sprinkler System (optional)

Hose station

BNBC 2015 FINAL DRAFT Check Valve Non-Return Valve

Siamese

Connection

Water Supply Line

Ground Tank Pressuring Pump

Auto Fire Pump

Figure 4.4.5 Typical diagram for fire protection with ground tank and automatic fire pump

Figure 4.4.6 Typical diagram for storage tank (ground or overhead) with domestic and fire reserve.

4.2.3.8 The ground storage tank shall be easily accessible to fire engine of Fire Department. In absence of space available for fire engine, the cover slab of ground storage tank shall be designed to withstand a vehicular load of local fire engine.

4.2.3.9 The standpipe shall be located such as intermediate stair landing, vestibules or nearby in noncombustible enclosure such that it will be able to provide hose stream to the most remote area of the floor served.

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4.2.3.10 The hose shall be connected to the standpipe within a height not more than 1.5 m from the finished floor level. The hose stations shall be easily accessible for inspection and testing.

4.2.3.11 The hose connection to a standpipe for large stream shall be at least 100 mm nominal and that of small stream may be 63 mm or 50 mm on each point. The size of first aid hose shall be 38 mm nominal. The hose length shall not be more than 30 m.

4.2.3.12 Different piping materials and fittings for standpipe system presented in Tables 4.4.3 and 4.4.4 shall conform to the standard or one of the standards cited against them. The standard requirements for other materials not provided in these tables shall be subject to the approval of the Authority.

Table 4.4.3: Piping for Standpipe System Standard

Material ASTM B75, ASTM B88

ASTM B251

Copper Tube ASTM A55, ASTM A120, ASTM A135

Copper and Copper-Alloy Tube ANSI B36.10

Steel Pipe

Wrought Steel or Iron

Table 4.4.4: Standpipe FittingsBNBC 2015 FINAL DRAFT Standard

Material

ANSI 616.1, ANSI B16.4

Cast Iron ANSI B16.18, ANSI B16.22

Copper ANSI B16.3

Malleable Iron ANSI B16.5, ANSI B16.9, ANSI B16.11, ANSI

Steel B16.25, ASTM A234

4.2.3.13 The standpipe riser shall be supported at the top and at the lowest level. The riser shall also be provided with support at the alternate level in between top and bottom level of the standpipe riser. The support shall be of adequate strength to support the water-filled pipe load and an additional load of 110 kg.

4.2.3.14 The horizontal standpipe shall have hangers with a spacing not more than 5 m. The hanger shall be able to carry a load of five times the weight of the water-filled pipe and an additional load of 110 kg.

4.2.3.15 There shall be Siamese connection also termed as firemen connection to the standpipe or to the delivery pipe of the gravity roof storage tank. The location of Siamese connection shall be easily accessible from the street or means of access.

4.2.3.16 The system shall be provided with adequate drainage piping to discharge under pressure. The drain

pipe shall not discharge into sanitary sewer.

4.2.3.17 All control valves shall be designed to withstand the pressure specified in Sec 4.2.3.3

4.2.4 Wet Riser

A wet riser is a vertical pipe of not less than 100 mm internal diameter, kept permanently charged with water which is then immediately available for use on any floor in the building at which a hydrant or landing valve is provided. The riser is connected to a booster pump or town main of suitable capacity so that they are capable to supply four 13 mm jet at 2.5 bars at the highest outlets.

4.2.5 Down Comer

A similar function to that of wet riser is performed by down comer which like a wet riser is constructed of vertical piping, with outlets at different levels, but is supplied with water from a tank in the roof through terrace pump, gate valve and non-return valve. It is also fitted with inlet connections at ground level and air release valve at roof level for being capable of charged with water by pumping from fire engines.

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4.2.6 High Velocity Water Spraying Projector System

This system applies water in the form of conical spray consisting of droplets of water traveling at high velocity. The three principles of extinguishments are employed, namely emulsification, cooling and dilution. While the water droplets are passing through the flame zone, some of the water is turned into steam, diluting the oxygen feeding the fire. Addition of water to the burning oil also cools it and reduces the rate of vaporization. In addition to this droplets of water traveling at high velocity bombard the surface of the oil to form an emulsion of oil and water that will not support combustion.

4.2.7 Water Mist Technology

Fine water spray suppression system can extinguish fires using water and nitrogen from air. Nozzle is used to atomize water by nitrogen or other suitable media to generate mist or fog of finely controlled water droplets. The system operates at low pressure and produces droplets in a range of 80 to 200 microns. These droplets extinguish fire rapidly and efficiently even those involving highly volatile hydrocarbons. This system is an alternative to Halon and other gaseous system in many applications.

4.2.8 Drenchers

Drenchers are used for the external protection of the building against exposure hazard, or radiant heat. Drencher heads are similar to sprinkler heads and may be sealed or unsealed. Drenchers are of three types, roof drenchers, wall drenchers, window drenchers.

4.2.9 Dry Riser System

Dry riser stand pipe system shall be an equivalent alternative of wet riser stand pipe system. The water supply for an automatic or semi-automatic standpipe system shall be designed such that the system must be capable of supply the system during peak demand hour.

4.2.10 Design Consideration of Sprinkler System

4.2.10.1 A system of water pipes fitted with sprinkler heads as per manufacturers specification may be installed actuate automatically, control and extinguish a fire by the discharge of water.

4.2.10.2 The pipe schedule sizing to supply different number of sprinklers for their different uses may be in accordance with Tables 4.4.5 and 4.4.6

4.2.10.3 Each sprinkler shall serve a maximum ceiling area specified in Table 4.4.7 for different types of building according to their uses.

4.2.10.4 Water supply piping and fittings for sprinkler system shall conform to the standard or one of the standards cited against them in accordance with Tables 4.4.4 and 4.4.8. The standard requirements for other pipe materials not provided in these tables shall be subject to the approval of the Authority.

4.2.10.5 The sprinkler system shall be provided with adequate support or made flexible to prevent pipe breakage during earthquake

4.2.10.6 The hanger in sprinkler system shall be designed to carry a load equal to five times the weight of the water-filled pipe plus an addition load of 110 kg. The support shall be designed to support a load equal to the weight-filled pipe plus and additional load of 110 kg.

4.2.11 Connection

4.2.11.1 There shall be Siamese connection to the sprinkler system located outside the building and accessible to the fire department connection.

4.2.11.2 All risers shall be connected through a gate valve with a main of size equal to that largest riser.

4.2.11.3 The sprinkler system shall be provided with adequate drainage arrangement. The drain pipe shall not discharge into sanitary sewer.

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4.2.11.4 All control valves and fittings shall be able to withstand the pressure specified in Sec 4.2.3.3.

4.2.12 Inspection, Testing and Maintenance

4.2.12.1 Inspection

All piping and equipment shall be inspected for satisfactory supports in accordance with Sec 6.15 in Part 8 of this Code and protection from damage and corrosion. All outlets shall be free from obstruction.

Table 4.4.5: Size of Water Supply Steel Pipe to Sprinklers

Pipe Size mm (inch)	No. of Sprinkler for Ordinary	No. of Sprinkler for Hazard *	No. of Sprinkler for Extra
nominal	Hazard	Hazard *	Hazard
25	(1)	2	

32 (11) 3 3 2
5 5 5
4 10 10 8

38 (11)

2

50 (2)

63 (112) 30 20 15
75 (3) 60 40 27
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88 (31) 100 65 40

2 NL** 100 55
- 160 90
100 (4) - 275 150
125 (5) - 400*** 225***
150 (6)
200 (8)

* Definitions of these terms are given in Table 4.4.1.

** No limit.

*** One sprinkler system riser or combined system riser shall serve the floor area not more than 4850 m2 for light and ordinary hazardous occupancy and 2325 m2 for extra hazardous occupancy

Table 4.4.6: Size of Water Supply Copper Pipe to Sprinklers

Pipe Size	No. of Sprinkler Connection	No. of Sprinkler Connection	No. of Sprinkler Connection
mm (inch) nominal	Ordinary	Ordinary	Ordinary
25 (1)	2		
2	1		

32 (11) 3 3 2
5 5 5
4 12 12 8

38 (11)

2

50 (2)

63 (11) 40 25 20
65 45 30
2

75 (3)

88 (312) 115 75 45

100 (4) NL** 115 65

125 (5) - 180 100

150 (6) - 300 170

200 (8) - *** ***

* Definition of these terms is given in Table 4.4.1.

** No limit.

*** One sprinkler system riser or combined system riser shall serve the floor area not more than 4850 m² for light and ordinary hazard occupancy and 2325 m² for extra hazard occupancy

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Table 4.4.7: Ceiling Area for a Sprinkler

Construction Type Light Hazard Ordinary Hazard Extra Hazard
Protected Spacing Protected Spacing Protected Spacing

area (Max) area (Max) area (Max)
ft² (m²) ft (m) ft² (m²) ft (m) ft² (m²) ft (m)

Roof or Floor on Trusses, Girders 200 (18.6) 15 (4.6) 130 (12.1) 15 (4.6) 100 (9.3) 12 (3.7)
or Beam

With High Piling ***

Open Wood Joists 225 (20.9) 15 (4.6) 130 (12.1) 15 (4.6) 100 (9.3) 12 (3.7)
With High Piling ***

Other Type of Construction 168 (15.6) 15 (4.6) 130 (12.1) 15 (4.6) 100 (9.3) 12 (3.7)
With High Piling ***

* Maximum distance in m between sprinklers and between line of piping.

* * The definitions of these terms are given in Table 4.4.1.

** * Storage facilities which permit closely piled materials over 4.5 m or materials on rack over 3.6 m.

Table 4.4.8: Piping for Sprinkler System Standard

Material

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Copper and Copper-Alloy ASTM B32, ASTM B75, ASTM B88, ASTM B25, ANSI B36

Steel ASTM A53, ASTM A120, ASTM A135, ASTM A795

4.2.12.2 Testing

Fire protection plumbing system or part thereof shall be tested and approved after installation by the Authority.

(a) Testing of Standpipe System: The hydrant pipes shall be hydraulically tested to a pressure 1400 kPa or 150% of working pressure whichever is the higher for 2 hours without any leakage at any points. The system shall be able to maintain above test pressures. The system shall also be tested for the required flow at the highest outlet.

(b) Testing of Sprinkler System: This system shall be tested for at least 2 hours for a pressure of 1000 kPa or at 350 kPa in excess of normal working pressure when normal working pressure will be more than 650 kPa. The system shall be able to maintain above test pressures. The system shall also be tested for the required flow at the highest outlet.

(c) Testing of Sprinkler System Pump: The pump used for sprinkler system firefighting purpose shall be tested by approved authority for their performance characteristics and this test report must be submitted at the time of supply of pump. The pump shall be retested or repaired to its original condition if their performance characteristics fall below more than 10 percent of the supplier's test characteristic curve or as specified for the fire protection water supply system.

4.2.12.3 Maintenance

The system shall be maintained for safe operating conditions and tested at least once a year.

4.3 FIXED INSTALLATION OTHER THAN WATER

Other than water there are different types of fixed installation. These are of mainly two types. (a) Centrally fixed, (b) locally fixed.

4.3.1 Centrally Fixed Installation Discharging Extinguishing Agent other than Water

4.3.1.1 General

This installation can be of two types, one for zone coverage and the other for total coverage. For these system pipe circuits and exhaust manifold are required and shall have special discharging Alarm distinctly different than fire alarm. These fixed installations can be of different types, such as (a) Foam installation, (b) Vaporizing liquid

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installation, (c) Dry powder installation. (d) Gaseous installation (e) Dry chemical installation (f) Wet chemicalBNBC
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installation.

4.3.1.2 Foam installation

Foam extinguishing system shall be of an approved type and shall be installed in accordance with the specification of the manufacturer. The foam extinguishing system is designed to discharge fire suppressive foam concentrates over the area to be protected.

(a) There are different types of foam installation, such as (i) Pump operated mechanical foam installation, (ii) Self-contained pressurized installation, (iii) Pre-Mixed Foam installation, (iv) High Expansion Foam installation.

(b) A foam extinguishing system shall be automatically actuated during a fire with provision of manual actuation.

(c) Warning sign and discharge alarm system shall be provided with the foam extinguishing system, which shall be actuated during the use of the system.

(d) The system provides protection of boiler rooms with its ancillary storage of furnace oils in basement and other areas where hazardous liquids are stored.

4.3.1.3 Vaporizing liquid installation

Liquefied compressed Halogenated hydrocarbon is fed through distribution pipe works and specially designed discharged nozzles to the area need to be extinguished. Upon discharge the liquid immediately vaporized to form a heavy vapour which achieves very rapid extinction.

There are two types of Vaporizing liquid installation, such as total flooding system and Local application system. This system shall be installed in accordance with the specification of the manufacturer. Safe guards are necessary to prevent injury or death of personnel in area where the atmosphere may be made hazardous by the discharge.

4.3.1.4 Dry powder installation

Dry powder of certain chemicals installation consist of pipe work and discharge nozzle and pressuring media. This installation can be operated automatically or manually. This can be designed for total coverage and for zone coverage.

Dry powder is a range of chemical agents available as extinguishing media. They are used on various flammable liquids where they are confined. This system shall be installed in accordance with the specification of the manufacturer.

4.3.1.5 Gaseous installation

(a) General: Gaseous extinguishing system shall be of an approved type and shall be installed as per provisions of this Code. The system supplies gas from a pressurized vessel through fixed pipes and nozzles.

(b) The system is used where water or foam cannot be used for fire extinguishing because of the special nature of the contents within the building or areas to be protected.

(c) The system shall be automatically actuated and shall be equipped with manual actuation devices as well.

(d) Warning signs and discharge alarm shall be provided where persons are likely to be trapped in an area made hazardous due to discharge of extinguishing gases

(e) Halocarbon agents and inert gas system: Any approved Type of Halocarbon agents are chemicals in the liquid form at high pressure and vaporize readily leaving no residue. These are primarily to protect hazardous fire in enclosed room, vaults, machines, containers, storage tanks, engines, unattended computer server rooms, electrical appliances, liquid gas storage etc. Some example of these chemical is dichlorodifluoro ethane, chlorodifluoro methane. Inert gas system is also an alternative of Halocarbon

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agents. These are nitrogen and argon in pure form or in mixer at different proportion. These gases are identified as clean total flooding fire suppression agents. They are stored in high pressure gas cylinders.

4.3.1.6 Dry chemical extinguishing system

(a) General: Dry chemical extinguishing system shall be of an approved type and shall be installed in

accordance with the provisions of this Code and manufacture's instruction.

(b) The system shall be automatically actuated during a fire and shall be equipped with manual actuation

device as well.

(c) Warning signs and discharge alarm shall be provided where persons are likely to be exposed to chemical

discharge. Chemical agents of the system shall be nontoxic.

4.3.1.7 Wet chemical extinguishing system

(a) A wet chemical system is a solution of water and potassium carbonate or acetate based chemical which

forms the extinguishing agent. The system shall be installed in accordance with the provisions of this Code and manufacturer's installation instruction.

(b) The system shall be automatically actuated during a fire and shall be equipped with manual actuation device as well.

(c) In case of wet chemical extinguishing system, label of the approved agent shall be affixed.

(d) Warning signs and discharge alarm shall be provided where persons are likely to be exposed to wet chemical discharge.

4.3.2 Localized Fixed

Containerized extinguishing agent are available in different shapes and size to be placed in different locations those are prone to fire hazard as for example at the top of cookers in the kitchen, electric connection box etc. Use of these containers shall be approved type and installation shall be as per specification of the manufacturer.

4.4 PORTABLE FIRE EXTINGUISHER

4.4.1 Portable fire extinguishers shall readily available in different type. These are portable fire extinguisher are of carbon dioxide types, dry chemical types, water types, and Halon types, film-forming type, foam types and Halon carbon type. For proper operation persons with adequate knowledge and familiar with their operation must be available.

4.4.2 In accordance with the occupancy hazard, specification of the manufacturer and guide line set by NFPA 10, the minimum number of portable fire extinguishers for different class of fire shall be ascertained. As for example where the floor area of a building is less than 279 m² at least one fire extinguisher of the minimum size is recommended for Fire Class A.

4.4.3 Portable fire extinguishers shall be fully charged, operable at any time and conspicuously located where they will be readily accessible. Portable fire extinguishers shall not be obstructed or obscured from view. In large rooms, means shall be provided to indicate the extinguisher location.

4.4.4 Portable fire extinguishers shall be adequately protected from impact, vibration, and adverse

environment and shall not be exposed to temperatures outside the listed temperature range shown on the fire extinguisher label.

4.4.5 Portable fire extinguishers mounted in cabinets or wall recesses shall be placed so that the fire extinguisher operating instructions face outward. The location of such fire extinguishers shall be marked conspicuously.

4.4.6 The owner or designated agent or occupant of a property in which fire portable extinguishers are located shall be responsible for inspection, maintenance, and recharging. The procedure for inspection and

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maintenance of fire extinguishers varies considerably. Monthly "quick check" or inspection in order to follow theBNBC 2015 FINAL DRAFT inspection procedure as outlined in NFPA 10 shall be done.

4.4.7 Maintenance, servicing and recharging shall be performed by trained persons having available the appropriate servicing manual(s), the proper types of tools, recharge materials, lubricants, and manufacturer's recommended replacement parts or parts specifically listed for use in the fire extinguisher. These extinguishers shall be maintained as per NFPA 10, at intervals of not more than one (1) year.

4.4.8 All rechargeable-type fire extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance or as per the recommendations of the manufacturer.

4.4.9 For personal safety during approach with extinguishing equipment it shall be remembered that most fires produce toxic decomposition products of combustion and some materials can produce highly toxic gases. Fires can also consume available oxygen or produce dangerously high heat. All of these can affect the degree to which a fire can be safely extinguished.

4.4.10 All extinguishing agents other than clean agents shall be approved by the authorities having jurisdiction.

4.5 RATE OF WATER FLOW FOR FIRE PROTECTION IN TALL BUILDING

High rise building exceeding 80 meter height shall be termed as Tall Building. The quantity, sources and mode of water supply in tall building shall be in accordance with Sec 4.2. In high rise buildings fittings and equipment for firefighting may be subject to excessive pressure.

Pressure on firefighting equipment in Tall building shall be reduced by dividing the building into different zones. In this process the building shall be divided into different water supply zones so that the firefighting equipment will serve within their maximum allowable limit of pressure. Separate automatic fire pump or combination of tank and automatic pump shall be installed for supplying water to the fire-fighting equipment in each zone, Figures 4.4.7 and 4.4.8.

4.6 FIRE DETECTION AND ALARM SYSTEM

4.6.1 Fire Detection Shall be Done by the Following Ways

(a) Human surveillance:

Human surveillance shall be acceptable where the user and occupant are capable of maintaining surveillance for

detecting fire and smoke when a person appointed and assigned to detect fire shall be termed as Fire watch.

(b) Automatic smoke or/and heat detection :

The installation of automatic fire and smoke detection system shall be a necessity when the size, arrangement and occupancy of a building become such that a fire itself cannot provide adequate warning to its occupants.

The automatic fire and smoke detection system shall include, spot or line type heat sensitive detectors and optical, ionized or chemical sensitive type of smoke detectors.

(c) Video surveillance :

Cameras capable of registering and transmitting real time images in to a monitoring device having display commonly termed as CCTV shall be installed systematically to cover an area for detecting any incision of smoke and fire. This CCTV will remain under either human surveillance or monitored by compatible software to transmit signal automatically to the fire alarm system and also to the authorized persons.

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4.6.2 Fire Alarm System

Water efficient fittings, including faucets, showerheads and flushes, that use less water for the same function as effectively as standard models, shall be used in buildings of all occupancies. The low flow fixtures shown in Table 3.4.7 shall be used.

4.6.2.1 In a fire incident, panic management shall be the prime concern for a successful relocation, delayed egress or evacuation of occupants from a building structure. Activation of alarm shall be sequential and compatible with all design scenarios. Means of egress system is so designed that all alarms of a building shall not be activated at a time. A general announcement of fire shall be done for the occupant or the word "Fire" shall be avoided but authorized persons responsible for evacuation shall be alerted through Password or Pass Phrase. As per design scenarios a systemic execution protocol shall be developed where a building shall be sub-divided into zones for installation alarms and for fight in place, relocation of occupants, delayed egress or immediate evacuation.

Alarm system can be of different types, such as audible alarm, visual alarm, vibration alarm, and display alarm.

(a) Audible alarm: Ringer, bell, horn, chime and voice command via public address system (PA system) are the examples of audible alarm system.

(b) Visual Alarm: A bright white light emitting device with specific intensity and cycle of emission is capable to draw attention of a person having limited hearing shall be termed as visual alarm. A visual alarm shall be installed where a person working alone in a room or a space having hearing limitations. In a public place or in any place more than two persons are present and one having normal hearing ability shall not require to install visual alarm.

(c) Vibration Alarm: Alarm activated through vibration can be used for alarm.

(d) Display Alarm: Textual, graphical or pictorial display on screens or monitors can be used as alarm.

Figure 4.4.7 Typical diagram for fire protection in different water supply zones of a tall building Vol. 1
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Figure 4.4.8 Typical diagram for fire protection in different water supply zones of a tall building

4.6.2.2 Each floor shall be separated as zone for the purpose of alarm annunciation.

4.6.2.3 A floor is subdivided by fire or smoke barriers and allows relocation of occupants from area of incident to another area on the same floor each area shall be considered as a zone and annunciated separately for the purpose of alarm location.

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4.6.2.4 Notification zones shall be consistent with emergency response or evacuation plan for the protected premises. The boundaries of notification zones shall be coincident with building peripheral walls, fire or smoke compartment boundaries, floor separations or other fire safety subdivisions.

4.6.2.5 If required by the authorities having jurisdiction, the alarm system be allowed the application of alarm signal to one or more zones at the same time, shall allow voice paging to the other zones or in any combination.

4.6.2.6 Alarm annunciation at the fire command center shall be by means of audible and visible indicators.

4.6.2.7 Activation of fire extinguishment system shall have a supervisory alarm. An automatic extinguishment system capable of discharging other than water extinguishing agents shall have dedicated and distinct alarm system and shall be actuated before discharging such agents.

4.7 RELATED APPENDIX

Appendix C Detail Guidelines for Selection and Sitting of Fire Detection System

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Chapter 5

REQUIREMENTS FOR FIRE DETECTION AND EXTINGUISHING SYSTEM

5.1 SCOPE

Installation of fire detection and firefighting equipment fixed centrally or localized or portable and theirBNBC 2015
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arrangement in the buildings shall be performance based. Construction type and occupancy classification of Buildings shall be as per provisions of this Code. Part 3 of this Code shall be determinant of construction type and the A-Z list for occupancy classification. Installation of fire detection and firefighting equipment shall comply with the Chapter 4 of Part 4 of this Code.

Intent of this Chapter is to reduce the probability of fire incident by confinement, extinguishment to reduce probability of injury or death from fire, structural failure due to fire and safety of building use.

Provisions of this Chapter shall be considered as minimum requirement and shall not be intended to prevent additional installation of higher standard of equipment.

5.1.1 Performance based fire protection system which includes "Passive" that is arrangement of building components and "Active" means detection, alarm, extinguishment devices and equipment which shall be incorporated in all buildings unless otherwise specified in this Code. Performance based design considerations shall be as follows:

- (a) The starting of a fire incident shall be a single source to evaluate the fire protection system.
- (b) The prime objective of a fire protection system to safe life and minimization of property damage shall be achieved by using required design scenarios and the performance criteria to be fulfilled. Each design scenario shall be challenging as realistic and the probability of occurrence is present in the building shall be reduced and protected.
- (c) Design scenario shall include but not limited to those specified in Sections 5.1.2 to 5.1.4 and shall be documented and demonstrated to the satisfaction of the authorities having jurisdiction.
- (d) Each design scenario used in the performance-based design shall be translated into input data specification as appropriate for calculation method or model.
- (e) Input data of any design scenario did not analyzed and explicitly addressed or incorporated shall be omitted from input data specifications shall be identified by a sensitivity analysis of the consequences of the modification for such omissions shall be performed.

5.1.2 Design Scenario I

Fire Class and Fire resistance rating shall be determined as per provision of this Code for the followings:

- (a) All surface finish materials.
- (b) Structural Members.
- (c) Joints of Structural Members.
- (d) All slabs.
- (e) Roof Slab.

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- (f) Joints between Slabs.
- (g) All Exterior Walls.
- (h) All Interior Walls.
- (i) Partitions.
- (j) Suspended Ceiling.

Construction classification and the structural stability shall be concluded and documented.

5.1.3 Design Scenario II

Occupancy specific design scenario representative of a typical fire shall explicitly specify the following:

- (a) Occupant activities.
- (b) Number and location of occupants.
- (c) Room size.
- (d) Number of Control Area.
- (e) Furnishings and contents.
- (f) Fuel Properties represented by Fire Class and ignition sources.
- (g) Ventilation conditions.
- (h) First item ignited and its location.

5.1.4 Design Scenario III

(a) The largest possible fuel load characteristic of the normal operation of the building shall be considered

regarding a rapid developing fire in presence of occupants.

(b) A slow-developing fire shielded from protection in the close proximity to a high occupancy area shall be

considered a concern regarding a relatively small ignition source causing a significant fire.

(c) A concealed space or suspended ceiling space adjacent to a large occupied room shall be considered a concern

regarding a fire originating in a concealed space that does not have either detection system or suppression system and then spreading into the room within holding the greatest number of occupants.

(d) An Ultrafast developing fire in the main exit access portion in a condition when interior doors are open but reduction in number of available means of egress shall be considered.

(e) A room normally unoccupied from where a fire starts that can potentially endanger a large number of occupants in a room or other area shall be considered.

(f) The concern regarding exposure of fire outside of an area of incident started at a remote location either spreading from the area or bypassing barriers spread into another area and developed untenable condition thereof.

(g) The reliability and the design performance shall be considered for fire detection and protection system in such a way that a fire originating in ordinary combustibles in a room with each passive or active fire protection system or fire protection feature independently rendered ineffective shall be considered individually being unreliable or becoming unavailable. This scenario shall not be considered for a room or a space or a building where fire detection and protection systems or any independent features are absent.

5.1.5 Fire class shall be determined for all movables in each room and all control areas in the building.

5.1.6 Fire Protection Plan

A building or part thereof must have a fire protection plan for the following cases.

- (a) High rise building or building sections 33 m and above in heights.

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(b) Building or building sections classified in the occupancy groups J, G, H, K and M which are two or more storeyBNBC 2015 FINAL DRAFT
in height with over 1858 m² per gross floor area or are two or more in height with total area exceeding 4717 m² gross floor area.

(c) Building classified as A3 containing 30 or more dwelling units.

(d) Part of building used as mercantile, assembly or institutional for care having gross floor area over 930 m².

(e) Alteration to a building or a portion thereof listed in Sections 5.1.6(a) to 5.1.6(d) above, if cost of alteration

equivalent to one third cost of new construction of the same or more or involves changes in occupancy classification.

(f) The plan shall include information where applicable building address, height in meter, occupancy classification, detail occupant load,

(g) Key Plan shows all floors, exits, corridors, partitions serving as fire separations or compartments, locations and ratings of required enclosures, windowless stair with pressurization, exit discharge, locations of frontage space including street width of abutting plot.

(h) Descriptions in narrative forms of safety systems and features where applicable, including:

- Communications systems
- Alarm system
- Detection systems
- Location of fire command station
- Elevator recall
- Emergency Lighting and power.
- Extinguishing equipment.
- Compartmentation.
- Horizontal Exits.
- Mechanical ventilation and air conditioning.
- Smoke control systems and equipment
- Furnishing type and materials
- Places of assembly
- Fire department access.
- Other system, required or voluntary to be installed.

(i) A Fire protection plan shall be signed by the same architect who is signing on the proposed drawings for building approval and any person responsible for the Fire protection design.

5.2 SPECIFIC RECOMMENDATIONS

Specific recommendations applicable for buildings complied with the followings:

5.2.1 All building constructed monolithically as per provisions of this Code as an inherent full fire resistive construction type shall be termed as Type I-A.

5.2.2 All surface finishes shall be Class-I within the range of zero to twenty five flame spread index.

5.2.3 Any offsite construction, pre-stressed, pre-fabricated or steel structure encased with fire resistive assembly shall be termed as Modified Type I-A.

5.2.4 The following recommendations for fire protection system specified in Sections 5.3 to 5.14 are made based on construction type and surface finishes specified in Sections 5.2.1 and 5.2.2 respectively.

5.2.5 All buildings of any occupancy type and construction type as per provisions of this Code other than Sec 5.2.1 with all surface finish as per Sec 5.2.2 shall provide a performance based fire protection.

5.3 OCCUPANCY A: RESIDENTIAL

The residential buildings complied with Sections 5.2.1 and 5.2.2 shall provide the following active fire protection:

5.3.1 Occupancy A1 and A2: Single Family Dwelling and Two Families Dwelling

(a) For low rise building fire detection and fixed firefighting arrangements shall not be required.

(b) High rise buildings exceeding each floor area 500 m² shall have manual alarm system and portable

extinguishers provided in the escape stairs route or in fire lift lobby and as per provision of this Code.

(c) High rise buildings exceeding each floor area 500 m² shall have manual alarm system and dry or wet riser

hydrant system per provision of this Code.

5.3.2 Occupancy A3: Flats and Apartments

(a) Up to 20 m height fire detection and fixed firefighting arrangement shall not be required.

(b) No protection required within the dwelling units of flats and apartments high rise buildings manual alarm

system and fixed hydrant system shall be provided in the landings of fire stairs or in the left lobby as per provision of this Code shall be required.

5.3.3 Occupancy A4: Mess, Boarding House and Hostels

(a) For buildings up to 2 storey height, fire detection, fire alarm and fixed firefighting arrangements shall not be required.

(b) Buildings having 3 stories and having floor area less than 300 m² shall not require fire detection and fixed firefighting arrangements.

(c) The floor area of 3 stories building having more than 300 m² per floor and less than 33 m height having central corridor with rooms on both sides, manual fire alarm system shall be provided along with portable fire extinguishers. Instead of double loaded corridor a single loaded corridor having 3 m width shall not require any detection and fixed firefighting arrangements.

(d) High rise boarding house, mess and hostels manually operated electric fire alarm system shall be provided along with hydrant system.

5.3.4 Occupancy A5: Hotels and Lodging Houses

(a) For buildings up to 2 storey height, fire detection, fire alarm and fixed firefighting arrangements shall not be required.

(b) Buildings having 3 floors or above and having floor area less than 300 m² shall not require fire detection and fixed firefighting arrangements.

(c) The floor area of such building is more than 300 m² per floor and low rise building having central corridor with rooms on both sides, manually operated fire alarm system shall be provided along with portable fire extinguishers.

(d) High rise hotels and lodging houses manually operated electric fire alarm system shall be provided along with hydrant system.

5.4 OCCUPANCY B: EDUCATIONAL

The educational buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.4.1 Low rise buildings with open corridor of 3m width fire detection and fixed firefighting arrangements shall not be required.

5.4.2 High rise building or building having central corridor with classrooms on both sides, manual fire alarm and fixed firefighting comprised of dry or wet riser arrangements shall be required as per provisions of this Code. Single loaded open corridor having 3 m width shall have manual detection and manual alarm system along with hydrants.

5.4.3 Where hydrants cannot be used to extinguish fire in those areas appropriate portable firefighting appliances shall be installed as per standard.

5.5 OCCUPANCY C: INSTITUTION FOR CARE

The Institution for care buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.5.1 Occupancy C1: Institution for Care of Children:

Fire detection and fixed firefighting arrangements shall not be required. Portable firefighting appliances shall be installed as per the provisions of this Code.

5.5.2 Occupancy C2: Custodial Institution for the Physically Capable adults:

Fire detection and fixed firefighting arrangements shall not be required. Portable firefighting appliances shall be installed as per the provisions of this Code.

5.5.3 Occupancy C3, C4, C5: Custodial Institution for the Physically Incapable, Penal and mental institutions for children and Penal and mental institutions for adults:

Manually operated electric fire alarm system shall be installed. Portable firefighting appliances shall be installed as per the provisions of this Code.

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5.6 OCCUPANCY D: HEALTH CARE FACILITIES

The Health care facilities buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.6.1 Occupancy D1: Normal Medical Facilities:

Manually operated electric fire alarm system or automatic fire alarm system shall be installed in the duty room, so that the duty personnel receive the fire warning well in advance. Portable fire fighting appliances shall be installed as per the provisions of this Code.

5.6.2 Occupancy D2: Emergency Medical Facilities:

The requirements shall include the installation of manually operated electric fire alarm system or automatic fire alarm system so that the duty personnel receive the fire warning well in advance. Portable fire fighting appliances shall be installed as per the provisions of this Code.

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5.7 OCCUPANCY E: BUSINESS

The Business buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

Buildings Active Fire Protection

- (i) Office buildings up to 2 storey high and
Portable fire extinguishers or hydrants.
500 m² single effective undivided space in a floor.
- (ii) Office buildings more than 2 storey high or more Manually operated electric fire alarm system shall be provided along with portable fire extinguishers or hydrants.
than 500 m² single effective undivided space in a floor. Automatic fire alarm system and performance based extinguishing
- (iii) Laboratories with precession instruments. system.
- (iv) Control areas of office buildings dealing with Automatic foam or gaseous or dry chemical fire extinguishing flammable liquids. system required along with portable fire extinguishers.
- (v) Solvent storage in a control area of an office Automatic fire alarm and performance based foam or gaseous or dry chemical fire extinguishers or portable fire extinguishers.
- (vi) Telecommunication, Internet gateway equipment
or computer installation in an unattended server Automatic fire alarm system and performance based fixed room. gaseous or fixed vaporizing liquid extinguishers or portable fire extinguishers.
- (vii) Electrical low tension distribution panel room in a sub-station. Automatic fire alarm and performance based localized fixed gaseous or vaporizing liquid extinguisher or portable fire
- (ix) Space under one false ceiling more than 500 m² extinguishers.
- (x) Essential Services (Occupancy E3) Automatic fire alarm system shall be installed for above and under the false ceiling.

Due to importance of services and the functionality of the building of this occupancy classification during any national or local emergency situation thus the fire protection system design shall be performance based.

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5.8 OCCUPANCY F: MERCANTILE

The Mercantile buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protections:

5.8.1 Occupancy F1: Small Shops and Markets

Mercantile Active Fire Protection

- (i) Whole sale establishments, transport booking Manual fire alarm system shall be provided along with portable fire establishments. extinguishers or hydrant.

(ii) Other premises (other than shops, stores, markets Manual fire alarm system shall be provided along with portable fire etc.) extinguishers or hydrant.

5.8.2 Occupancy F2: Large Shops and Markets Active Fire Protection

Mercantile Manual fire alarm system and portable fire extinguishers shall be

(i) Shopping arcade with central corridors open to sky provided or hydrant.

Manual fire alarm and dry or wet riser with performance based

(ii) Mercantile building under covered roof with single portable fire extinguisher shall be installed. effective undivided space more than 500 m² on

each floor Automatic fire alarm, sprinklers and standpipe with performance based portable fire extinguisher shall be installed.

(iii) Underground mercantile structure

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5.8.3 Occupancy F3: Petrol and CNG Stations Active Fire Protection

Mercantile

Fixed automatic foam or gaseous or dry chemical fire extinguishing

(i) Petrol pump and CNG station, automobile garages system shall be provided along with portable extinguisher.

(ii) Aircraft hangars Automatic foam or gaseous or dry chemical fire extinguishing system shall be provided along with portable extinguisher.

BNBC 2015 FINAL DRAFT 5.9 OCCUPANCY G: INDUSTRIAL

The Industrial buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.9.1 Occupancy G1: Low Hazard Industries

Manually operated electric fire alarm system shall be installed with portable fire extinguishers or hydrants when occupant loads are not more than 150.

Where occupant loads are more than 150 active fire protections shall be performance based.

5.9.2 Occupancy G2: Moderate Hazard Industries

Among the moderate hazard industries where large number of occupants are densely populated in a building, the active fire protections shall be performance based. Fire safety requirement for such type industry is elaborated as follows:

(a) Where occupancy load is more than 150 per production area shall have minimum 9.5 m³ air volume per occupant.

(b) There shall have direct exits from the ground floor. This exit doors shall be used by only the occupant of the ground floor.

(c) Buildings less than 33 m height shall have open stair and the interior stairs shall be protected by fire rated enclosures. Occupants located 33 m or above, all stair shall have smoke proof enclosures constructed as per provision of the Code.

(d) All windows or openings on exterior walls passable by occupant located above 3 m in height shall be protected by grills and all these grills shall be designed as such that a part or a portion having minimum 0.6 m height and minimum 0.75 m width framed and the grill within the frame shall be side hinged or pivoted so that it can swing. This swing type operable portion must be always locked and in case of emergency the firefighters can open by breaking the lock for rescue operation.

(e) The floor shall be constructed such that the travel path of the occupant shall not be exceeded as per Table 4.3.7 of this Code.

(f) As per general requirements, all exit access doors shall be of a side-swinging type. Fulfilling the conditions laid down by NFPA 101, edition 2015, article 7.2.1.4 horizontal sliding or vertical-rolling security grills or door assemblies that are part of the required means of egress shall be permitted.

(g) All raw materials, finished good and accessories shall be stored in control areas as per provision of part 3.

(h) Density of storage materials per control area shall not be exceeded the provision of this Code.

(i) During production that is feeding, checking for quality control rejects, waiting area for finishing, packing, cartooning etc. in every case dedicated area shall be defined as on process storages. The total volume of materials on process shall be such that in every four hour the material shall be used up and the finished goods shall be transferred to controlled area as finished goods store.

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(j) From each end every work station shall be connected with a passage. The width of the passage shall comply with the provision of this Code Chapter 3 Part 4.

(k) Cargo lift and passenger lift shall have smoke proof lift lobby.

(l) Occupant load in a single effective undivided space shall not exceed 600. In case of existing building if the occupant load of a single effective undivided space exceeds 600, the space shall be compartmented complying with the horizontal exit provision of the Code.

(m) Where control areas and in process stores having materials may cause a fire classified as fire class A shall have hydrant system as per provision of this Code. In the utility occupancy areas fire extinguishing system shall be installed as per provision as specified for utilities of this Code.

(n) If there any change of fire classification due to the working condition or raw materials than appropriate extinguishing system shall be installed as per provision of this Code.

(o) Up to 750 m² single effective undivided space in a floor shall be installed with manual fire alarm system with portable fire extinguishers or as an alternate hydrants system shall be installed as per provisions of this Code.

(p) Above 750 m² single effective undivided space in a floor shall be fitted with manual fire alarms system with hydrants shall be installed.

5.10 OCCUPANCY H: STORAGE

The Storage buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

5.10.1 Occupancy H1: Low Fire Risk Storage

Manually operated electric fire alarm system shall be installed. Depending on the type of materials to be stored performance based fire protection shall be installed as per provision of this Code.

5.10.2 Occupancy H2: Moderate Fire Risk Storage

Performance based fire protection system shall be installed as per provision of this Code.

5.11 OCCUPANCY I: ASSEMBLY

The Assembly buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

5.11.1 Occupancy I1: Large Assembly with Fixed Seats

All auditorium, corridor, green rooms and canteen attached to assembly buildings shall be fitted with manual fire alarm system and the performing stage should preferably be covered by an automatic sprinkler system. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

5.11.2 Occupancy I2: Small Assembly with Fixed Seats

Requirements specified in Sec 5.6.1 shall be complied.

5.11.3 Occupancy I3: Large Assembly without Fixed Seats

Automatic fire alarm system shall be provided. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

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5.11.4 Occupancy I4: Small Assembly without Fixed SeatsBNBC 2015 FINAL DRAFT

Requirements specified in Sec 5.6.3 shall be complied.

5.11.5 Occupancy I5: Sports Facilities

Manually operated electric fire alarm system shall be provided. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

5.12 OCCUPANCY J: HAZARDOUS

The Hazardous buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

All hazardous occupancies shall be installed with automatic fire alarm and automatic fixed firefighting gaseous or foam or dry chemical extinguishing system as compatible with class of fire shall be installed as per provision of this Code.

5.13 OCCUPANCY K: GARAGES

The parking buildings (garages) complied with Sections 5.2.1 and 5.2.2 shall provide the following fire protections:

- (a) Where both parking and repair operations are conducted in the same building, the entire building shall comply with the requirement stated in this Code for Occupancy G1.
- (b) Where the parking and repair sections are separated by not less than 1-hour fire-rated construction, the parking and repair sections shall be permitted to be treated separately.
- (c) In areas where repair operations are conducted, the requirement of Occupancy G1 shall be fulfilled.
- (d) The area used only for parking shall fulfill the requirement as laid down in chapter 42 of NFPA 101 edition 2015.

5.14 OCCUPANCY L: UTILITIES

Fire protection system shall be as stated in Sec 2.12 of this Code

5.15 OCCUPANCY M: MISCELLANEOUS

Performance based fire protection system shall be installed.

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Appendix A

Guidelines for Fire Drill and
Evacuation Procedure

A.1 INTRODUCTION

The following provisions shall be applicable for emergency reporting, fire safety and evacuation plan of the occupants of different occupancies.

A.2 FIRE REPORTING

Any occupant within the occupancy discovering a fire or smoke shall immediately report the incident to the fire brigade directly or through the ground command station, if there is any. Reporting of this situation shall not be delayed by any person by way of making, issuing, posting or maintaining any regulation or order written or verbal to that effect.

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A.3 SUPERVISION OF FIRE SAFETY AND EMERGENCY ACTION AND PLANS

The owner shall designate competent persons to act as fire safety and evacuation plan staff, train the staff and conduct fire drill. Such persons shall possess such qualifications and/or hold such certificate of fitness as are required by the provisions of this Chapter. The owner shall ensure that adequate fire safety and evacuation plan staff is present on the premises during regular business hours and other time when the building is occupied, to perform the duties and responsibilities set forth in the fire safety and evacuation plan.

A.4 FIRE SAFETY STAFF

A.4.1 The fire safety and evacuation plan shall designate a fire safety director, a number of deputy fire safety directors and fire safety brigade members having following duties, authority and qualifications.

A.4.2 Fire Safety Director

(a) The fire safety plan shall contain the name of fire safety director, whether employed by a fire security firm or directly employed by the management.

(b) Depending on the size and complexity of the building, the Fire Safety director shall be a person of proven capability, having good training and schooling with adequate experience in dealing with fire.

(c) The fire safety director shall be present in the building during regular business hours. Duties of Fire Safety director shall primarily include but not be limited to the following.

(i) Shall be well conversant with the written fire safety plan for the fire drill and evacuation procedures.

(ii) Shall be in charge of selecting qualified building service employees for the fire command and engage in organizing, training and supervising the works of command crew.

(iii) Shall be responsible to conduct fire and evacuation drill.

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(iv) Shall be responsible for the availability and state of preparedness of fire command crew during emergencies.

(v) Shall be responsible for the assignment and training of Fire fighters on floor supported by adequate number of deputies as detailed out in the fire safety plan.

(vi) Shall be responsible for the day to day supervision of the fire fighters and his deputies and the state of alertness of the fire fighters. When the number of fire fighters and deputies become such that it becomes impractical for the chief fire safety officer to check them directly during the working hours, he may provide substitute. Nonetheless the fire safety director shall spot check any number of floors as he wishes or time permits. An up to date organization chart shall be displayed at appropriate locations.

(vii) Cases of negligence to duties on the part of members of his crew shall be taken up by him and he shall rectify the situation by appropriate measures as far as he has been empowered under the fire safety plan, failing which he shall notify the matter to the owner or the management of the building. The owner or the management on their part shall take up the matter with the fire security firm or if employed directly shall deal with the matter directly. If the person/persons is/are employed by a firm, and the firm fails to correct the situation, the owner/management shall notify the matter to the Department of Fire Service and Civil Defence to take disciplinary action against the firm.

(viii) In the event of fire/emergency he/she shall be in charge of fire command station and shall supervise, guide and coordinate activities such as ensuring that the Department of Fire Service and Civil Defence has been notified of fire or fire alarm, direct the evacuation procedure as detailed in the fire safety plan, manning the fire command station, appraise the Department of Fire Service and Civil Defence about the spot of fire on their arrival, advise the Department of Fire Service and Civil Defence officer in charge of the operation.

A.4.3 Fire Safety Deputy Director

The fire safety plan shall contain the details of Deputy Fire Safety Director similar to the details mentioned under the fire safety director. Qualification and experience of Deputy Fire Safety Director shall also be similar to those of the Fire Safety director excepting that he shall be less experience than the Director.

Tenant or tenants of each floor upon request by the owner or in-charge of the building shall assign and make available dependable and trustworthy person/persons under their employee at the disposal of the Director to act as fire safety coordinator and fire fighter. They shall undergo basic firefighting and evacuation training by the Director or his deputy.

Duties of the Deputy Fire safety Director shall be similar to those mentioned under Sec A.4.2 except that he shall receive command from the Fire Safety director for execution and shall assume the role of Fire Safety director in his absence.

Each floor of a building shall be under the command of a deputy fire director for the safe evacuation of inmates in the case of fire. When the floor area of a tenant exceeds 700 m² a deputy fire director shall be assigned for each 700 m² or part thereof.

The deputy fire safety director shall be present in the building at all times. Duties of deputy Fire Safety director shall primarily include but not be limited to the following

(a) Each Deputy Fire Safety director shall be conversant with the fire safety plan. They must be well acquainted with fire exits and location and operation of fire alarms.

(b) In case of fire or fire alarm, the deputy Fire Safety director shall ascertain location of fire and unfold evacuation procedure as directed from the command station and to the following general guides.

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(i) The most critical area for immediate evacuation would be the fire floor and the floors above. BNBC 2015 FINAL DRAFT

Evacuation from other floors shall be initiated if so commanded by the ground command station or the situation indicates to be so. Evacuation should be carried out via stairs not influenced by fire and fire fighter shall try to carry out the operation using stair other than the ones used by the Department of Fire Service and Civil Defence personnel. If it becomes impossible, the fighters before opening door to the fire floor shall sought advice from the Department of Fire Service and Civil Defence personnel.

(ii) Evacuation from two or more floors below the fire floor should be adequate. He shall continuously keep the ground command station informed of his location.

(iii) Ensure that fire alarm has been transmitted.

(iv) Fire fighters shall ensure that all the inmates are intimated of the emergency and shall immediately proceed with the evacuation exercise detailed under Fire Safety Plan.

(v) Fire fighter shall keep the ground station informed of the step being taken by him/her.

(vi) Similarly fire fighter above fire floor shall notify the command station of the means being taken by him/her or any other special feature after unfolding Fire Safety Plan.

(vii) If and when stairways serving fire floor/floors above become useless by the presence of fire, smoke, fumes, in several floors above and when fire engulfs a considerable number of inmates then use of elevators shall be considered in accordance with the followings:

- If the elevator serving the floor to be evacuated also serves the fire floor, the lifts shall not be used if it is not fire lift. If there are more than one lift bank, however, the lift/lifts in the other bank may be used if notified by the ground command station that one may use such lift/lifts.
- If the lifts do not serve the fire floor or lift shaft has no opening on the fire floor, they may be used if not otherwise instructed by the command station.
- Elevators taken over by trained in-house person or Department of Fire Service and Civil Defence personnel may be used.
- In absence of unaffected available lift/lifts, Fire fighter shall decide to use the fire stair for evacuation based on considerations/information available on the floor and any other instruction received from ground command. Before entering the fire stairway with the evacuees, the Fire fighter shall be sure about the environment within the fire stairway by personal inspection and in case of adverse environment consider using an alternate stairway and shall notify the ground command accordingly.
- The Fire fighter shall keep the ground command informed of the means adopted by him during the evacuation process.

A fire safety coordinator and fire fighter shall be available at all times other than normal working hours when the Fire Safety Director or his Deputy is not available within the building.

Fire safety coordinator shall be a person capable of directing the evacuation procedure of occupants within the buildings as detailed in the Fire Safety Plan.

During fire/emergencies, primary function of fire safety coordinator shall be to take over command of the ground station and to direct and execute the evacuation process as laid down in the plan.

Fire safety coordinator shall be trained by the Director and shall be under his command for all evacuation purposes. His activities shall be controlled and governed by the clauses in Fire Safety Plan and shall be subject to scrutiny of the Department of Fire Service and Civil Defence.

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Fire Party: If, in the opinion of the Fire Safety Director and endorsed by the Department of Fire Service and Civil Defence that the number of fighter, coordinator and Deputy are inadequate, a Fire Party shall be raised from among the employees of the tenants and the management who shall be acting as help to regular in-house fire fighting force in the event of fire and follow the same work schedule and function in the same manner as fighter, coordinator and Deputy fire safety director do.

A.5 SIGNS AND FLOOR PLANS

A.5.1 The lettering, arrows and other symbols of exit signs shall be written with vernacular alphabets high contrast background as per NFPA 170. Words on the signs shall be at least 150 mm high with a stroke of not less than 20 mm. For vernacular alphabets and numerics at least 150 mm high with stroke of not less than 20 mm. The sign/signs may be posted directly above the call button of the lift or any other conspicuous location securely attached to the surface of the wall. The top of the sign shall not be more than 2 m above floor level. Sign shall be posted and maintained in front of the landing area of lifts on all floors that occupants may not miss,

which shall direct the occupants to use stairs and not lifts during emergencies/fires, if not directed otherwise and shall also contain a floor plan with exact location of the stair and the relative position between the sign and the stair. Such posting in front of the landing area of lifts shall be omitted only if such signs are posted on all floors and some other area conspicuously located with the same message inscribed on it.

A.5.2 Sign Depicting Floor Number

A sign shall be posted and maintained on each stair enclosure preferably on the wall of the intermediate landing which in actual fact shall be half storey more or less than the actual indicating the floor number. The number shall be at least 75 mm square and in vernacular alphabets with contrast background as per NFPA 170.

A.5.3 Stairs and Elevators Identification

Each stair and Elevator shall be identified by a vernacular alphabet and posted with a sign, securely placed preferably on the wall of the stair side of the lift door from which egress is to be made.

A.5.4 Stair re-entry Provision

A sign shall be posted and maintained on each floor within stairway and on the occupancy side of the stairway where required, indicating whether re-entry is provided into the building and the floor where such re-entry is provided.

A.5.5 Command Station

Command station on the ground floor shall be provided with a detailed floor plan of the entire building including detailed locations of all first aid, firefighting equipment and other pertinent information. Command stations shall be adequately illuminated.

A.5.6 Two Way Communications and Fire Alarm

A two way communication system between each floor and the command station on the lobby of the entrance floor shall be provided and maintained by the owner of the building. Similarly fire alarm on each floor and the command station shall be fitted and maintained.

A.6 FIRE SAFETY PLAN

A.6.1 A fire safety plan shall be developed in line with the details elaborated as below and must have the approval of the local Department of Fire Service and Civil Defence regarding its adequacy.

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A.6.2 Fire safety plan elaborates the purpose and objective of the plan with details of personnel and their duties and fire drilling and evacuation plan. In developing fire safety plan, evaluation of all individual floor layout, total occupancy load on each floor, number and kinds of exits available, zoning of the floor by area and occupancy shall be taken into consideration, careful evaluation of occupant movements and the most expeditions routes to exit and alternate routes shall be identified and taken into consideration.

A.6.3 Fire safety plan starts with the location, address of the building with telephone number and details of any other communication facilities available within the building.

A.6.4 Purpose of the plan is to delineate details of systematic safe and orderly evacuation of a part or whole of the building by its occupants in case of fire/emergency in the shortest possible time to a safe area through the safe means of egress. It also details out the use of in-built facilities of fire warning and firefighting like fire alarm, first aid hose etc. to safeguard the lives of the inmates of the building.

A.6.5 Objective of the plan is to provide continued education to the inmates and the fire command personnel and keep the people oriented to the in-built equipment in readiness to act in the event of fire. The plan shall be rehearsed through fire drill and the written plans containing instruction shall be updated if needed and use of the in-built equipment along with initiating fire safety procedure to safeguard life in case of fire until the fire brigade arrives.

A.6.6 Once the plan is accorded after approval by the Department of Fire Service and Civil Defence, the plan shall be distributed to all the tenants of the building by the building management, including the employees of the tenants and employees of the management.

A.6.7 If the building is owned by an individual or a single corporate body and the owner or right holding member/members of the corporate body are residing in the building shall be equally subject to fire safety plan applicable to other tenants.

A.6.8 All major changes in the safety plan shall be promptly reported to Department of Fire Service and Civil Defence for their approval.

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A.7 FIRE DRILLS

A.7.1 Fire drill shall be conducted as detailed under the fire safety plan. The frequency of fire drill shall be as per table shown below. All occupants of the buildings, building service employees including fire safety and evacuation plan staff shall participate in the fire drill. However, the very old, convalescent patients or otherwise incapacitated inmates are not obliged to actively take part in the exercise, except the fire man and his staff and family members of such person shall chalk out a clear plan as to how to evacuate in a real emergent situation with such incapacitated persons.

A.7.2 A record of such drills shall be kept in writing for at least 3 years for the inspection Department of Fire Service and Civil Defence whenever called for. The frequency of such fire drill shall be as mentioned in Table 4.A.1.

Table 4.A.1: Fire Drill Frequency

Occupancy Frequency

Industry Having occupancy more than 150 Monthly

Industry Having occupancy less than 150 Quarterly

Mercantile occupancy more than 150 Quarter

Mercantile occupancy less than 150 Half yearly

School, College, Universities Half yearly

High rise building Half yearly

Tall building Quarterly

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A.8 ORGANIZATION CHART FOR FIRE DRILL AND EVACUATION ASSIGNMENT

(a) An organization chart clearly delineating assignment attributed to designated employees shall be prepared as per fire safety plan and posted to all tenants and in very conspicuous location/locations on each floor. A copy of the chart shall be in possession of the fire safety director.

(b) An updated list shall be continuously made available with the director, his deputy and coordinators and Fire fighter for all the disabled occupants unable to move without aid in the stairs. Arrangement shall be made in detail in the fire safety plan to have these inmates assigned in moving down the stairs two or more floors below fire floor. If it becomes necessary to move them still further down the stair, help may be sought of the elevator bank unaffected by fire and evacuated safely to ground floor. In case any extra assistance is needed, the director shall be notified.

(c) During fire or fire drill exercise, fire fighter shall be using arm band or such other identification.

(d) During fire on the fire floor it is to be ensured that all inmates are notified and are evacuated to safe area. A rush search shall be carried out including lavatories that all the inmates have been covered and the person in charge of this operation shall be trained in accomplishing this task fast and flawless.

(e) Persons not available on duty as per organization chart shall be promptly replaced as per contingency plan detailed in the fire safety plan.

(f) On completion of evacuation operation, a head count shall be carried out of all the regular occupants known to have occupied the floor evacuated.

(g) Immediately on receipt of the alarm, the fire fighter shall take position near the two way communication station on the floor, so that he/she can maintain continuous contact with the ground command and receive instructions.

A.9 INSTRUCTION TO INMATES OF THE BUILDING

Once the fire safety plan has been approved by the Department of Fire Service and Civil Defence, the applicable portion of the plan shall be distributed to all the tenants and the management of the building who in turn shall pass it on to their respective employees. All the occupants shall actively participate and cooperate in carrying out the provisions of fire safety plan.

A.9.1 Fire Prevention and Protection Program

A Plan for periodic formal inspection of each floor shall be developed in respect of exit facilities, fire extinguishers and good housekeeping. Reports of such inspection shall be carefully maintained for inspection of Department of Fire Service and Civil Defence. The Plan shall have provision for monthly testing of two way communication and fire alarm system.

A.9.2 Personal Fire Instruction Card

All the occupants of the building shall be supplied with a personal Fire Instruction Card containing details of the floor plan and exit routes as well as instruction to be followed during fire. Instructions may contain the following either in Bangla or both in Bangla and English.

A.9.3 Detailed Building Information

A form shall be maintained for the benefit of all concerned with fire hazard of the building and shall contain the following basic information.

(a) Building address in adequate details about its location.

(b) Name, Address and telephone number of the owner (corporate body or individual) and the person in charge of the building.

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(c) Name address and telephone number if any, of the Fire Safety Director and his Deputy. BNBC 2015 FINAL DRAFT

(d) Certificate of occupancy.

(e) Height, area, construction class (details of various load and non-load bearing elements).

(f) Number, type and location of fire stairs and/or fire towers.

(g) Number, type and location of horizontal exits or other refuge areas.

(h) Number, type location and operation of elevators and escalators (if any).

(i) Locations of fire alarm-floor wise and central.

(j) Communication System (telephone, mobile, walkie-talkie).

(k) Size and location of stand pipe system, gravity or pressure tank, fire pump and the name and

qualifications of the person or persons in charge of the facilities.

(l) Automatic fire sprinkler system, primary and secondary water supply system and the area or areas

being protected along with the name and qualification of the person or persons in charge.

(m) Any other fire extinguishing system, their location, efficacy and other pertinent details.

(n) Average number of employed persons by day and night.

(o) Average number of disabled persons visiting the building by day and night.

(p) Average number of outsiders visiting the building by day and night.

(q) Locations, types and capacities of other service facilities like primary and standby electric power,

normal and emergency lighting arrangement, heating with fuel (if any), ventilation with fixed windows, other means of emergency exhaust facilities of smoke and heat, air-conditioning system including floor coverage and ducting, refuse disposal facilities, any other firefighting equipment, any other service facilities available.

(r) Measures taken or to be taken for addition, alteration and repair of any aspect within the buildings.

(s) Information on flammable solids, liquids and gases if used and stored within the building premises.

(t) In mixed occupancy, complete details of such occupancies and their special needs to be covered during fire or emergencies.

A.10 ENGLISH TEXT OF INSTRUCTIONS

(a) Safety First

- Push button fire alarm boxes (number is mentioned here) are provided on your floor. Please read the operating instruction posted on them.

- Please read the operating instructions on the body of the fire extinguisher provided in your floor.

- Nearest exit from your flat is shown in this plan (plan to be provided here).

- Assemble on the ground floor at the location indicated on the following plan. For clarification, contact

the fire fighter or Deputy Safety Director. (plan of assembly point in ground floor to be provided here)

(b) For personal and collective safety, notify the fire fighter/Deputy Safety Director in case.

- Exit route and/or door are obstructed by dumping of boxes or such other loose materials.

- Staircase door, lift lobby doors do not close automatically or completely.

- Push button fire alarm or fire extinguisher are obstructed or damaged or seem to be out of order.

(c) If you discover a Fire

- Break the glass and push the button of the nearest fire alarm and call the fire service.

- With assistance from the floor fire fighter if needed, fight fire with the in-built facilities on your floor.
- Evacuate, if so instructed by the fire fighter

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(d) When you hear Evacuation Instructions

- Immediately leave the floor taking the nearest staircase.
- Report to your fire fighter on reaching the predetermined assembly point outside the building.
- Try not to use lifts.
- Avoid going to cloak room.
- Refrain from running or shouting, do not get panicked.
- Do not waste a moment collecting personal belongings.
- Keep the lift lobby and staircase doors shut.

A.11 BANGLA TEXT OF INSTRUCTIONS (evsjvq wb†`©kvejx)

(K) wbivcĖvB me©v†MÖ

- fe†bi cÖwZ Zjvq Pvc tevZvg wewkó AwMœ wec` ms†KZ hšĳ †`qv Av†Q| e`env†ii c~†e© hšĳi Mv†q gyw`Zª wb†`©kvejx cob– |
- AwMœwbev© cb hšĳ e`env†ii c~ e© AbyMÖn K†i hšĳi Mv†q gyw`Zª wb†`©kvejx cob– |
- fe†bi †h †v †b Avcbw Ae†v †b Ki†Qb †mLv† †_†K wbMg© †bi wbKUZg/mnRZg c_ L†yu R †c†Z wbM©gb bKkv Abymib Kiæb|
- wbM©gb†bi mwy eav†_© fe†bi wbPZjvq wbMg© b bKkv wb†`w© kZ †v †b mg†eZ nDb I AwMœwbev© cb Kgx© i wb†`©kbv Abmy ib Kiæb|

(L) Avcbvi e`w³MZ I mvgwMÖK wbivcĖvi †v^ †_© wb†œ D†jØwLZ wel†q AwMwœ bev© cK Kg©x†K AewnZ Kiæb

- Riæix wbM©gb c†_ †Kvb cÖKvi evav _vK†j|
- wmwöN†ii †Rv, wjdU& jwei †Rv m†úb~ f© v†e ev mswµqfv†e eÜ bv n†j|
- AwMœwbev© cb wec` ms†KZ hšĳ I AwMwœ be©vcb hšĳ A†K†Rv ev e`envi Dc†hvMx bv _vK†j|

(M) Av†bi Drm Lu†y R †c†j

- wec` ms†KZ hšĳi Kv†Pi Aveib ††¹⁄₂ †djyb, tevZv†g Pvc w`b Ges dvqvi mvwf©†m Lei w`b|
- fe†b iwjZ AwMœ wbev© cK hšĳi m†vn†h AwMœ wbev© c†b m†vqZv Kiæb|
- AwMœ wbev© cb Kg©xi wb†`©kbv †g†b feb Z`vM Kiæb|

(N) feb Z`v†Mi wb†`©kbv †c†j

- wbKUZg wmwö w`†q `æª Z feb Z`vM Kiæb|
- fe†bi evB†i Aew`Z wba©vwiZ mgv†ek`†j AwMœ wbe©vcb Kgx© †K Avcbvi Dcw`wZ AewnZ Kiæb|
- AwMœKv†Üi mgq wjdU& e`envi Ki†eb bv|
- AwMœKv†Üi mgq fxZmšĳ`Í n†q A†nZKz †Šov†Šwo ev wPrKvi Ki†eb bv|
- e`w³MZ wRwbm msM†Ö ni Rb` mgq bó Ki†eb bv|
- wmwöN†ii †Rv, wjd&U jwei †Rv eÜ ivLyb|
- cmÖ vab Kÿ e`envi Kiv †_†K weiZ _vKbz |
- ,R†e Kvb ††eb bv, ,Re Qov†eb bv|

Appendix B

Fire Protection Considerations for Venting in Industrial and Storage Buildings

B.1 SCOPE BNBC 2015 FINAL DRAFT

B.1.1 This Appendix covers venting requirements in industrial buildings. Provisions contained herein shall be applicable to factory and storage facilities requiring large floor areas without dividing walls and enclosures.

B.1.2 This Appendix shall not apply to ventilation designed for personnel comfort, commercial cooking operation, regulating odor or humidity in toilet and bathing facilities, to regulate cooling equipment.

B.1.3 This Appendix shall apply to fire and smoke of two criteria: (a) Fire or smoke layer that does not enhance the burning rate and (b) Deflagration.

B.2 VENTING OF FIRE AND SMOKE THAT DOES NOT ENHANCE THE BURNING RATE

B.2.1 Determination of precise venting requirements is difficult, as variables like rate of combustion, composition of the combustion product, shape, size and packaging of the combustible materials as well the size, height and disposition of the stacks of materials are involved with it.

B.2.2 Vent system designs shall be computed by calculating the vent area required to achieve a mass rate of flow through the vent that equals the mass rate of smoke production.

B.2.3 Venting devices are to be so designed and installed that they operate automatically at the earliest sign of fire or smoke.

B.2.4 The smoke and fire venting system shall be so designed and installed as to keep the temperature of the combustion product as low as possible, preferably below 150°C.

B.2.5 To achieve full efficiency in vents total area of all vents must be more than the inlet area for cold air. Ideally the inlets should be as close to the ground as possible.

B.2.6 The area of unit vent shall not exceed $2d^2$, where d is the design depth of the smoke layer. For vents with length to width ratio more than two, the width shall not exceed the design depth of the smoke layer.

B.2.7 The center-to-center spacing of vents within a curtained area shall not exceed $2.8 H$, where H is the ceiling height. For different shape of the roof the ceiling height can be calculated as per provision of NFPA 204.

B.2.8 The spacing of vents shall be such that the horizontal distance from any point on a wall or draft curtain to the center of the nearest vent, within a curtained area does not exceed $1.4 H$.

B.2.9 The total vent area per curtained area shall be sized to meet the design objectives and the performance objectives relative to the design fire or smoke, determined in accordance with NFPA 204.

B.2.10 The design of venting for sprinkled building shall be based on performance analysis acceptable to the authority having jurisdiction, demonstrating that the established objectives are met.

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B.2.11 Smoke and heat venting systems and mechanical exhaust systems shall be inspected and maintained in accordance with NFPA 204.

B.2.12 Venting systems are complement to fire extinguishing system. Where automatic sprinklers are installed as fire extinguishing system, the sprinklers shall operate before the vent system comes into operation.

B.2.13 In industrial buildings exterior wall windows alone shall not be accepted as satisfactory means of venting, but may be reckoned as additional means of venting when located close to the eaves and are provided with ordinary glass or movable section arranged for both manual and automatic operation.

B.2.14 Vents shall be automatic in operation unless where designed specifically for both manual and automatic operation.

B.2.15 Release mechanism of vent closure shall be simple in operation and shall not be dependent on electric power.

B.2.16 The automatic operation of vents can be achieved by actuation of fusible links or other heat or smoke detectors or by interlacing with the operation of sprinkler system or any other automatic fire extinguishing system covering the area. The vents can be so designed as to open by counterweights utilizing the force of gravity or spring loaded level following its release.

B.2.17 When vents and automatic sprinklers where installed together, sprinkler shall go into operation first before vents open, in order to avoid delay in sprinkler operation.

B.2.18 Materials used in hinges, hatches and other related parts in vents shall be noncorrosive in nature for long trouble free operation.

B.2.19 Vents shall be properly sited, at the highest point in each area to be covered.

B.2.20 If possible, vents shall be sited right on top of the probable risk area to be protected to ensure free and speedy removal of smoke and other combustion product.

B.2.21 Minimum vent opening shall not be less than 1250 mm in any direction.

B.2.22 Vent spacing shall be designed considering the fact that higher number of smaller vents is better than smaller number of large vents.

B.3 DEFLAGRATION VENTING

B.3.1 Deflagration is the propagation of a fire or smoke at a velocity less than the sound wave. When this velocity of combustion increased beyond sound velocity then the combustion is said to be detonated and explosion occurred with the rupture of an enclosure or a container due to the increase of internal pressure from a deflagration.

B.3.2 The design of deflagration vents and vents closures necessitates consideration of many variables, only some of which have been investigated in depth. No Venting recommendations are currently available for fast-burning gases with fundamental burning velocities greater than 1.3 times that of propane, such as hydrogen. Recommendations are unavailable and no venting data have been generated that addresses condition that fast-burning gas deflagrations. The user is cautioned that fast-burning gas deflagrations can readily undergo transition to detonation.

B.3.3 Deflagration venting is provided for enclosures to minimize structural damage to the enclosure itself and to reduce the probability of damage to the other structures.

B.3.4 Venting shall be sufficient to prevent the maximum pressure that develops within the enclosure from exceeding enclosure strength.

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B.3.5 The vent area shall be distributed as symmetrically and as evenly as possible. BNBC 2015 FINAL DRAFT

B.3.6 The need for deflagration vents can be eliminated by the application of explosion prevention techniques described in NFPA 69.

B.3.7 The vent closure shall be designed to function as rapid as is practical. The mass of the closure shall be as low as possible to reduce the effects of inertia. The total mass of the moveable part of the vent closure assembly shall not be exceeded 12.2 kg/m².

B.3.8 When an enclosure is subdivided into compartments by walls, partitions, floors, or ceilings, then each compartment that contains a deflagration hazard should be provided with its own vent closure(s).

B.3.9 It is possible to isolate hazardous operations and equipment outside of buildings with a pressure resisting wall which will reduce risk of structural damage. Such operations and equipment may be housed in a single storey building having appropriate venting facilities and a device to absorb explosion shock from blowing through the duct back to the building.

B.3.10 Sometimes it may not be possible to house hazardous operations and equipment outside of the building, in which case the separation from other parts and equipment shall be achieved by pressure resisting walls and such units shall be ventilated outdoors. If suitable vents are integrated, external walls may be of heavy construction or of heavy panel which may be blown off easily.

B.3.11 Unobstructed vent opening is the most effective pressure release vent structures.

B.3.12 Explosion relief vents may be provided with open or unobstructed vents, louvers, roof vents, hanger type doors, building doors, windows, roof or wall panels or marble/fixed sash. Any or more than one of these may be adopted depending on individual situations and requirements.

B.3.13 Roof vents covered with weather hoods shall be as light as possible and attached lightly, so that it is easily blown off as and when an explosion occurs.

B.3.14 Doors and windows used as explosion vents shall be so fixed as to open outward. Doors shall be fitted with friction, spring or magnetic, latches that function automatically at the slight increase in internal pressure.

B.3.15 Placed at the top or bottom, the hinged or projected movable sash shall be equipped with latch or friction device to prevent accidental opening due to wind action or intrusion. Such latches or locks shall be well maintained.

B.3.16 Venting shall be so planned as to prevent injury to inmates and damage to enclosure. In populated locations, substantial ducts or diverts shall be provided to channelize the blast towards a pre-determined direction.

B.3.17 If explosion are probable within the duct, they shall be equipped with diaphragm to rupture at predetermined locations. The duct system shall not be physically connected to more than one collector.

B.3.18 Skylight with moveable sash that opens outward or fixed sash having panes of glass or plastic that blow out readily under pressure from within can be used to supplement wall vents or windows, provided their resistance to opening or displacement may be kept as low as possible consistent with structural requirement of the building.

B.3.19 For equivalent explosion pressure release, larger closed vents will be required compared to open vents.

B.3.20 As far as possible hazardous areas shall be segregated by means of fire walls or party walls to prevent spread of fire.

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Appendix C

Selection and Siting of Fire Detection System

C.1 GENERAL BNBC 2015 FINAL DRAFT

This Appendix provides information for selection and siting of equipment for fire detection in buildings.

C.2 CHOICE OF FIRE DETECTORS

Fire detectors may respond to any one manifestation of combustions such as heat generation, smoke and flames.

Smoke detectors are not naturally suitable in places where the production process produces smokes.

Application of flame detectors are restricted due to the fact that all combustions do not necessarily accompany flame and that clear line of sight is desirable as radiation from flames travel in straight lines for actuation of sensitive element.

No single detector is able to meet the need of all types of fires and all types of occupancies. As such, based on needs arising out of various situations and occupancies, judicious selection is extremely important for the reduction of fire hazards.

C.2.1 Heat Detectors

"Point" or "Spot" type detectors are actuated by heat at layer adjacent to it over a limited area. "Line" type detectors are sensitive to the effect produced by heated gas along any portion of the detector line. Both the types operate on two broad principles: one, the heat sensitive elements is actuated by temperature rising beyond a predetermined level; while the second system is actuated by predetermined rate of rise of

temperature.

C.2.2 Flame Detectors

Flame detectors are sensitive to radiation emitted by flames. Since heat, smoke and flame are produced during a fire, detectors responding to all these are accepted as general purpose detectors.

Fixed temperature heat detectors are suitable for use where ambient temperatures are high and or may rise and fall rapidly over a short period.

C.2.3 Rate of Rise Heat Detectors

These are suitable for use where ambient temperatures are low and/or may rise over a wide range slowly. Abnormally sharp rise in temperature during a fire actuates this alarm. As such it cannot be used with confidence where ambient temperatures reaches in the neighborhood of 40oC, but are best used where ambient temperatures are in the range of about 40oC.

C.2.4 Smoke Detectors

Three types of smoke detectors are commonly used. First type is actuated by absorption or scattering of visible or near-visible light by combustion product and known as "optical detector". The second type is actuated by the

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production on ionization current within the detector and referred to as "ionization detector". The third type is sensitive to carbon monoxide or other products of combustion and is known as "chemically sensitive detector". In general, these should be used at places where ambient temperature varies between 0o to 35oC.

C.2.4.1 Optical smoke detectors

Invisible smoke from a clear burning shall not actuate such detectors. But they respond quickly where smoke is optically dense and as such suitable for use in dust free clean atmosphere. Over a period of time, due to dust and dirt, the sensitive surface of photo sensitive element and/or excutor lamp of optical detectors may loss its efficiency and as such optical detectors should be cleaned and maintained regularly.

C.2.4.2 Ionization chamber smoke detectors

These responds quickly to invisible smoke of clear burning, but may not respond to fire producing dense smoke. These can be used in dust free, humidity controlled area. Smoke and other fumes, dust including slow accumulated and disturbed aerial dust, fiber, steam and condensation produced by normal processes and vehicle engines may cause false alarm. Warehouses exposed to fast air flows can also cause false alarm. Burning of polyvinyl chloride will not sensitize the detector in time and may provide late warning or no warning at all.

C.2.4.3 Chemically sensitive smoke detectors

Chemically coated sensitive elements react to carbon monoxide or other products of combustion present in smoke. Dust or moisture adversely affects the sensitive elements and are not very suitable for residential use.

C.3 SITING OF DETECTORS

Considering the prevailing weather condition of the occupancies and the problem of false alarm, the type of detectors and the area of coverage shall be decided. Area of coverage of detectors is dependent on many factors. The following aspects shall be taken into considerations in the design of detectors.

- Various forms of overhead heating
- Exhaust air from air cooling equipment blowing out into the room or factory area
- Deep beams
- Roofs and ceiling of unusual shape
- Building with ground areas above 10 m and up to 30 m in height
- Staircases
- Canteen and Restaurants
- Plant Rooms
- Ambulant air currents

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PART 5 BNBC 2015 FINAL DRAFT BUILDING MATERIALS

PART 5

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Chapter 1

SCOPE AND DEFINITIONS

1.1 SCOPE

This Part specifies the minimum requirements of materials to be complied with in buildings and works under the provisions of the Code.

For each of the building materials the applicable standard specifications and test methods are listed. All materials shall conform to these Standards.

The list of standards given in this Part of the Code would be augmented from time to time by amendments, revisions and additions of which the Authority shall take cognizance. The latest version of a specification shall, as far as practicable, be applied in order to fulfil the requirements of this Part.

In view of the limited number of Bangladesh Standards (BDS) for building materials available at the present time, a number of standards of other countries have been referenced in this Code as applicable standards. As more standards of BDS regarding building materials become available and adopted by amendment of this Code, they shall supplement and/or replace the relevant standards listed in this Part.

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1.2 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 Part 1, the meaning provided in this Part shall govern for interpretation of the provisions of this Part.

ACTUAL DIMENSIONS Measured dimensions of a designated item.
ADMIXTURE

Material other than water, aggregate, or hydraulic cement used as an ingredient of AGGREGATE concrete and added to concrete before or during its mixing to modify its properties.

AGGREGATE, LIGHT Granular material, such as sand, gravel, crushed stone, crushed brick and iron blast-WEIGHT furnace slag, when used with a cementing medium that forms hydraulic cement CONCRETE concrete or mortar.

Aggregate with a dry, loose weight of 11.25 kN/m³ or less.

CONCRETE, PLAIN

CONCRETE, PRECAST A mixture of Portland cement or any other hydraulic cement, fine aggregate, coarse aggregate and water, with or without admixtures.

CONCRETE,

PRESTRESSED Concrete that does not conform to the definition of reinforced concrete.

CONCRETE,

REINFORCED Plain or reinforced concrete element cast separately before they are fixed in position.

Reinforced concrete in which internal stresses have been introduced to reduce potential tensile stresses in concrete resulting from loads.

Concrete containing adequate reinforcement, prestressed or non-prestressed, and designed on the assumption that the two materials act together in resisting forces.

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FIBRE BOARD A fibre-felted, homogenous panel made from lignocellulosic fibres (usually wood or cane) and having a unit weight between 1.6 kN/m³ and 5 kN/m³.

HARD BOARD A fibre-felted homogenous panel made of lignocellulosic fibres consolidated under heat and pressure in a hot press to a density of 4.9 kN/m³ or above.

MASONRY UNIT Brick, tile, stone, glass-block or concrete-block used in masonry constructions.

MASONRY UNIT, Form of grouted masonry construction in which certain designated cells of hollow GROUTED HOLLOW units are continuously filled with grout.

MASONRY UNIT, A masonry unit whose net cross-sectional area in every plane parallel to the bearing HOLLOW surface is less than 75 percent of the gross cross-sectional area in the same plane.

MASONRY UNIT, SOLID A masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is 75 percent or more of the gross cross-sectional area in the same plane.

NOMINAL DIMENSIONS Nominal dimensions of masonry units are equal to their specified dimensions plus the thickness of the joint with which the unit is laid.

PARTICLE BOARD A manufactured panel product consisting of particles of wood or combinations of wood particles and wood fibres cemented together with synthetic resins or other suitable bonding system by an appropriate bonding process.

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PLYWOOD A built-up panel of laminated veneers.

REINFORCED MASONRY Form of masonry construction in which reinforcement acting in conjunction with the masonry is used to resist designed forces.

REINFORCEMENT Reinforcing bars, plain or deformed, excluding prestressing tendons, bar and rod mats, welded smooth wire fabric and welded deformed wire fabric used in concrete.

REINFORCEMENT, Deformed reinforcing bars, bar and rod mats, deformed wire, welded smooth wire DEFORMED fabric and welded deformed wire fabric.

REINFORCEMENT, PLAIN Reinforcement that does not conform to definition of deformed reinforcement.

REINFORCEMENT, Continuously wound reinforcement in the form of a cylindrical helix.
SPIRAL

STIRRUP Reinforcement used to resist shear and torsion stresses in structural member; typically bars, wires, or welded wire fabric (smooth or deformed) bent into L, U or rectangular shapes and located perpendicular to or at an angle to longitudinal reinforcement. (The term "Stirrup" is usually applied to lateral reinforcement in flexural members and the term "ties" to those in compression members).

STRUCTURAL GLUED Any member comprising an assembly of laminations of lumber in which the grain of LAMINATED TIMBER all laminations is approximately parallel longitudinally in which the laminations are bonded with adhesives.

TENDON Steel element such as wire, cable, bar, rod or strand, or a bundle of such elements, used to impart prestress to concrete.

TIE A loop of reinforcing bar or wire enclosing longitudinal reinforcement.

YIELD STRENGTH The stress at which plastic deformation takes place under constant or reduced load.

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Chapter 2BNBC 2015 FINAL DRAFT

BUILDING MATERIALS

2.1 GENERAL

Materials used for the construction of buildings shall conform to standard specifications listed in this Part of the Code. Any deviation from the type design or architectural detail from those specified in these standards may be accepted by the Building Official as long as the materials standards specified therein are conformed with.

2.1.1 New or Alternative Materials

The provisions of this Part are not intended to prevent the use of any new and alternative materials. Any such material may be approved provided it is shown to be satisfactory for the purpose intended and at least the equivalent of that required in this Part in quality, strength, effectiveness, fire resistivity, durability, safety, maintenance and compatibility.

Approval in writing shall be obtained by the owner or his agent before any new, alternative or equivalent materials are used. The Building Official shall base such approval on the principle set forth above and shall require that specified tests be made as per Sec 2.1.4 or sufficient evidence or proof be submitted, at the expense of the owner or his agent, to substantiate any claim for the proposed material.

2.1.2 Used Materials

The provisions of this Part do not preclude the use of used or reclaimed materials provided such materials meet the applicable requirements as for new materials for their intended use.

2.1.3 Storage of Materials

All building materials shall be stored at the building site(s) in such a way as to prevent deterioration or the loss or impairment of their structural and other essential properties (Part 7 of this Code).

2.1.4 Methods of Test

Every test of material required in this Part, or by the Building Official, for the control of quality and for the fulfillment of design and specification requirements, shall be carried out in accordance with a standard method of test issued by the Bangladesh Standards and Testing Institution (BSTI). In the absence of Bangladesh Standards, the Building Official shall determine the test procedures. Laboratory tests shall be conducted by recognized laboratories acceptable to the Building Official.

If, in the opinion of the Building Official, there is insufficient evidence of compliance with any of the provisions of the Code or there is evidence that any material or construction does not conform to the requirements of this Code, the Building Official may require tests to be performed as proof of compliance. The cost of any such test shall be borne by the owner.

The manufacturer or supplier shall satisfy himself that the materials conform to the relevant standards and if requested shall furnish a certificate or guarantee to this effect.

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2.2 MASONRY

2.2.1 Aggregates

Aggregates for masonry shall conform to the standards listed as follows: ASTM C144 Aggregates for Masonry Mortar; ASTM C404 Aggregates for Masonry Grout; ASTM C331 Lightweight Aggregates for Concrete Masonry Units (the applicable Standards for masonry are listed at the end of this Section).

2.2.2 Cement

Cement for masonry shall conform to the standards listed as follows: BDS EN 197-1: 2003 Cement Part-1 Composition, specifications and conformity criteria for common cements; or ASTM C150/C150M Portland Cement; ASTM C91 Masonry Cement; ASTM C595/C595M Blended Hydraulic Cements.

2.2.3 Lime

Limes for masonry shall conform to the standards listed as follows: ASTM C5, Quicklime for Structural Purposes; ASTM C207, Hydrated Lime for Masonry Purposes.

2.2.4 Masonry Units BNBC 2015 FINAL DRAFT

(a) Clay: Masonry units of clay (or shale) shall conform to the standards listed as follows: BDS 208: 2009, Common building clay bricks; BDS 1249:1989, Acid resistant bricks; BDS 1250: 1990, Burnt clay facing bricks; BDS 1263: 1990, Burnt clay hollow bricks for walls and partitions; BDS 1264 : 1990, Glossary of terms relating to structural clay products; BDS 1432: 1993, Burnt clay perforated building bricks; BDS 1803: 2008, Specification for hollow clay bricks and blocks; ASTM C34 Structural Clay Load-Bearing Wall Tile; ASTM C212 Structural Clay Facing Tile; ASTM C56 Structural Clay Non-Load-Bearing Tile; and IS 7556 Burnt clay jallies.

(b) Concrete: Concrete masonry units shall conform to the standards listed as follows:

BDS EN 771-3: 2009 Specification for masonry units - Part: 3 Aggregate concrete masonry units
BDS EN 772-1: 2009 (dense and lightweight aggregates).

BDS EN 772-2: 2009

BDS EN 772-6: 2009 Methods of test for masonry units - Part 1: Determination of compressive

BDS EN 772-11: 2009 strength.

BDS EN 772-13: 2009 Methods of test for masonry units - Part 2: Determination of percentage

BDS EN 772-14: 2009 area of voids in masonry units (by paper indentation).

BDS EN 772-16: 2009

BDS EN 772-20: 2009 Methods of test for masonry units - Part 6: Determination of bending

BDS EN 1052-3: 2009 tensile strength of aggregate concrete masonry units.

Methods of test for masonry units - Part 11: Determination of water absorption of aggregate concrete, autoclaved aerated concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units.

Methods of test for masonry units - Part 13: Determination of net and gross dry density of masonry units (except for natural stone).

Methods of test for masonry units - Part 14: Determination of moisture movement of aggregate concrete and manufactured stone masonry units.

Methods of test for masonry units - Part 16: Determination of dimensions.

Methods of test for masonry units - Part 20: Determination of flatness of faces of masonry units.

Methods of test for masonry - Part 3: Determination of initial shear strength
BDS EN 1745: 2009 Masonry and masonry products - Methods for determining design thermal values.

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ASTM C55 Concrete Building Bricks.
ASTM C90 Specification for Load-Bearing Concrete Masonry Units.
ASTM C129 Non-Load Bearing Units.

(c) Others BNBC 2015 FINAL DRAFT Calcium Silicate Face Brick (Sand-Lime Brick) shall conform to ASTM C73 Calcium Silicate Standard Specification.

Glazed Masonry Units

Glazed Masonry building units shall conform to the standards listed as

Glass Block follows: ASTM C126, Ceramic-Glazed Structural Clay Facing Tile, Facing Brick, Un-burnt Clay Masonry and Solid Masonry Units; or ASTM C744 Prefaced Concrete and Calcium Units Silicate Masonry Units.

Architectural Terra Cotta

Glass block may be solid or hollow and contain inserts; all mortar contact

Natural Stone surfaces shall be treated to ensure adhesion between mortar and glass.

Cast Stone Masonry of un-burnt clay units including cement stabilized and lime stabilized blocks shall not be used, in any building more than one storey in height.

AAC Masonry

Ceramic tile All architectural terra cotta units shall be formed with a strong homogeneous Second Hand Units body of hard-burnt weather-resistant clay which gives off a sharp metallic ring when struck. All units shall be formed to engage securely with and anchor to the structural frame or masonry wall.

Natural stone for masonry shall be sound and free from loose friable inclusions. Natural stone shall have the strength and fire resistance required for the intended use.

All cast stone shall be fabricated of concrete or other approved materials of required strength, durability and fire resistance for the intended use and shall be reinforced where necessary.

AAC (Autoclaved Aerated Concrete) masonry units shall conform to ASTM C1386 for the strength class specified.

Ceramic tile shall be as defined in, and shall conform to the requirements of ANSI A137.1.

Second hand masonry units shall not be used unless the units conform to the requirements for new units. The units shall be of whole, sound material and be free from cracks and other defects that would interfere with proper laying or use. All old mortar shall be cleaned from the units before reuse.

2.2.5 Mortar

Mortar shall consist of a mixture of cementitious material and aggregates to which sufficient water and approved additives, if any, have been added to achieve a workable, plastic consistency. Cementitious materials for mortar shall be one or more of the following: lime, masonry cement, Portland cement and mortar cement. Mortar for masonry construction other than the installation of ceramic tile shall conform to the requirements of BDS 1303: 1990 Chemical resistant mortars; BDS 1304:1990 Methods of test for chemical resistant mortars; ASTM C270, Mortar for Unit Masonry.

2.2.6 Grout

Grout shall consist of a mixture of cementitious materials and aggregates to which water has been added such

that the mixture will flow without segregation of the constituents. Cementitious materials for grout shall be one or both of the following: Lime and Portland cement. Grout shall have a minimum compressive strength of 13 MPa. Grout used in reinforced and nonreinforced masonry construction shall conform to the requirements of ASTM C476 Grout for Masonry.

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2.2.7 Mortar for Ceramic Wall and Floor Tile

Portland cement mortars for installing ceramic wall and floor tile shall comply with ANSI A 108.1-2005 listed in Sec 2.2.11 and be of the composition specified in Table 5.2.1.

2.2.7.1 Dry-set leveling cement mortars

Premixed prepared leveling cement mortars, which require only the addition of water and are used in the installation of ceramic tile, shall comply with ANSI A118.1. The shear bond strength for tile set in such mortar shall be as required in accordance with ANSI A118.1. Tile set in dry-set Portland cement mortar shall be installed in accordance with ANSI A108.5.

2.2.7.2 Latex-modified leveling cement mortar

Latex-modified leveling cement thin-set mortars in which latex is added to dry-set mortar as a replacement for all or Part of the gauging water that are used for the installation of ceramic tile shall comply with ANSI A118.4. Tile set in latex-modified leveling cement shall be installed in accordance with ANSI A108.5.

2.2.7.3 Epoxy mortar

Ceramic tile set and grouted with chemical-resistant epoxy shall comply with ANSI A118.3. Tile set and grouted with epoxy shall be installed in accordance with ANSI A108.6.

2.2.7.4 Furan mortar and grout

Chemical-resistant furan mortar and grout that are used to install ceramic tile shall comply with ANSI A118.5. Tile set and grouted with furan shall be installed in accordance with ANSI A108.8.

2.2.7.5 Modified epoxy-emulsion mortar and grout

Modified epoxy-emulsion mortar and grout that are used to install ceramic tile shall comply with ANSI A118.8. Tile set and grouted with modified epoxy-emulsion mortar and grout shall be installed in accordance with ANSI A108.9.

2.2.7.6 Organic adhesives

Water-resistant organic adhesives used for the installation of ceramic tile shall comply with ANSI A136.1. The shear bond strength after water immersion shall not be less than 275 kPa (40 psi) for Type I adhesive and not less than 138 kPa (20 psi) for Type II adhesive when tested in accordance with ANSI A136.1. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4.

2.2.7.7 Portland cement grouts

Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A108.10.

2.2.7.8 Mortar for Autoclaved Aerated Concrete (AAC) masonry

Thin-bed mortar for AAC masonry shall comply with Article 2.1 C.1 of TMS 602/ACI 530.1/ASCE 6. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1 C.2 of TMS 602/ACI 530.1/ASCE 6.

2.2.8 Metal Ties and Anchors

Metal ties and anchors shall conform to the standards listed as follows: ASTM A82/A82M, Wire Anchor and Ties; and ASTM A1008/A1008M, Sheet Metal Anchors and Ties.

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Table 5.2.1: Ceramic Tile Mortar Compositions

Walls Scratch coat 1 cement, 0.20 hydrated lime*,
4 dry or 5 damp sand

Setting bed and leveling coat 1 cement, 0.50 hydrated lime,
5 damp sand to 1 cement,
1 hydrated lime; 7 damp sand

Floors Setting bed 1 cement; 0.10 hydrated lime;
5 dry or 6 damp sand; or 1
cement; 5 dry or 6 damp sand

Ceilings Scratch coat and sand bed 1 cement; 0.50 hydrated lime;
2.50 dry sand or 3 damp sand

* Lime may be excluded from the mortar if trial mixes indicate that the desired workability and performance are achieved without lime.

2.2.9 Reinforcement

Reinforcement in masonry shall conform to the standards listed as follows: ASTM A82/A82M, Cold Drawn Steel Wire for Concrete Reinforcement; ASTM A615/A615M, Deformed and Plain Billet Steel Bars; ASTM A996/A996M, Rail-Steel Deformed and Plain Bars; ASTM A996/A996M, Axle-Steel Deformed and Plain Bars; ASTM A706/A706M, Low-Alloy Steel Deformed Bars; ASTM A767/A767M, Zinc-Coated (Galvanized) Steel Bars; and ASTM A775/A775M, Epoxy - Coated Reinforcing Steel Bars.
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2.2.10 Water

Water used in mortar or grout shall be clean and free of deleterious amounts of acid, alkalis or organic material or other harmful substances.

2.2.11 Applicable Standards for Masonry

The applicable standards for Masonry are listed below:

BDS EN 197-1: 2003 Cement Part-1 Composition, Specifications and Conformity Criteria for Common (Reaffirmed 2010) Cements.

BDS 208 : 2009

BDS 238 Specification for Common Building Clay Bricks :Specifies the dimensions, quality and strength of common burnt clay bricks, methods of sampling, testing etc.

BDS 1249 : 1989

BDS 1250 : 1990 Fire Clay Refractory Bricks and Shapes for General Purposes: This Standard specifies

BDS 1263 : 1990 the requirements for fireclay refractory bricks and shapes meant for general purpose; the products are classified in four grades according to the duty for which they are

BDS 1264 : 1990 suitable.

BDS 1432 : 1993 Acid Resistant Bricks: It specifies the requirements for acid-resistant bricks, dimensions, tolerances, test etc.

Burnt Clay Facing Bricks: It specifies the dimensions, quality and strength of burnt clay facing bricks used in building and other structure, physical requirements etc.

Burnt Clay Hollow Bricks for Walls and Partitions: It covers the dimensions, quality and strength for hollow bricks made from burnt clay and having perforations through and at right angle to the bearing surface tests.

Glossary of Terms Relating to Structural Clay Products: It covers the definition of common terms applicable to structural clay products, used in building and civil engineering works.

Burnt Clay Perforated Building Bricks: Specifies the requirements in regard to dimensions, perforations, quality, strength and also for quality of surface in case of special grade for facing bricks of perforated burnt clay building bricks for use in walls and partitions.

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BDS 1433 : 1993 BNBC 2015 FINAL DRAFT Dimensions quantities in general construction work: Specifies the various dimensional values in SI units used in general construction work.

BDS 1803 : 2008

BDS EN 1338: 2009 Specification for hollow clay bricks and blocks.

BDS EN 1339:2009

BDS EN 1340:2009 Concrete paving blocks - Requirements and test methods.

BDS EN 13369: 2009

BDS EN 771-3: 2009 Concrete paving flags - Requirements and test methods.

BDS EN 772-1: 2009 Concrete kerb units - Requirements and test methods.

BDS EN 772-2: 2009

Common rules for precast concrete products.

BDS EN 772-6: 2009

Specification for masonry units Part 3: Aggregate concrete masonry units (dense and

BDS EN 772-11: 2009 lightweight aggregates).

BDS EN 772-13: 2009 Methods of test for masonry units Part 1: Determination of compressive strength.

BDS EN 772-14: 2009 Methods of test for masonry units Part 2: Determination of percentage area of voids in masonry units (by paper indentation).

BDS EN 772-16: 2009

BDS EN 772-20: 2009 Methods of test for masonry units Part 6: Determination of bending tensile strength of aggregate concrete masonry units.

BDS EN 1052-3: 2009

BDS EN 1745: 2009 Methods of test for masonry units Part 11: Determination of water absorption of ANSI A108.1A aggregate concrete, autoclaved aerated concrete, manufactured stone and natural ANSI A108.1B stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units.

ANSI A108.1

ASTM A82/A82M Methods of test for masonry units Part 13: Determination of net and gross dry

ASTM A1008/A1008M density of masonry units (except for natural stone).

ASTM A615/A615M Methods of test for masonry units Part 14: Determination of moisture movement of

aggregate concrete and manufactured stone masonry units.

ASTM A996/A996M

Methods of test for masonry units Part 16: Determination of dimensions.

ASTM A706/A706M

Methods of test for masonry units Part 20: Determination of flatness of faces of ASTM A183 masonry units.

ASTM A775/A775M

Methods of test for masonry Part 3: Determination of initial shear strength.

Masonry and masonry products: Methods for determining design thermal values.

Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.

Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex-Portland Mortar.

Specifications for the Installation of Ceramic Tile with Portland Cement Mortar.

Specification for Steel Wire, Plain, for Concrete Reinforcement.

Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

Standard Specification for Carbon Steel Track Bolts and Nuts.

Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

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ASTM C5 Standard Specification for Quicklime for Structural Purposes.

ASTM C34 Standard Specification for Structural Clay Load-Bearing Wall Tile.

ASTM C55 Standard Specification for Concrete Building Brick.

ASTM C56 Standard Specification for Structural Clay Non load bearing Tile.

ASTM C73 Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).

ASTM C90 Standard Specification for Load bearing Concrete Masonry Units.

ASTM C91 Standard Specification for Masonry Cement.

ASTM C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.

ASTM C129 Standard Specification for Non-load bearing Concrete Masonry Units.

ASTM C144 Standard Specification for Aggregate for Masonry Mortar.

ASTM C90 Standard Specification for Load bearing Concrete Masonry Units.
ASTM C150/C150M Standard Specification for Portland Cement.
ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.
ASTM C212 Standard Specification for Structural Clay Facing Tile.
ASTM C270 Standard Specification for Mortar for Unit Masonry.
ASTM C331 Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
ASTM C404 Standard Specification for Aggregates for Masonry Grout.
ASTM C476 Standard Specification for Grout for Masonry.
ASTM C595/C595M Standard Specification for Blended Hydraulic Cements.
ASTM C744 Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
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2.3 CEMENT AND CONCRETE

2.3.1 General

Materials used to produce concrete, and admixtures used for concrete shall comply with the requirements of this Section and those of Chapter 5 Part 6 of this Code.

2.3.2 Aggregates

Concrete aggregates shall conform to the following standards:

BDS 243: 1963, Coarse and Fine Aggregates from Natural Sources for Concrete; ASTM C33/C33M Concrete Aggregates; ASTM C330/C330M Lightweight Aggregates for Structural Concrete; ASTM C637 Aggregates for Radiation-Shielding Concrete; ASTM C332 Lightweight Aggregate for Insulating Concrete; IS: 9142 Artificial lightweight aggregates for concrete masonry units.

2.3.2.1 Special tests

Aggregates failing to meet the specifications listed in Sec 2.4.2 shall not be used unless it is shown by special test or actual service experience to produce concrete of adequate strength and durability and approved by the Building Official.

2.3.2.2 Nominal size

Nominal maximum size of coarse aggregate shall not be larger than:

(a) One-fifth of the narrowest dimension between sides of forms; or

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(b) One-third the depth of slabs; or

(c) Three fourths the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, or pre-stressing tendons or ducts.

Exception:

The above limitations regarding size of coarse aggregate may be waived if, in the judgment of the Engineer, workability and methods of consolidation are such that concrete can be placed without honeycomb or voids.

2.3.3 Cement

Cement shall conform to the following standards: BDS EN 197-1:2003 Cement Part-1 Composition, specifications

and conformity criteria for common cements; BDS 612 Sulphate resisting Portland cement-type A; ASTM C150/C150M, BDS 232 Portland cement; ASTM C595/C595M Blended Hydraulic Cements; and to other such cements listed in ACI 318.

2.3.4 Water

Water used in mixing concrete shall be clean and free from injurious amounts of oils, alkalies salts, organic materials or other substances that may be deleterious to concrete or reinforcement. Water shall conform to the following standards: BDS ISO 12439:2011 Mixing water for concrete.

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2.3.4.1 Chloride ions

Mixing water for pre-stressed concrete or for concrete that will contain aluminium embedment, including the portion of mixing water contributed in the form of free moisture on aggregates shall not contain deleterious amounts of chloride ion. The maximum water-soluble chloride ion concentration in concrete shall not exceed the limitations specified in Sec 5.5.3 Part 6.

2.3.4.2 Potability

Nonpotable water shall not be used in concrete unless the following are satisfied:

- (a) Selection of concrete proportions shall be based on concrete mixes using water from such source.
- (b) Mortar test cubes made with nonpotable mixing water shall have 7 days and 28 days strengths equal to at least 90 percent of strengths of similar specimens made with potable water.

2.3.5 Admixtures

Admixtures to be used in concrete shall be subject to prior approval by the Building Official and shall comply with Sections 2.4.5.1 to 2.4.5.5. Admixtures shall conform following standards:

BDS EN 934-1:2008 Admixtures for Concrete, Mortar and Grout - Part 1: Common Requirements

BDS EN 934-2:2008

Admixtures for Concrete, Mortar and Grout - Part 2: Concrete Admixtures

Definitions, Requirements, Conformity, Marking and Labelling

2.3.5.1 Chloride

Calcium chloride or admixtures containing chloride from admixture ingredients shall not be used in prestressed concrete, concrete containing embedded aluminium in concrete cast against permanent galvanized metal forms, or in concrete exposed to severe or very severe sulphate-containing solutions (Sec 5.5.2.1 Part 6).

2.3.5.2 Standards

Air-entraining admixtures shall conform to ASTM C260 Standard Specification for Air-entraining Admixtures for Concrete. Water-reducing admixtures, retarding admixtures, accelerating admixtures, water-reducing and retarding admixtures, and water-reducing and accelerating admixtures shall conform to ASTM C494/C494M Chemical Admixtures for Concrete, or ASTM C1017/C1017M Chemical Admixtures for Use in Producing Flowing Concrete.

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2.3.5.3 Pozzolanas BNBC 2015 FINAL DRAFT

Fly ash (Pulverized Fuel Ash) or other Pozzolanas used as admixtures shall conform to ASTM C618.

2.3.5.4 Blast furnace slag

Ground granulated blast-furnace slag used as an admixture shall conform to ASTM C989.

2.3.5.5 Pigment for coloured concrete

Pigment for integrally coloured concrete shall conform to ASTM C979.

2.3.6 Metal Reinforcement

Reinforcement and welding of reinforcement to be placed in concrete shall conform to the requirements of this Section.

(a) Deformed Reinforcement: Deformed reinforcing bars shall conform to the following Standards; BDS ISO 6935-2:2010, Steel for the reinforcement of concrete - Part-2: Ribbed bars; Reinforcement conforming to the ASTM, Standards: A615/A615M Deformed and Plain Billet-Steel Bars; A616M, Rail-Steel Deformed and Plain Bars; A617M Axle-Steel Deformed and Plain Bars; A706M Low-Alloy Steel Deformed Bars; A767M Zinc Coated (Galvanized) Steel Bars; and A775M Epoxy-Coated Reinforcing Steel.

Deformed reinforcing bars with a specified yield strength exceeding 410 MPa may be used, provided shall be the stress corresponding to a strain of 0.35 percent and the bars otherwise conform to ASTM standards noted above. Fabricated deformed steel bar mats conforming to ASTM A184/A184M and deformed steel wire complying with ASTM A496/A496M may be used. Deformed wire for concrete reinforcement shall not be smaller than size D4 (nominal diameter: 5.72 mm), and for wire with a specified yield strength, exceeding 410 MPa, shall be the stress corresponding to a strain of 0.35 percent.

Welded deformed steel wire fabric conforming to ASTM A497/A497M may be used; for a wire with specified yield strength exceeding 410 MPa, shall be the stress corresponding to a strain of 0.35 percent. Welded intersections shall not be spaced farther apart than 400 mm in direction of calculated stress, except for wire fabric used as stirrups.

(b) Plain Reinforcement: Plain reinforcement shall conform to the following BDS and ASTM Standards. BDS ISO 6935-1:2010; ASTM A615/A615M; ASTM A996/A996M and ASTM A996/A996M. Steel welded wire, fabric plain reinforcement conforming to ASTM A185/A185M may be used, except that for wire with specified yield strength exceeding 410 MPa, shall be the stress corresponding to a strain of 0.35 percent. Welded intersections shall not be spaced farther apart than 300 mm in direction of calculated stress, except for wire fabric used as stirrups.

Smooth steel wire conforming to ASTM A182/A182M may be used in concrete; except that for a wire with specified yield strength exceeding 410 MPa, shall be the stress corresponding to a strain of 0.35 percent.

(c) Cold-worked Steel Reinforcement: Cold-worked steel high strength bars shall conform to IS 1786 or BS 4461: 1978.

(d) Pre-stressing Tendons: Wire, strands and bars for tendons in pre-stressed concrete shall conform to BDS: 240 Plain cold drawn steel wire; ASTM A416/A416M Steel Strand Uncoated Seven-Wire Stress Relieved; ASTM A421/A421M: Uncoated Stress Relieved Steel Wire; and ASTM A722/A722M: Uncoated High-Strength

Steel Bar.

Wires, strands and bars not specifically listed in the above standards may be used, provided they conform to minimum requirements of these specifications and do not have properties that make them less satisfactory than those listed.

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(e) Structural Steel, Steel Pipe or Tubing: Structural steel used with reinforcing bars in composite compression members meeting the requirements of the Code shall conform to ASTM A36/A36M Structural Steel; ASTM A242/A242M High Strength Low-Alloy Structural Steel; ASTM A572/A572M High-Strength Low-Alloy Columbium-Vanadium Steel; and ASTM A588/A588M High-Strength Low-Alloy Structural Steel.

Steel pipe or tubing for composite compression members composed of a steel-encased concrete core meeting the requirements of this Code shall conform to ASTM A53/A53M Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless; ASTM A500/A500M Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; and ASTM A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

2.3.7 Applicable Standards

Materials used in concrete shall comply with the applicable standards listed below.

BDS 279:1963 BNBC 2015 FINAL DRAFT Specification for Abrasion of Coarse Aggregates by Use of Los Angeles Machine

(under revision).

BDS 281:1963

BDS 921:1980 Specification for Organic Impurities in Sands for Concrete (under revision).

BDS 240:1963

BDS 243:1963 Specification for Standard Sand for Testing of Cement.

BDS ISO 1920-8: 2010

Specification for Plain Cold Drawn Steel Wire for Pre-stressed Concrete.

BDS ISO 1920-9: 2010

Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.

BDS ISO 1920-10: 2011

Testing of Concrete - Part 8: Determination of Drying Shrinkage of Concrete

BDS ISO 22965-1: 2008 for Samples Prepared in the Field or in the Laboratory.

BDS ISO 22965-2: 2008

Testing of Concrete - Part 9: Determination of Creep of Concrete Cylinders in
ASTM C31/C31M Compression.

ASTM C39/C39M

Testing of Concrete - Part 10: Determination of Static Modulus of Elasticity in
ASTM C42/C42M Compression.

ASTM C78 Concrete - Part 1: Methods of Specifying and Guidance for the Specifier.

ASTM C94/C94M Concrete - Part 2: Specification of Constituent Materials, Production of
ASTM C172 Concrete and Compliance of Concrete.

ASTM C192/C192M

Standard Practice for Making and Curing Concrete Test Specimens in the Field.

ASTM C317/C317M

ASTM C496/C496M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

ASTM C617

ASTM C685/C685M Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

ASTM C989

Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

Standard Specification for Ready-Mixed Concrete.

Standard Practice for Sampling Freshly Mixed Concrete.

Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.

Standard Specification for Gypsum Concrete.

Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

Standard Practice for Capping Cylindrical Concrete Specimens.

Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

Standard Specification for Slag Cement for Use in Concrete and Mortars.

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2.3.8 Concrete Pipe and Precast Sections

Concrete pipes and precast sections shall conform to the Standards listed below:

BDS 1626:1999 BNBC 2015 FINAL DRAFT Concrete pipes (with and without) reinforcement.

ASTM C14M

Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and
ASTM C76M Culvert Pipe (Metric).

ASTM C361M Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer

ASTM C444M Pipe (Metric).

ASTM C478M

ASTM C507M Standard Specification for Reinforced Concrete Low-Head Pressure Pipe (Metric).

ASTM C654M Standard Specification for Perforated Concrete Pipe (Metric).

ASTM C655M

Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

ASTM C1433M

Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and
ASTM C858 Sewer Pipe (Metric).

ASTM C891

Standard Specification for Porous Concrete Pipe (Metric).

ASTM C913

ASTM C924M Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and
Sewer Pipe (Metric).

IS 458

IS 784 Standard Specification for Precast Reinforced Concrete Monolithic Box Sections

IS 1916 for Culverts, Storm Drains, and Sewers (Metric).

IS 3597

IS 4350 Standard Specification for Underground Precast Concrete Utility Structures.

IS 7319

IS 7322 Standard Practice for Installation of Underground Precast Concrete Utility
Structures.

Standard Specification for Precast Concrete Water and Wastewater Structures.

Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test
Method (Metric).

Specification for precast concrete pipes with and without reinforcement.

Specification for pre-stressed concrete pipes.

Specification for steel cylinder pipe with concrete lining and coating.

Methods of test for concrete pipes.

Specification for concrete porous pipes for under drainage.

Specification for perforated concrete pipes.

Specification for specials for steel cylinder reinforced concrete pipes.

2.4 PRE-STRESSED CONCRETE

2.4.1 Concrete for Pre-stressed Concrete

Cement and concrete required for pre-stressed concrete are elaborately described in Sec 2.3 of this Part. BDS and other standards for concrete as a material are also contained in the same section.

2.4.2 Steel for Pre-stressed Concrete

Steel and tendons for pre-stressed concrete along with the BDS and other standard requirements are included in Sec 2.8 of this Part.

Steel material for pre-stressed concrete shall also conform following Standards.

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BDS ISO 6934 - 1 : 2008 Steel for the prestressing of concrete - Part 1: General requirements.

BDS ISO 6934 - 2 : 2008

BDS ISO 6934 - 3 : 2008 Steel for the prestressing of concrete - Part 2: Cold-drawn wire.
BDS ISO 6934 - 4 : 2008
BDS ISO 6934- 5: 2008 Steel for the prestressing of concrete - Part 3: Quenched and tempered wire.
BDS ISO 6935 (Part-1): 2010
BDS ISO 6935 (Part-2): 2010 Steel for the prestressing of concrete - Part 4: Strand.
BDS ISO 6935 (Part-3): 2006
Steel for the Prestressing of concrete - Part 5: Hot-rolled steel bars with or
BDS ISO 10065: 2006 without subsequent processing.
BDS ISO 15835-1:2010
BDS ISO 15835-2:2010 Steel for the reinforcement of concrete - Part-1: Plain bars.
BDS ISO 10144:2006
BDS ISO 15630-1: 2008 Steel for the reinforcement of concrete - Part-2: Ribbed bars.
BDS ISO 15630-2: 2008
BDS ISO 15630-3: 2008 Steel for the reinforcement of concrete - Part-3: Welded fabric. Specifies
BDS ISO 16020: 2008 technical requirements for factory made sheets or rolls welded fabric
manufacture from steel wires or bars with diameters from 4 mm to 16 mm
and designed for reinforcement in ordinary concrete structured and for non-
prestressed reinforcement in prestressed concrete structures.

Steel bars reinforcement of concrete bend and re-bend tests.

Steel for the reinforcement of concrete - Reinforcement couplers for
mechanical splices of bars - Part 1: Requirements.

Steel for the reinforcement of concrete - Reinforcement couplers for
mechanical splices of bars - Part 2: Test methods.

Certification scheme for steel bars and wires for the reinforcement of
concrete structures.

Steel for the reinforcement and Prestressing of concrete - Test methods - Part
1: Reinforcing bars, wire rod and wire.

Steel for the reinforcement and prestressing of concrete - Test methods - Part
2: Welded fabric.

Steel for the Reinforcement and prestressing of concrete - Test methods - Part
3: Prestressing steel.

Steel for the reinforcement and prestressing of concrete - Vocabulary.

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2.5 BUILDING LIMES

2.5.1 Types of Lime

According to the degree of calcinations, slaking and setting actions and depending upon the nature and amount of foreign matters associated with, the limes are classified as: (i) High calcium, fat, rich, common or pure lime; (ii) Lean, meager or poor lime; and (iii) Hydraulic or water lime

2.5.2 Properties of Lime

A good lime should slake readily in water, dissolve in soft water, free from fuel ashes and unburnt particles and have good setting power under water.

Building limes shall comply with the following ASTM standard specifications: ASTM C206 Finishing Hydrated Lime; ASTM C207 Hydrated Lime for Masonry Purposes; ASTM C141/C141M Hydraulic Hydrated Lime for Structural Purposes; ASTM C977 Quicklime and Hydrated Lime for Soil Stabilization; and ASTM C5 Quicklime for Structural Purposes.

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The following Indian Standards may also be accepted for lime concrete and testing of building limes:

IS712 Specification for building limes.

IS1624 Method of field testing of building lime.

IS 2686 Specification for cinder aggregates for use in lime concrete.

IS 3068 Specification for broken brick (burnt clay) coarse aggregates for use in lime concrete.

IS 3115 Specification for lime-based blocks.

IS 3182 Specification for broken brick (burnt clay) fine aggregates for use in lime mortar.

IS 4098 Specification for lime-pozzolana mixture.

IS 4139 Specification for sand-lime bricks.

IS 6932(Parts I to XI) Method of tests for building limes.

IS 10360 Specification for lime-pozzolana concrete blocks for paving.

IS 10772 Specification for quick setting lime pozzolana mixture.

IS12894 Specification for pulverized fuel ash lime bricks.

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2.6 GYPSUM BASED MATERIALS AND PLASTER

2.6.1 Gypsum Board

Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, pre-decorated gypsum board or water resistant gypsum backing board complying with the standards listed below.

2.6.2 Gypsum Plaster

A mixture of calcined gypsum or calcined gypsum and lime and aggregate and other approved materials as specified in this Code.

2.6.3 Gypsum Veneer Plaster

Gypsum plaster applied to an approved base in one or more coats normally not exceeding 1/4 inch (6.4 mm) in total thickness.

2.6.4 Cement Plaster

A mixture of Portland or blended cement, Portland cement or blended cement and hydrated lime, masonry cement or plastic cement and aggregate and other approved materials as specified in this Code.

Gypsum building materials shall conform to the Standards listed below.

ASTM C22/C22M Standard Specification for Gypsum.

ASTM C28/C28M Standard Specification for Gypsum Plasters.

ASTM C35 Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster.

ASTM C59/C59M Standard Specification for Gypsum Casting Plaster and Gypsum Molding Plaster.
ASTM C317/C317M Standard Specification for Gypsum Concrete.
ASTM C471M Standard Test Methods for Chemical Analysis of Gypsum and Gypsum Products.
ASTM C472 Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.

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ASTM C474 Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction.
ASTM C587
ASTM C1396/C1396M Standard Specification for Gypsum Veneer Plaster.
IS 2849-1983
Standard Specification for Gypsum Board.

Specification for non-load bearing gypsum partition blocks (solid and hollow types).

2.7 FLOORING MATERIALSBNBC 2015 FINAL DRAFT

2.7.1 General

Flooring materials are generally of two types; precast systems like tiles, bricks and cast in-situ.

2.7.2 Concrete/Terrazzo Tiles

Concrete/Terrazzo tiles shall have good abrasion and impact resistance properties. Factors such as the type of cement and the type and grading of aggregate used, influence the resistance of such tiles to chemicals including cleaning agents. Terrazzo tiles shall have a wear layer after grinding at least 6 mm composed of graded marble chipping in white, tinted or grey Portland cement on a layer of fine concrete. They may be ground after manufacture to expose the marble aggregate and subsequently grouted. Slip resisting grits may be incorporated. These tiles shall conform to BDS EN 13748-1:2008 Terrazzo tiles - Part 1: Terrazzo tiles for internal use; BDS EN 13748-2:2008 Terrazzo tiles - Part 2: Terrazzo tiles for external use; BDS 1262: 1990 Clay flooring tiles; BDS 1248: 1989 Ceramic unglazed vitreous acid resistant tiles or IS: 1237, Specification for cement concrete flooring tile.

2.7.3 Asphalt Tiles/Flooring

Asphalt tiles/floorings are suitable for industrial flooring in areas where they will not be exposed to solvents, grease, oil, corrosive chemicals and excessive heat. Bitumen mastic for flooring shall conform to IS: 1195; IS: 8374 Bitumen Mastic, Anti-static and Electrically Conducting Grade and IS: 9510 Bitumen Mastic Acid Resisting Grade.

2.7.4 Mosaic Tiles

Mosaic tiles of a variety of shapes and sizes may be used. Thickness of the wear layer is dependent on the sizes of marble chips but shall not be less than 6 mm thick. The tiles shall be wet cured for sufficient time before laying so that their surfaces are not damaged during grinding and polishing.

2.7.5 Clay Tile

Clay floor tiles shall have sufficient strength and abrasion resistant characteristics to withstand the impact and abrasion they are likely to be subject to. When glazed earthenware tiles are used in flooring they shall conform to IS: 777 Glazed Earthenware Tiles.

2.7.6 Vinyl Tiles

The vinyl tiles shall consist of a thoroughly blended composition of thermoplastic binder, asbestos fibre, fillers and pigments. The thermoplastic binder shall consist substantially of either or both of the following:

- (a) Vinyl chloride polymer
- (b) Vinyl chloride copolymers.

The polymeric material shall be compounded with suitable plasticizers and stabilizers. The tiles may be plain, patterned or mottled. The thickness shall not be less than 1.5 mm.

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2.7.7 Rubber Tiles

These tiles are composed of natural, synthetic or reclaimed rubber, or a combination of these, with reinforcing fibres, pigments, and fillers, vulcanized and molded under pressure. The tiles shall have excellent resilience and resistance to indentation, and good resistance to grease, alkali and abrasion. The thickness shall not be less than 2 mm.

2.7.8 Cast In-situ Floor Coverings

(a) Terrazzo: Terrazzo is a marble mosaic with Portland cement matrix and is generally composed of two parts marble chips to one part Portland cement. Color pigments may be added. The thickness of terrazzo topping may vary from 13 mm to 19 mm and may be applied to green concrete of the floor or bonded with neat Portland cement, or over a sand cushion placed on the concrete floor.

(b) Concrete: A concrete topping may be applied to a concrete structural slab before or after the base slab has hardened. Integral toppings may generally be 25 mm to 40 mm thick; independent toppings about 25 mm to 50 mm thick. Aggregate sizes shall not exceed 6 mm.

2.7.9 Other Flooring Materials

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Other flooring materials i.e. bricks, natural stone, etc. showing satisfactory performance in similar situations may be allowed. Plastic flooring tile and ceramic unglazed vitreous acid resistant tiles, if used, shall conform to IS: 3464 and IS: 4357 respectively.

Flooring compositions complying with IS: 657, Materials for use in the manufacture of magnesium oxychloride flooring composition; and IS: 9197, Epoxy resin composition for floor topping may be allowed. Linoleum sheets and tiles shall conform to IS: 653.

Flooring materials shall also conform to the standards listed below.

BDS 1248: 1989 Ceramic unglazed vitreous acid resistant tiles set covers the requirements for
BDS 1262: 1990 ceramic unglazed vitreous acid resistant tiles used in laying of floors & lining of
BDS ISO 10545 - 1: 2006 tanks subjected to corrosive conditions. Manufacture, Finish, Tests etc.
BDS ISO 10545 - 2: 2006
Clay flooring tiles.
BDS ISO 10545 - 3: 2006 Specifies the requirements for dimensions, quality & strength for clay flooring
tiles & different types of tests.

Ceramic tiles, Sampling and basis for acceptance.
Specifies rules for batching, sampling, inspection and acceptance/rejection of
ceramic tiles.

Ceramic tiles, Determination of dimensions and surface quality.
Specifies methods for determining the dimensional characteristics (length,
width, thickness, straightness of sides, rectangularity, and surface flatness) and
the surface of ceramic tiles.

Ceramic tiles, Determination of water absorption, apparent porosity, apparent
relative density and bulk density.

BDS ISO 10545 - 4: 2006 Specifies methods for determining water absorption, apparent porosity,
BDS ISO 10545 - 5: 2005 apparent relative density and bulk density of ceramic tiles.

Ceramic tiles, Determination of modulus of rupture and breaking strength

Defines a test method for determining the modulus of rupture and breaking
strength of all ceramic tiles.

Ceramic tiles, Determination of impact resistance by measurement of coefficient
of restitution

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BDS ISO 10545 - 6: 2006 BNBC 2015 FINAL DRAFT Specifies methods for determining the impact resistance of ceramic
tiles by

BDS ISO 10545 - 7: 2006 measuring the coefficient of restitution.

BDS ISO 10545 - 8: 2006

BDS ISO 10545 - 9: 2006 Ceramic tiles, Determination of resistance to deep abrasion for unglazed tiles.

BDS ISO 10545 - 10: 2006

BDS ISO 10545 - 11: 2006 Ceramic tiles, Determination of resistance to surface abrasion for glazed tiles.

BDS ISO 10545 - 12: 2006 Specifies a method for determining the resistance to surface abrasion of all

BDS ISO 10545 - 13: 2006 glazed ceramic tiles used for floor covering.

BDS ISO 10545 - 14: 2006

BDS ISO 10545 - 15: 2006 Ceramic tiles, Determination of linear thermal expansion

BDS ISO 10545 - 16: 2006

Defines a test method for determining the coefficient of linear thermal

BDS EN 490: 2008 expansion of ceramic tiles.

BDS ISO 13006: 2006

Ceramic tiles, Determination of resistance to thermal shock.

BDS EN 491: 2008

Defines a test method for determining the resistance to thermal shock of all ceramic tiles under normal conditions of use.

Ceramic tiles, Determination of moisture expansion.

Specifies a method for determining the moisture expansion of all ceramic tiles.

Ceramic tiles, Determination of crazing resistance for glazed tiles.

Defines a test method for determining the crazing resistance of all glazed ceramic tiles except when the crazing is an inherent decorative feature of the product.

Ceramic tiles, Determination of frost resistance.

Specifies a method for determining the frost resistance of all ceramic tiles intended for use in freezing conditions in the presence of water.

Ceramic tiles, Determination of chemical resistance.

Specifies a test method for determining the chemical resistance of all ceramic tiles at room temperature. The method is applicable to all types of ceramic tiles.

Ceramic tiles, Determination of resistance to stains.

Specifies a method for determining the resistance to stains of the proper surface of ceramic tiles.

Ceramic tiles, Determination of lead and cadmium given off by glazed tiles.

Specifies a method for the determination of lead and cadmium given off by the glaze of ceramic tiles.

Ceramic tiles, Determination of small color differences.

Describes a method for utilizing color measuring instruments for quantifying the small color differences between plain colored glazed ceramic tiles, which are designed to be uniform and consistent color. It permits the specification of a maximum acceptable value which depends only on the closeness of match and not on the nature of the color difference.

Concrete roofing tiles and fittings for roof covering and all cladding - Product specifications.

Ceramic tiles - Definitions, classification, characteristics and marking.

This Standard defines terms and establishes classifications characteristics and marking requirements for ceramic tiles of the best commercial quality (first quality).

Concrete roofing tiles and fittings for roof covering and wall cladding - Test methods.

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BDS EN 538: 2008 Clay roofing tiles for discontinuous laying - Flexural strength test.

BDS EN 539 - 1: 2008

Clay roofing tiles for discontinuous laying. Determination of physical

BDS EN 1024: 2008 characteristics - Part 1: Impermeability test.

BDS EN 1304: 2008 Clay roofing tiles for discontinuous laying - Determination of geometric

BDS EN 13748 - 1: 2008 characteristics.

BDS EN 13748 - 2: 2008

Clay roofing tiles and fittings - Product definitions and specifications.

Terrazzo tiles - Part 1: Terrazzo tiles for internal use.

Terrazzo tiles - Part 2: Terrazzo tiles for external use.

2.8 STEEL

2.8.1 Reinforcing Steel

Reinforcing steel shall comply with the requirements specified in Sec 2.3.6 in this Part.

2.8.2 Structural Steel

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Structural steel shall conform to Bangladesh Standards BDS 878: 1978, Specification for weld able structural steels; BDS 1355: 1992, Dimensions and properties of hot rolled steel beam, column, channel and angle sections. Where Bangladesh standards are not available, the relevant standards listed below shall be applicable.

BDS 1429:1993 Light gauge steel sections.

BDS ISO 2566 - 1

BDS ISO 2566 - 2 Steel - Conversion of elongation values - Part 1: Carbon and low alloy steels.

BDS ISO 657 - 1

BDS ISO 657 - 2 Steel - Conversion of elongation values - Part 2: Austenitic steels.

BDS ISO 657 - 5

Hot-rolled steel sections - Part 1: Equal-leg angles - Dimensions.

BDS ISO 657 - 11

Hot-rolled steel sections - Part 2: Unequal-leg angles - Dimensions.

BDS ISO 657 - 15

Hot-rolled steel sections - Part V Equal-leg angles and unequal leg angles -

BDS ISO 657 - 16 Tolerances for metric and inch series.

BDS ISO 657 - 18 Hot-rolled steel sections - Part 11: Sloping flange channel sections (Metric series) - Dimensions and sectional properties.

BDS ISO 657 - 19

Hot-rolled steel sections - Part 15 Sloping flange beam sections (Metric series) -

BDS ISO 657 - 21 Dimensions and sectional properties.

BDS ISO 10474 Hot-rolled steel sections - Part 16: Sloping flange column sections (metric series) -

BDS ISO 14284 Dimensions and sectional properties.

BDS ISO 9769 Hot-rolled steel sections - Part 18: L sections for shipbuilding (metric series) 104 -
BDS ISO 6929 Dimensions, sectional properties and tolerances.

BDS ISO 20723

Hot-rolled steel sections - Part 19: Bulb flats (metric series) - Dimensions, sectional
properties and tolerances.

Hot-rolled steel sections - Part 21 T-sections with equal depth and flange width -
Dimensions.

Steel and steel products - Inspection documents.

Steel and iron - Sampling and preparation of samples for the determination of
chemical composition.

Steel and iron - Review of available methods of analysis.

Steel products - Definition and classification.

Structural steels - Surface condition of hot-rolled sections - Delivery requirements.

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BDS ISO 24314 BNBC 2015 FINAL DRAFT Structural steels - Structural steels for building with improved seismic
resistance -

Technical delivery conditions.

BDS ISO 404

BDS ISO 1127 Steel and steel products - General technical delivery requirements.

BDS ISO 4200 Stainless steel tubes - Dimensions, tolerances and conventional masses per unit
length.

BDS ISO 6761

ASTM A27/A27M Plain end steel tubes, welded and seamless - General tables of dimensions and
ASTM A36/A36M masses per unit length.

ASTM A48/A48M

ASTM A53/A53M Steel tubes - Preparation of ends of tubes and fittings for welding.

ASTM A148/A148M Standard Specification for Steel Castings, Carbon, for General Application.

ASTM A242/A242M

ASTM A252 Standard Specification for Carbon Structural Steel.

ASTM A283/A283M

Standard Specification for Gray Iron Castings.

ASTM A307

ASTM A325 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded
and Seamless.

ASTM A325M

Standard Specification for Steel Castings, High Strength, for Structural Purposes.

ASTM A336/A336M

Standard Specification for High-Strength Low-Alloy Structural Steel.

ASTM A653/A653M

Standard Specification for Welded and Seamless Steel Pipe Piles.

ASTM A449

Standard Specification for Low and Intermediate Tensile Strength Carbon Steel

ASTM A490 Plates.

ASTM A500/A500M Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

ASTM A501 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi
Minimum Tensile Strength.

ASTM A514/A514M

Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum

ASTM A529/A529M Tensile Strength [Metric].

ASTM A563 Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature

ASTM A563M Parts.

ASTM A1011/A1011M

Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-
Coated (Galvannealed) by the Hot-Dip Process.

Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated,
120/105/90 ksi Minimum Tensile Strength, General Use.

Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi
Minimum Tensile Strength.

Standard Specification for Cold-Formed Welded and Seamless Carbon Steel
Structural Tubing in Rounds and Shapes.

Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural
Tubing.

Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel
Plate, Suitable for Welding.

Standard Specification for High-Strength Carbon-Manganese Steel of Structural
Quality.

Standard Specification for Carbons and Alloy Steel Nuts.

Standard Specification for Carbon and Alloy Steel Nuts [Metric].

Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and
Ultra-High Strength.

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ASTM A572/A572M Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural
ASTM A588/A588M Steel.

ASTM A606/A606M

ASTM A1008/A1008M Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance.

ASTM A618/A618M

ASTM A666 Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-

ASTM A668/A668M Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.

ASTM A690/A690M

Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-

ASTM A852/A852M Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Harden able.

Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.

Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments.

Standard Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi [485 MPa] Minimum Yield Strength to 4 in. [100 mm] Thick.

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2.8.3 Steel Plate, Sheet and Strips

These shall conform to the following standards.

BDS 868 : 1978 Code of practice for galvanized corrugated sheet roof and wall coverings.

BDS 1122: 1985

BDS ISO 9328 - 1:2009 Specification for hot-dip galvanized steel sheet and coil.

BDS ISO 9328 - 2:2009 Steel flat products for pressure purposes - Technical delivery conditions - Part 1: general requirements.

BDS ISO 9328 - 3:2009

Steel flat products for pressure purposes - Technical delivery conditions - Part 2:

BDS ISO 9328 - 4:2009 Non-alloy and alloy steels with specified elevated temperature properties.

BDS ISO 9328 - 5:2009 Steel flat products for pressure purposes - Technical delivery conditions -Part 3: Weldable fine grain steels, normalized.

BDS ISO 9328 - 6:2009

Steel flat products for pressure purposes - Technical delivery conditions - Part 4:

BDS ISO 9328 - 7:2009 Nickel-alloy steels with specified low temperature properties.

BDS ISO 4995:2006 Steel flat products for pressure purposes - Technical delivery conditions - Part 5:

BDS ISO 7452:2008 Weldable fine grain steels, thermo mechanically rolled.

BDS ISO 7778:2008

BDS ISO 7788:2008 Steel flat products for pressure purposes - Technical delivery conditions - Part 6:

BDS ISO 9034:2008 Weldable fine grain steels, quenched and tempered.

Steel flat products for pressure purposes - Technical delivery conditions - Part 7:

Stainless steels.

Hot-rolled steel sheet of structural quality.

Hot-rolled structural steel plates - Tolerances on dimensions and shape.

Steel plate with specified through - Thickness characteristics.

Steel - Surface finish of hot-rolled plates and wide flats - Delivery requirements.

Hot-rolled structural steel wide flats - Tolerances on dimensions and shape.

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BDS ISO 9364:2011 Continuous hot-dip aluminum/zinc coated steel sheet of commercial, drawing and structural qualities.

BDS ISO 16160:2011

BDS ISO 16162:2011 Continuously hot-rolled steel sheet products - Dimensional and shape tolerances.

BDS ISO 16163:2011

Continuously cold-rolled steel sheet products - Dimensional and shape tolerances.

IS 412

IS 1079 Continuously hot-dipped coated steel sheet products - Dimensional and shape

IS 4030 tolerances.

IS 7226

Specification for expanded metal steel sheets for general purposes.

IS 3502

ASTM A109/A109M Specification for hot rolled carbon steel sheet and strip.

ASTM A123/A123M

Specification for cold-rolled carbon steel strip for general engineering purposes.

ASTM A167

Specification for cold-rolled medium, high carbon and low-alloy steel strip for

ASTM A176 general engineering purposes.

ASTM A240/A240M Specification for steel chequered plates.

Standard Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled.

Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.

Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

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ASTM A263 Standard Specification for Stainless Chromium Steel-Clad Plate.

ASTM A264

ASTM A285/A285M Specification for Stainless Chromium-Nickel Steel-Clad Plate.

ASTM A328/A328M Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and
ASTM A1008/A1008M Intermediate-Tensile Strength.

ASTM A414/A414M Standard Specification for Steel Sheet Piling.

ASTM A424/A424M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-
ASTM A929/A929M Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution
Hardened, and Bake Harden able.

ASTM A463/A463M

ASTM A480/A480M Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy for
Pressure Vessels.

ASTM A505

Standard Specification for Steel, Sheet, for Porcelain Enameling.

ASTM A506

Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for
ASTM A507 Corrugated Steel Pipe.

Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process.

Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-
Resisting Steel Plate, Sheet, and Strip.

Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled,
General Requirements for.

Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-
Rolled and Cold-Rolled.

Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-
Rolled.

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ASTM A568/A568M Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-
ASTM A577/A577M Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

ASTM A578/A578M

ASTM A879/A879M Standard Specification for Ultrasonic Angle-Beam Examination of Steel Plates.

ASTM A599/A599M

ASTM A606/A606M Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel
ASTM A635/A635M Plates for Special Applications.

ASTM A653/A653M Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for
ASTM A666 Applications Requiring Designation of the Coating Mass on Each Surface.

ASTM A690/A690M

Standard Specification for Tin Mill Products, Electrolytic Tin-Coated, Cold-Rolled

ASTM A775/A775M Sheet.

ASTM A792/A792M

ASTM A857/A857M Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-

ASTM A875/A875M Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.

Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled,
Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with
Improved Formability, General Requirements for.

Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-
Coated (Galvannealed) by the Hot-Dip Process.

Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet,
Strip, Plate, and Flat Bar.

Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel
H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine
Environments.

Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-
Dip Process.

Standard Specification for Steel Sheet Piling, Cold Formed, Light Gage.

Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-
Dip Process.

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2.8.4 Steel Pipe, Tube and Fittings

These items shall conform to the following Standards:

BDS ISO 49:2008 Malleable cast iron fittings threaded to ISO 7-1.

BDS ISO 3419: 2008

BDS ISO 3545 - 3: 2008 Non - alloy and alloy steel butt-welding fittings.

BDS ISO 4144: 2008 Steel tubes and fittings - Symbols for use in specifications - Part 3: Tubular fittings

BDS ISO 4145: 2008 with circular cross-section.

BDS ISO 5251: 2008

ASTM A53/A53M Pipe work - Stainless steel fittings threaded in accordance with ISO 7-1.

ASTM A105/A105M Non-alloy steel fittings threaded to ISO 7-1.

ASTM A106/A106M

Stainless steel butt-welding fittings.

ASTM A134

Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded
and Seamless.

Standard Specification for Carbon Steel Forgings for Piping Applications.

Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

Standard Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over).

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Part 5 BNBC 2015 FINAL DRAFT Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over).
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Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

ASTM A139/A139M

ASTM A181/A181M Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges,

ASTM A182/A182M Forged Fittings, and Valves and Parts for High-Temperature Service.

ASTM A234/A234M Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASTM A252

ASTM A254 Standard Specification for Welded and Seamless Steel Pipe Piles.

ASTM A268/A268M

Standard Specification for Copper-Brazed Steel Tubing.

ASTM A269

Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless

ASTM A270 Steel Tubing for General Service.

ASTM A312/A312M Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

ASTM A333/A333M

Standard Specification for Seamless and Welded Austenitic Stainless Steel Sanitary

ASTM A334/A334M Tubing.

ASTM A403/A403M Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic

ASTM A420/A420M Stainless Steel Pipes.

ASTM A423/A423M Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature

ASTM A450/A450M Service.

ASTM A500/A500M Standard Specification for Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service.

ASTM A50

Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.

ASTM A522/A522M

Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel

ASTM A524 for Low-Temperature Service.

ASTM A530/A530M Standard Specification for Seamless and Electric-Welded Low-Alloy Steel Tubes.

ASTM A589/A589M Standard Specification for General Requirements for Carbon and Low Alloy Steel

ASTM A618/A618M Tubes.

ASTM A632 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel

Structural Tubing in Rounds and Shapes.

ASTM A707/A707M

Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

Standard Specification for Forged or Rolled 8 and 9% Nickel Alloy Steel Flanges, Fittings, Valves, and Parts for Low-Temperature Service.

Standard Specification for Seamless Carbon Steel Pipe for Atmospheric and Lower Temperatures.

Standard Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe.

Standard Specification for Seamless and Welded Carbon Steel Water-Well Pipe.

Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.

Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service.

Standard Specification for Forged Carbon and Alloy Steel Flanges for Low-Temperature Service.

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ASTM A733 Standard Specification for Welded and Seamless Carbon Steel and Austenitic

ASTM A778 Stainless Steel Pipe Nipples.

ASTM A807/A807M

ASTM A865/A865M Standard Specification for Welded, Un-annealed Austenitic Stainless Steel Tubular Products.

Standard Practice for Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications.

Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.

2.8.5 Steel Bars, Wire and Wire Rods

These shall conform to the following Standards.

BDS ISO 1035 - 1: 2006BNBC 2015 FINAL DRAFT Hot-rolled steel bars-Part 1: Dimensions of round bars.

BDS ISO 1035 - 2: 2006

BDS ISO 1035 - 3: 2006 Hot-rolled steel bars-Part 2: Dimensions of square bars.

BDS ISO 1035 - 4: 2006

BDS ISO 4951 - 1: 2008 Hot-rolled steel bars-Part 3: Dimensions of flat bars.

BDS ISO 4951 - 2: 2008

Hot-rolled steel bars-Part 4: Tolerances.

BDS ISO 4951 - 3: 2008

High yield strength steel bars and sections - Part 1: General delivery requirements.

ASTM A29/A29M

High yield strength steel bars and sections - Part 2: Delivery conditions for

ASTM A49 normalized, normalized rolled and as-rolled steels.

ASTM A108 High yield strength steel bars and sections - Part 3: Delivery conditions for thermo

ASTM A116 mechanically-rolled steels.

ASTM A185/A185M

ASTM A227/A227M Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General

ASTM A228/A228M Requirements for.

ASTM A229/A229M

ASTM A276 Standard Specification for Heat-Treated Carbon Steel Joint Bars, Micro alloyed Joint

ASTM A311/A311M Bars, and Forged Carbon Steel Compromise Joint Bars.

ASTM A322 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

ASTM A108

ASTM A368 Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric.

ASTM A434

Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

ASTM A475

ASTM A478 Standard Specification for Steel Wire, Cold-Drawn for Mechanical Springs.

ASTM A479/A479M Standard Specification for Steel Wire, Music Spring Quality.

Standard Specification for Steel Wire, Oil-Tempered for Mechanical Springs.

Standard Specification for Stainless Steel Bars and Shapes.

Standard Specification for Cold-Drawn, Stress-Relieved Carbon Steel Bars Subject to Mechanical Property Requirements.

Standard Specification for Steel Bars, Alloy, Standard Grades.

Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

Standard Specification for Stainless Steel Wire Strand.

Standard Specification for Steel Bars, Alloy, Hot-Wrought or Cold-Finished, Quenched and Tempered.

Standard Specification for Zinc-Coated Steel Wire Strand.

Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire.

Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.

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ASTM A492 Standard Specification for Stainless Steel Rope Wire.

ASTM A499

ASTM A510 Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails.

ASTM A575 Standard Specification for General Requirements for Wire Rods and Coarse Round

ASTM A576 Wire, Carbon Steel.

ASTM A580/A580M

ASTM A586 Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

ASTM A603 Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.

ASTM A627

Standard Specification for Stainless Steel Wire.

ASTM A663/A663M

Standard Specification for Zinc-Coated Parallel and Helical Steel Wire Structural

ASTM A666 Strand.

ASTM A706/A706M Standard Specification for Zinc-Coated Steel Structural Wire Rope.

ASTM A764 Standard Test Methods for Tool-Resisting Steel Bars, Flats, and Shapes for Detention and Correctional Facilities.

ASTM C933

Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.

Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

Standard Specification for Metallic Coated Carbon Steel Wire, Coated at Size and Drawn to Size for Mechanical Springs.

Standard Specification for Welded Wire Lath.

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2.8.6 Steel Fasteners

Steel fasteners shall conform to the following Standards:

BDS 1373 : 1992 Slotted countersunk flat head tapping screws.

BDS 1374 : 1992 Slotted raised counter.

BDS 1375 : 1992 Fasteners hexagon products widths across flats.

BDS 1405: 1993 Bolts, screws, nuts and accessories terminology and nomenclature.

BDS 1406: 1993 Hexagon nuts style 2 products grades A and B.

BDS 1407: 1993 Hexagon nuts style 3 products grades A and B.

BDS 1408: 1993 General purpose screw threads general plan.

BDS 1409: 1993 General purpose screw threads selected sizes for screws, bolts and nuts.

BDS 1410: 1993 Thread run-outs for fasteners thread of BDS 1408: 1995 and BDS 1409: 1993.

BDS 1411: 1993 Tapping screws thread.

BDS 1412: 1993 Thread undercuts of external metric thread fasteners.

BDS 1413: 1993 Head configuration and gauging of countersunk head screws.

BDS 1428: 1993 Fasteners-bolts, screws, studs and nuts-symbols and designations of dimensions.

ASTM A31 Standard Specification for Steel Rivets and Bars for Rivets, Pressure Vessels.

ASTM A183 Standard Specification for Carbon Steel Track Bolts and Nuts.

ASTM A193/A193M Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High

Temperature or High Pressure Service and Other Special Purpose Applications.

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ASTM A194/A194M BNBC 2015 FINAL DRAFT Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or

High Temperature Service, or Both.

ASTM A307

ASTM A320/A320M Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength.

ASTM A325 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.

ASTM A354

Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi

ASTM A437/A437M Minimum Tensile Strength.

ASTM A449 Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.

ASTM A489

ASTM A490 Standard Specification for Stainless and Alloy-Steel Turbine-Type Bolting Specially Heat Treated for High-Temperature Service.

ASTM A502

ASTM A540/A540M Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated,

ASTM A563 120/105/90 ksi Minimum Tensile Strength, General Use.

ASTM A574

ASTM C514 Standard Specification for Carbon Steel Lifting Eyes.

ASTM C954

Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi

ASTM C955 Minimum Tensile Strength.

ASTM C1002 Standard Specification for Rivets, Steel, Structural.

ASTM F436 Standard Specification for Alloy-Steel Bolting for Special Applications.

ASTM F593

ASTM F594 Standard Specification for Carbons and Alloy Steel Nuts.

ASTM F844

ASTM F959 Standard Specification for Alloy Steel Socket-Head Cap Screws.

Standard Specification for Nails for the Application of Gypsum Board.

Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

Standard Specification for Hardened Steel Washers.

Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

Standard Specification for Stainless Steel Nuts.

Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

2.8.7 Welding Electrodes and Wires

Welding electrodes and wires shall conform to the following Standards:

BDS 239: 1963 Specification for soft solder.

BDS 1442 - 1: 1994 Filler rods and wire for gas shielded arc-welding-ferric steel.

BDS 1442 - 2: 1994 Filler rods and wire for gas shielded arc-welding-austenitic stainless steel.

BDS 1442 - 3: 1994 Filler rods and wires for gas shielded arc welding-copper and copper alloy.

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Part 5 BNBC 2015 FINAL DRAFT Filler rods and wires for gas shielded arc welding-aluminum and aluminum alloy and Building Materials magnesium alloys.

BDS 1442 - 4: 1994 Filler rods and wires for gas shielded arc welding-nickel and nickel alloys.

BDS 1442 - 5: 1994

IS 814 Specification for covered electrodes for manual metal arc welding of carbon and IS 815 carbon manganese steel.

IS 1278

IS 1395 Classification and coding of covered electrodes for metal arc welding of structural IS 3613 steels.

IS 4972

IS 6419 Specification for filler rods and wires for gas welding.

IS 6560

IS 7280 Specification for low and medium alloy steel covered electrodes for manual metal

IS 8363 arc welding.

ISO 9453

ISO 9454 Acceptance tests for wire flux combinations for submerged-arc welding of structural steel.

ISO 9455-1

Specification for resistance spot-welding electrodes.

ISO 9455-8

Specification for welding rods and bare electrodes for gas shielded arc welding of

ISO 9455-11 structural steel.

ISO 9455-14 Specification for molybdenum and chromium-molybdenum low alloy steel welding rods and bare electrodes for gas shielded arc welding.

Specification for base wire electrodes for submerged-arc welding of structural steels.

Specification for bare wire electrodes for electro slag welding of steels.

Soft solder alloys-chemical compositions and forms.

Soft soldering fluxes-classification and requirements.

Part 1: Classification, labeling and packaging.

Soft soldering fluxes- test methods.

Part 1: Determination of non-volatile matter, gravimetric method.

Soft soldering fluxes-test methods.

Part 8: Determination of zinc content.

Soft soldering fluxes-test methods.

Part 11: Solubility of flux residues.

Soft soldering fluxes-test methods.

Part 14: Assessment of tackiness of flux residues.

2.9 TIMBER & WOOD PRODUCTS

2.9.1 Timber Types and Properties

Timber types for the structural purpose with their engineering characteristics are contained in Table 6.11.1 Part 6 of this Code. Details of the uses of timber in structures or elements of structures including terminology, material requirements, and moisture content preferred cut sizes of sawn timbers, grading, permissible defects, suitability in respect of durability and treatability, design criteria, and details of joints are also given in Chapter 11 Part 6. Timber and timber constructions shall satisfy the requirements of that Chapter and conform to the following Standards:

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BDS 142: 1961 Specification for wood doors.

BDS 173: 1962 Specification for wood windows.

BDS 230: 1962 Glossary of terms applicable to timber, plywood and joinery.

BDS 803:1973 Trade names and abbreviated symbols for timber species.

BDS 819:1975 Code of practice for preservation of timber.

BDS 820:1978 Recommendation for maximum permissible moisture content of timber used for different purposes in Bangladesh.

BDS 857:1977 Specification for grading rules for logs and sawn timbers.

BDS 1090:1984 Methods of test for plywood.

BDS 1256:1990 Classification of commercial timber.

BDS 1311:1990 Key for identification of commercial timber.

2.9.2 Plywood

A wood structural panel comprised of plies of wood veneer arranged in cross-aligned layers. The plies are bonded with waterproof adhesive that cures on application of heat and pressure.

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Plywood shall conform to the following Standards:

BDS 799: 1983 Specification for plywood for general purposes.

BDS 1158: 1986 Specification for veneered decorative plywood.

For sampling and testing of plywood, the following Standards are applicable:

BDS 1087: 1984 Specification for method of sampling of plywood.

BDS 1090: 1984 Methods of test of plywood.

IS 4990 Specification for plywood for concrete shattering work.

IS 5509 Specification for fire retardant plywood.

IS 5539 Specification for Preservative Treated Plywood.

2.9.3 Particle Boards and Fibre Boards

A panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers. The cellulosic material is combined with synthetic resin or other suitable bonding system by a process in which the inter-particle bond is created by the bonding system under heat and pressure.

Fiber boards are fibrous, homogeneous panel made from lingo-cellulosic fibers (usually wood or cane) and having a density of less than 497 kg per cubic meter but more than 160 kg per cubic meter.

These materials shall conform to the following standards:

BDS 619:1967 Specification for particle board (medium density).

BDS 620:1967 Specification for hardboard.

BDS EN 316:2008 Wood fiberboards - Definition, classification and symbols.

ISO 820 Particle boards - Definition and classification.

ISO 821 Particle boards - Determination of dimensions of test pieces.

ISO 822 Particle boards - Determination of density.

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ISO 823 Particle boards - Determination of moisture content.

ISO 766 Fibre building boards - Determination of dimensions of test pieces.

ISO 767 Fibre building boards - Determination of moisture content.

ISO 768 Fibre building boards - Determination of bending strength.

ISO 769 Fibre building boards - Hard and medium boards-determination of.

Water Absorption and of Swelling in Thickness after Immersion in Water;

ISO 818 Fibre building boards - Definition - Classification.

ISO 819 Fibre building boards - Determination of density.

ISO 2695 Fibre building boards - Hard and medium boards for general.

Purposes-Quality Specifications-Appearance, Shape and Dimensional Tolerances;

ISO 2696 Fibre building boards - Hard and medium boards - Quality.

Specifications- Water Absorption and Swelling in Thickness;BNBC 2015 FINAL DRAFT

ISO 3340 Fibre building boards - Determination of sand content.

ISO 3346 Fibre building boards - Determination of surface finish (roughness).

ISO 3729 Fibre building boards - Determination of surface stability.

ISO/TR 7469 Dimensional stability of hardboards.

Wood based Laminates

Laminated boards having a core of strips, each not exceeding 7 mm in thickness, glued together face to face to form a slab which in turn is glued between two or more veneers, with the direction of the grain of the core strips running at right angles to that of the adjacent outer veneers.

Wood based laminates shall conform to the following Standards:

IS 3513 Specification for resin treated compressed wood laminates (compregs).

IS 3513 Part 3 For general purposes.

IS 9307 (Parts I to VIII) Specification for resin treated compressed wood laminates (compregs).

Part 4 Sampling and Tests.

Methods of tests for wood-based structural sandwich construction.

Part I Flexure test.

Part II Edgewise compression test.

Part III Flatwise compression test.

Part IV Shear test.

Part V Flatwise tension test.

Part VI Flexure creep test.

Part VII Cantilever vibration test.

Part VIII Weathering test.

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2.9.4 Adhesives and Glues

Adhesives and glues are used to join two or more parts so as to form a single unit. Adhesives shall conform to the following Standards:

IS 848 Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic).

IS 849

IS 851 Specification for cold setting case in glue for wood.

IS 852 Specification for synthetic resin adhesives for construction work (nonstructural)

IS 4835 in wood.

IS 9188

Specification for animal glue for general wood-working purposes.

Specification for polyvinyl acetate dispersion-based adhesives for wood.

Specification for adhesive for structural laminated wood products for use under exterior exposure condition.

2.10 DOORS, WINDOWS AND VENTILATORS

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2.10.1 Wooden Doors, Windows and Ventilators

These shall conform to the following Standards:

BDS 142: 1961 Specification for wood door.

BDS 173: 1962 Specification for wood windows.

BDS 820: 1978 Recommendation for maximum permissible moisture content of timber used

BDS 1504: 1996 for different purposes in Bangladesh.

IS 1003 Timber door window and ventilator frames
Specification for timber panelled and glazed shutters.

IS 1826 Part 1- 2003 Door shutters.

IS 2191 Part 2- 1994 Window and ventilator shutters.

Specification for venetian blinds for windows.

IS 2202 Specification for wooden flush door shutters (cellular and hollow core type).

Part 1 Plywood face panels.

IS 4020 Part 2 Particle board face panels and hardboard face panels.

Specification for wooden flush door shutters (solid core type).

Part 1 Plywood face panels.

Part 2 Particle board face panels and hardboard face panels.

Method of tests for door shutters.

(Part 1): 1998 General.

(Part 2): 1998 Measurement of dimensions and squareness.

(Part 3): 1998 Measurement of general flatness.

(Part 4): 1998 Local planeness test.

(Part 5): 1998 Impact indentation test.

(Part 6): 1998 Flexure test.

(Part 7): 1998 Edge loading test.

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IS 4021 (Part 8): 1998 Shock resistance test.

IS 4962 (Part 9): 1998 Buckling resistance test.

IS 6198 (Part 10): 1998 Slamming test.

(Part 11): 1998 Misuse test.

(Part 12): 1998 Varying humidity test.

(Part 13): 1998 End immersion test.

(Part 14): 1998 Knife test.

(Part 15): 1998 Glue adhesion test.

(Part 16): 1998 Screw withdrawal resistance test.

Specification for timber door, window and ventilator frames.

Specification for wooden side sliding doors.
Specification for ledged, braced and battened timber shutters.

2.10.2 Metal Doors, Windows Frames and VentilatorsBNBC 2015 FINAL DRAFT

These shall conform to the following Standards:

BDS 1270: 1990 Specification for strong room door
BDS 1273: 1990 Specification for vault doors.
IS 1038 Specification for steel doors, windows and ventilators.
IS 1361 Specification for steel windows for industrial buildings.
IS 1948 Specification for aluminum doors, windows and ventilators.
IS 1949 Specification for aluminum windows for industrial buildings.
IS 4351 Specification for steel door frames.
IS 6248 Specification for metal rolling shutters and rolling grills.
IS 7452 Specification for hot rolled steel sections for doors, windows and ventilators.
IS 10451 Specification for steel sliding shutters (top hung type).
IS 10521 Specification for collapsible gates.

2.10.3 Plastic Doors and Windows

These shall conform to the following Standards:

BDS EN 477: 2008 Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
BDS EN 478: 2008 doors - Determination of the resistance to impact of main profiles by falling mass.
BDS EN 479: 2008
BDS EN 513: 2008 Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
BDS EN 514: 2008 doors - Determination of appearance after exposure at 150oC.

Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
doors - Determination of heat reversion.

Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
doors - Determination of the resistance to artificial weathering.

Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
doors - Determination of the strength of welded corners and T-joints.

BDS EN 12608: 2008 Unplasticized polyvinylchloride (PVC - U) profiles for the fabrication of windows and
doors - Classification, requirements and test methods.

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BDS ISO 1163 - 1: 2008 Plastics - Unplasticized polyvinylchloride (PVC - U) molding and extrusion materials -
BDS ISO 1163 - 2: 2008 Part 1: Designation system and basis for specifications.
IS 14856
IS 15380 Plastics - Unplasticized polyvinylchloride (PVC - U) molding and extrusion materials -
Part 2: Preparation of test specimens and determination of properties.

Specification for glass fibre reinforced (GRP) panel type door shutters for internal
use.

Specification for molded raised high density fibre (HDF) panel doors.

2.11 ALUMINIUM AND ALUMINIUM ALLOYS

Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM 1.

Aluminium and Aluminium Alloys shall also conform to the following Standards:

BDS EN 755 - 9: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 9: Profiles, tolerances on dimensions and form.

BDS EN 755 - 2: 2010BNBC 2015 FINAL DRAFTAluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties.

BDS EN 755 - 1: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 1: Technical conditions for inspection and delivery.

BDS EN 755 - 3: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 3: Round bars, tolerances on dimensions and form.

BDS EN 755 - 4: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 4: Square bars, tolerances on dimensions and form.

BDS EN 755 - 5: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 5: Rectangular bars, tolerances on dimensions and form.

BDS EN 755 - 6: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 6: Hexagonal bars, tolerances on dimensions and form.

BDS EN 755 - 7: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 7: Seamless tubes, tolerances on dimensions and form.

BDS EN 755 - 8: 2010 Aluminum and aluminum alloys - Extruded rod/bar, tube and profiles - Part 8: Porthole tubes, tolerances on dimensions and form.

BDS EN 12020 - 1: 2010 Aluminum and aluminum alloys- Extruded precision profiles in alloys EN AW-6060 and EN AW-6063- Part 1: Technical conditions for inspection and delivery.

BDS EN 12020 - 2: 2010 Aluminum and aluminum alloys - Extruded precision profiles in alloys EN AW-6060 and EN AW-6063 - Part 2: Tolerances on dimensions and form.

BDS EN 515: 2010 Aluminum and aluminum alloys - Wrought products - Temper designations.

ASTM B26/B26M Standard Specification for Aluminum-Alloy Sand Castings.

ASTM B85/B85M Standard Specification for Aluminum-Alloy Die Castings.

ASTM B108/B108M Standard Specification for Aluminum-Alloy Permanent Mold Castings.

ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

ASTM B210 Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

ASTM B211 Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

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Part 5 Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Building Materials Seamless Extruded Tube.

ASTM B241/B241M Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

ASTM B308/B308M Standard Specification for Aluminum and Aluminum-Alloy Round Welded Tubes.

ASTM B313/B313M

ASTM B316/B316M Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods.

ASTM B429/B429M

ASTM B483/B483M Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

ASTM B547/B547M Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Pipe for General Purpose Applications.

ASTM B632/B632M

ASTM B745/B745M Standard Specification for Aluminum and Aluminum-Alloy Formed and Arc-Welded ASTM E34 Round Tube.

Standard Specification for Aluminum-Alloy Rolled Tread Plate.

Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains.

Standard Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys.

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2.12 BUILDERS HARDWARE

The applicable Standards are listed below:

BDS 113: 1986 Specification for latches and locks for doors in buildings.

IS 204 Specification for tower bolts.

Part 1 Ferrous metals.

Part 2 Nonferrous metals.

IS 205 Specification for nonferrous metal butt hinges.

IS 206 Specification for tee and strap hinges.

IS 208 Specification for door handles.

IS 281 Specification for mild steel sliding door bolts for use with padlock.

IS 362 Specification for parliament hinges.

IS 363 Specification for hasps and staples.

IS 364 Specification for fanlight catch.

IS 452 Specification for door springs, rat-tail type.

IS 453 Specification for double acting spring hinges.

IS 729 Specification for drawer locks, cupboard locks and box locks.

IS 1019 Specification for rim latches.
IS 1341 Specification for steel butt hinges.
IS 1823 Specification for floor door stoppers.
IS 1837 Specification for fanlight pivots.
IS 2209 Specification for mortise locks (vertical type).
IS 2681 Specification for nonferrous metal sliding door bolts for use with padlocks.
IS 3564 Specification for door closers (hydraulically regulated).

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IS 3818 BNBC 2015 FINAL DRAFT Specification for continuous (piano) hinges.
IS 3828 Specification for ventilator chains.
IS 3843 Specification for steel back-flap hinges.
IS 3847 Specification for mortise night latches.
IS 4621 Specification for indicating bolts for use in public baths and lavatories.
IS 4948 Specification for welded steel wire fabric for general use.
IS 4992 Specification for door handles for mortise locks (vertical type).
IS 5187 Specification for flush bolts.
IS 5899 Specification for bathroom latches.
IS 5930 Specification for mortise latch (vertical type).
IS 6315 Specification for floor springs (hydraulically regulated) for heavy doors.
IS 6318 Specification for plastic window stays and fasteners.
IS 6343 Specification for door closers (pneumatically regulated) for light doors weighing up to 40 kg.
IS 6602 Specification for ventilator poles.
IS 6607 Specification for rebated mortise locks (vertical type).
IS 7196 Specification for hold fast.
IS 7197 Specification for double action floor springs (without oil check) for heavy doors.
IS 7534 Specification for sliding locking bolts for use with padlocks.
IS 7540 Specification for mortise dead locks.
IS 8756 Specification for ball catches for use in wooden almirah.
IS 8760 Specification for mortise sliding door locks, with lever mechanism.
IS 9106 Specification for rising butt hinges.
IS 9131 Specification for rim locks.
IS 9460 Specification flush drop handle for drawer.
IS 9899 Specification for hat, coat and wardrobe hooks.
IS 10019 Specification for steel window stays and fasteners.
IS 10090 Specification for numerical.
IS 10342 Specification for curtain rail system.
IS 12817 Specification for stainless steel butt hinges.
IS 12867 Specification for PVC hand rails covers.
IS 14912 Specification for door closers concealed type (hydraulically regulated)

2.13 ROOF COVERINGS

2.13.1 Scope

The provisions of this Section shall govern the materials used for roof coverings.

2.13.2 Compatibility of Materials

All roofs and roof coverings shall be of materials that are compatible with each other and with the building or structure to which the materials are applied.

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2.13.3 Material Specifications and Physical Characteristics

All materials to be used in the construction of roofs and roof coverings shall conform to the applicable standards listed in this Section. In the absence of applicable standards or when materials are of questionable suitability, testing by an approved testing agency may be required by the building official to determine the character, quality and limitations of use of the materials.

2.13.4 Weather Protection

All roofs shall be covered with approved roof coverings properly secured to the building or structure to resist wind and rain. Roof coverings shall be designed, installed and maintained in accordance with approved manufacturer's recommendations such that the roof covering shall serve to protect the building or structure.

2.13.5 Wind Resistance

All roofs and roof coverings shall be secured in place to the building or structure to withstand the wind loads.

2.13.6 Structural and Construction Loads

The structural roof components shall be capable of supporting the roof covering system and the material and equipment loads that will be encountered during installation of the roof covering system.

2.13.7 Impact Resistance

Roof coverings shall resist impact damage based on the results of tests conducted in accordance with ASTM D4272 or ASTM D3746.

2.13.8 Metal-Sheet Roof Coverings

Metal-sheet roof coverings installed over structural framing and decking shall comply with BDS 868, Galvanized corrugated sheet roof and wall coverings; BDS 1122, Hot-dip galvanized steel sheet and coil; ASTM A755/A755M or ASTM B101. Metal-sheet roof coverings shall be installed in accordance with approved manufacturer's installation instructions.

2.13.9 Interlocking Clay or Cement Tile

Interlocking clay or cement tile shall be installed only over solid sheathing or spaced structural sheathing boards. Interlocking clay or cement tile shall not be installed on roof slopes below one unit vertical in three units horizontal (1:3). Horizontal battens shall be required on roof slopes over one unit vertical in two units horizontal (1:2). Single layer underlayment is required over solid sheathing on all roof slopes. Reinforced underlayment shall be required when spaced sheathing is used. Regardless of roof slope, the first three tile courses and all tiles within 900 mm of roof edges, tiles at changes in roof slope or changes in slope direction, shall be fastened to the roof. For the field of the roof, fastening is not required on roof slopes below one unit vertical in two units horizontal (1:2). Every other tile course shall be fastened on roof slopes 1:2 to less than 1:1; and every tile shall be fastened on roof slopes 1:1 and over. Tile overlap shall be in accordance with approved manufacturer's installation instructions.

2.13.10 Non-interlocking Clay or Cement Tile

Non-interlocking clay or cement tile shall not be installed on roof slopes below one unit vertical in five units horizontal (1:5). Double layer underlayment is required on roof slopes below one unit vertical in four units horizontal (1:4). Single layer underlayment is required on all other roof slopes. Non-interlocking clay or cement tile shall be secured to the roof with two fasteners per tile. The minimum tile overlap shall be 75 mm.

2.13.11 Roof Insulation

Rigid combustible roof insulation shall be permitted, provided the insulation is covered with approved roof coverings directly applied thereto. In-situ lime concrete may be used on flat roofs of buildings. Minimum

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compacted thickness of such a layer shall be 75 mm and have adequate slope for drainage. The materials used in lime concrete shall conform to the standards specified in Sec 2.5 of this Part.

2.13.12 Recovering and Replacement of Roof Coverings

New roof coverings shall not be installed without first removing existing roof coverings when the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not acceptable as a base for additional roofing.

2.13.13 Reuse of Materials

Existing slate, clay or cement tile shall be permitted for reuse, except that damaged, cracked or broken slate or tile shall not be reused. Existing vent flashings, metal edgings, drain outlets, collars and metal counter flashings shall not be reused where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reused.

2.13.14 Applicable Standards

The applicable Standards for materials used in roofs and roof coverings are listed below:

BDS 868: 1978 BNBC 2015 FINAL DRAFT Code of practice for galvanized corrugated sheet roof and wall coverings.

BDS 1122: 1985

BDS EN 490: 2008 Specification for hot-dip galvanized steel and coil.

BDS EN 491: 2008 Concrete roofing tiles and fittings for roof covering and all cladding - Product specifications.

BDS EN 538: 2008

BDS EN 539-1: 2008 Concrete roofing tiles and fittings for roof covering and wall cladding - Test methods.

BDS EN 1024: 2008

Clay roofing tiles for discontinuous laying - Flexural strength test.

BDS EN 1304: 2008

ASTM A755/A755M Clay roofing tiles for discontinuous laying Determination of physical characteristics - Part 1: Impermeability test.

ASTM B101

Clay roofing tiles for discontinuous laying - Determination of geometric

ASTM C406 characteristics.

ASTM C836/C836M

Clay roofing tiles and fittings - Product definitions and specifications.

ASTM C1029

Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and

ASTM D225 Pre-painted by the Coil-Coating Process for Exterior Exposed Building Products.

ASTM D226/D226M Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.

ASTM D227

Standard Specification for Roofing Slate.

ASTM D312

ASTM D450 Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.

Standard Specification for Asphalt Shingles (Organic Felt) Surfaced With Mineral Granules.

Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing.

Standard Specification for Asphalt Used in Roofing.

Standard Specification for Coal-Tar Pitch Used in Roofing, Damp proofing, and Waterproofing.

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ASTM D1227 BNBC 2015 FINAL DRAFT Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.

ASTM D1863 Standard Specification for Mineral Aggregate Used on Built-Up Roofs.

ASTM D2178 Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

ASTM D2626 Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing.

ASTM D2898 Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

ASTM D3161 Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).

ASTM D3747 Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation.

ASTM D3909 Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced With Mineral Granules.

ASTM D4272 Standard Test Method for Total Energy Impact of Plastic Films By Dart Drop.

ASTM D4434/D4434M Standard Specification for Poly (Vinyl Chloride) Sheet Roofing.
 ASTM D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 ASTM D4637 Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.
 ASTM D4897/D4897M Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing.
 ASTM D6380 Standard Specification for Asphalt Roll Roofing (Organic Felt).
 ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings.
 ASTM G90 Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight.
 ASTM G154 Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
 ASTM G155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
 CGSB (Canadian Membrane, modified bituminous, prefabricated, and reinforced for roofing. General Standards Board) Approval standard for class I roof coverings.
 37 - GP - 56M - 80 Standard laboratories department approved standard for class I insulated steel FM 447 - 86 deck roofs.
 FM (Factory Manual) Wind design guide for ballasted single-ply roofing systems. 4450 - 89
 RMA (Rubber Wind design guide for ballasted single-ply roofing systems. Manufacturer Association, USA)
 RP - 4 - 88
 SPRI (Single Ply Roofing Institute, USA) - 86

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2.14 PAINTS AND VARNISHES

2.14.1 Water Based Paints and Pigments

Water based paints shall conform to the following Standards:

BDS 500: 1965 Specification for distemper dry.
 BDS 1097: 1984 Specification for plastic emulsion paint.
 Part 1 for Interior use.
 IS 427:1965 Part 2 for Exterior use.
 IS 428:2000 Specification for distemper, dry, color as required.
 IS 5410:1992 Specification for distemper, washable.
 IS 5411 Specification for cement paint, color as required.
 Specification for plastic emulsion paint.
 Part 1: For interior use.
 Part 2: For exterior use

2.14.2 Ready Mixed Paints, Enamels and Powder CoatingsBNBC 2015 FINAL DRAFT

Ready mixed paints and enamels shall conform to the following Standards:

BDS 13: 1960 Specification for ready mixed paints, varnish, lacquers and related products.
 BDS 14: 1960
 BDS 397: 1964 Specification for black bituminous paint, brushing for general purposes.
 BDS 398: 1964
 BDS 399: 1964 Specification for ready mixed paint, brushing, red oxide zinc chrome, priming.
 BDS 400: 1964
 BDS 401: 1964 Specification for ready mixed paint, spraying, red oxide zinc chrome, priming.
 BDS 402: 1989
 Specification for aluminum paint, spraying for general purposes, in dual container.
 BDS 499: 1965
 Specification for aluminum paint, brushing, for general purposes in dual container.
 BDS 616: 1966
 Specification for varnish, finishing, exterior, type-I, (synthetic).
 BDS 617: 1966
 Specification for ready mixed paint, brushing, finishing, semi-gloss, for general
 BDS 926: 1980 purposes.

 BDS 927: 1980 Specification for ready mixed paints, brushing, for road marking (white, yellow and black).

 Specification for enamel, brushing, exterior (i) undercoating, (ii) finishing, color as required.

 Specification for enamel, brushing, interior (i) undercoating, (ii) finishing, color as required.

 Specification for ready mixed paint, brushing, petrol resisting, air drying, for exterior painting of containers, color as required.

 Specification for ready mixed paint, brushing, petrol resisting, air drying, for interior painting of tanks and containers, red oxide (color unspecified).

 BDS 928: 1980 Specification for ready mixed paint, brushing, acid resisting, for protection against acid fumes, color as required.
 BDS 973: 1981
 Specification for specification and methods of test for linseed stand oil for paints and
 BDS 974: 1981 varnishes.
 BDS 1005: 1981
 Specification and methods of test for raw tung oils for paints and varnishes.

 Specification for ready mixed paint, brushing, finishing, stoving, enamel, color as required.

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Part 5 Specification for ready mixed aluminum priming paints for woodwork.
 Building Materials Specification for pavement marking paints.
 Methods of sampling and test for paints, varnishes and related products:
 BDS 1141: 1986 (Part I/Sec 1): Test on liquid paints (general and physical), Section 1 Sampling.
 BDS 1151: 1986 (Part I/Sec 2): Test on liquid paints (general and physical), Section 2 Preliminary IS 101 examination and preparation of samples for testing.
 (Part I/Sec 3): Test on liquid paints (general and physical), Section 3 Preparation of

BNBC 2015 FINAL DRAFTpanels.

(Part I/Sec 4): Test on liquid paints (general and physical), Section 4 Brushing test.

(Part I/Sec 5): Test on liquid paints (general and physical), Section 5 Consistency.

(Part I/Sec 6): Test on liquid paints (general and physical), Section 6 Flash point.

(Part I/Sec 7): Test on liquid paints (general and physical), Section 7 Mass per 10 litres.

(Part 2/Sec 1): Test on liquid paints (chemical examination), Section 1 Water content.

(Part 2/Sec 2): Test on liquid paints (chemical examination), Section 2 Volatile matter.

(Part 3/Sec 1): Tests on paint film formation, Section 1 Drying time.

(Part 3/Sec 2): Tests on paint film formation, Section 2 Film thickness.

(Part 3/Sec 4): Tests on paint film formation, Section 4 Finish.

(Part 3/Sec 5): Tests on paint film formation, Section 5 Fineness of grind

(Part 4/Sec 1): Optical test, Section 1 Opacity.

(Part 4/Sec 2): Optical test, Section 2 Color.

(Part 4/Sec 3): Optical test, Section 3 Light fastness test.

(Part 4/Sec 4): Optical test, Section 4 Gloss.

(Part 5/Sec 1): Mechanical test on paint films, Section 1 Hardness tests.

(Part 5/Sec 2): Mechanical test on paint films, Section 2 Flexibility and adhesion.

(Part 5/Sec 3): Mechanical test on paint films, Section 3 Impact resistance.

(Part 5/Sec 4): Mechanical test on paint films, Section 4 Print free test.

(Part 6/Sec 1): Durability tests, Section 1 Resistance to humidity under conditions of condensation.

(Part 6/Sec 2): Durability tests, Section 2 Keeping properties.

(Part 6/Sec 3): Durability tests, Section 3 Moisture vapour permeability.

(Part 6/Sec 4): Durability tests, Section 4 Degradation of coatings (pictorial aids for evaluation).

(Part 6/Sec 5): Durability tests, Section 5 Accelerated weathering test.

(Part 7/Sec 1): Environmental tests on paint films, Section 1 Resistance to water.

(Part 7/Sec 2): Environmental tests on paint films, Section 2 Resistance to liquids.

(Part 7/Sec 3): Environmental tests on paint films, Section 3 Resistance to heat.

(Part 7/Sec 4): Environmental tests on paint films, Section 4 Resistance to bleeding of pigments.

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IS 104 (Part 8/Sec 1): Tests for pigments and other solids, Section 1 Residue on sieve.

IS 109 (Part 8/Sec 2): Tests for pigments and other solids, Section 2 Pigments and IS 123 nonvolatile matter.

(Part 8/Sec 3): Tests for pigments and other solids, Section 3 Ash content.

IS 133 (Part 8/Sec 4): Tests for pigments and other solids, Section 4 Phthalic anhydride.

IS 137 (Part 8/Sec 5): Tests for pigments and other solids, Section 5 Lead restriction test.

IS 158 (Part 8/Sec 6): Tests for pigments and other solids, Section 6 Volume solids.

IS 168 (Part 9/Sec 1): Tests for lacquers and varnish, Section 1 Acid value.

IS 341 (Part 9/Sec 2): Tests for lacquers and varnish, Section 2 Rosin test.

IS 2074 Specification for ready mixed paint, brushing, zinc chrome, priming.

IS 2075

IS 2339 Specification for ready mixed paint, brushing, priming, plaster to Indian Standard

IS 2932 colors No. 361 and 631.

IS 2933 Specification for ready mixed paint, brushing, finishing, semi-gloss, for general purposes, to Indian Standard colors No. 445, 446, 448, 449, 451 and 473; and red oxide (color unspecified).

Specification for enamel, interior (a) undercoating, (b) finishing.

IS 3539 Specification for ready mixed paint, brushing, matt or egg-shell flat, finishing, interior, to Indian Standard color, as required.

IS 3678 Specification for ready mixed paint, brushing, bituminous, black, lead-free, acid, alkali, and heat resisting.

IS 9862 Specification for ready mixed paint, air-drying semi-glossy/matt, for general purposes.

Specification for black Japan, Types A, B and C.

Specification for ready mixed paint, air drying red oxide-zinc chrome, priming.

Specification for ready mixed paint, stoving, red oxide-zinc chrome, priming.

Specification for aluminum paint for general purposes, in dual container.

Specification for enamel, synthetic, exterior, (a) undercoating, (b) finishing.

Specification for enamel, exterior, (a) undercoating, (b) finishing.

Specification for ready mixed paint, brushing, wood primer.

Specification for ready mixed paint, finishing, interior for general purposes, to Indian Standard colors No. 101, 216, 217, 219, 275, 281, 352, 353, 358 to 361, 363, 364, 388, 410, 442, 444, 628, 631, 632, 634, 693, 697, white and black.

Specification for ready mixed paint, undercoating, for use under oil finishes, to Indian Standard colors, as required.

Specification for ready mixed paint, aluminum, brushing, priming, water resistant, for wood work.

Specification for ready mixed paint, thick white, for lettering.

Specification for enamel, synthetic, exterior, (a) undercoating, (b) finishing, for railway coaches.

Specification for ready mixed paint, brushing, bituminous black lead free, acid, alkali, water and chlorine resisting.

Specification for ready mixed paint, brushing, red oxide, priming for metals.

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IS 13183 Specification for aluminum paints, heat resistant.

IS 13213 Specification for polyurethane full gloss enamel (two pack).

IS 13607 Specification for ready mixed paint, finishing, general purposes, synthetic.

IS 13871 Specification for powder coatings.

2.14.3 Thinners and Solvents

These shall conform to the following Standards:

IS 324 Specification for ordinary denatured spirit.

IS 82 Methods of sampling and test for thinners and solvents for paints.

IS 324 Specification for ordinary denatured spirit.

IS 533 Specification for gum spirit of turpentine (oil of turpentine).

IS 14314 Specification for thinner general purposes for synthetic paints and varnishes.

2.14.4 Varnishes and Lacquers

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These materials shall conform to the following Standards:

BDS 401: 1964 Specification for varnish, finishing, exterior, type-I, (synthetic).

BDS 1064: 1983 Specification for varnish, stoving.

BDS 1065: 1983 Specification for varnish, acid resisting.

BDS 1066: 1983 Specification for varnish, finishing, interior.

IS 337 Specification for varnish, finishing, interior.

IS 347 Specification for varnish, shellac for general purposes.

IS 348 Specification for french polish.

IS 524 Specification for varnish, finishing, exterior, synthetic.

IS 525 Specification for varnish, finishing, exterior and general purposes.

IS 642 Specification for varnish medium for aluminum paint.

2.15 SANITARY APPLIANCES AND WATER FITTINGS

2.15.1 Sanitary Appliances

Sanitary appliances shall conform to the following Standards:

ASHRAE 90A Energy conservation in new building design.

ASHRAE 90B Energy Conservation in New Building Design.

AWWA C700 Cold-Water Meters - Displacement type, bronze main case.

AWWA C701 Cold-Water Meters - Turbine type, for customer service.

AWWA C702 Cold-Water Meters - Compound type.

BDS 1162: 2006 Ceramic wash basin and pedestal, ceramic wash basin and pedestals dimension, design & construction, type, permissible deviation

BDS 1163: 1987 Specification for Vitreous Sanitary Appliances,

Part-1, General requirements.

Part-2, Specific requirements for water closets;

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BDS 1361: 1992 Part-3, Specification requirements for urinal (bowl type).

BDS 1593: 1998 Part-4, Specific requirements for foot rest.

BS 1125 Part-5, Specific requirements for integrated squatting pans.

BS 1244 Faucets.

BS 1254 Plastic sanitary squatting pan.

BS 1329 Specification for WC flushing cisterns (including dual flash cisterns and flush pipes).

BS 1876 Metal Sink for domestic purposes.

Specification for C seats (plastics).

Specification for metal hand rinse basins.

Specification for automatic flushing cistern for urinals.

2.15.2 Pipes and Pipe Fittings for Water Supply and Sanitation

Pipes and pipe fittings for water supply and sanitation shall comply with the following Standards.

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BDS 1111:1984 Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.

BDS 1356:1992

BDS 1357: 1992 Specification for ferrules for water services.

BDS 1361 : 1992

Specification for washers with fittings for water service.

BDS 1562:1997

BDS 1593 : 1998 Faucets.

BDS EN 1254 - 2: 2009 This standard specifies the technical requirements of various types of Faucets.

BDS EN 1717: 2009 Solvent cements for polyvinylchloride (PVC) plastic pipe and fitting.

BDS EN 14506: 2009 Plastic sanitary squatting pan.

BDS ISO 3419: 2008 Pan lays down the requirement for material, dimension physical requirements and

BDS ISO 5251: 2008 testing for power flush type injection molded high density polyethylene (HDPE) or

BDS ISO 6761: 2008 polypropylene (PP) squatting pan.

BDS ISO 3822 - 1: 2009

Copper and copper alloys - Plumbing fittings - Part 2: Fittings with compression

BDS ISO 3822 - 2: 2009 ends for use with copper tubes.

Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow.

Devices to prevent pollution by backflow of potable water - Automatic diverter - Family H, type C.

Non - alloy and alloy steel butt-welding fittings.

Stainless steel butt-welding fittings.

Steel tubes - Preparation of ends of tubes and fittings for welding.

Acoustics: Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 1: Method of measurement.

Acoustics: Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 2: Mounting and operating conditions for draw-off taps and mixing valves.

BDS ISO 3822 - 4: 2009 Acoustics: Laboratory tests on noise emission from appliances and equipment

BDS ISO 161 - 1: 2008 used in water supply installations - Part 4: Mounting and operating conditions for special appliances.

Thermoplastics pipes for the conveyance of fluids Nominal outside diameters and Nominal Pressures- Part 1: Metric series.

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BDS ISO 161 - 2: 2008 BNBC 2015 FINAL DRAFT Thermoplastics pipes for the conveyance of fluids- Nominal outside

diameters and

BDS ISO 265 - 1: 2008 Nominal Pressures- Part 2: Inch - based series.

BDS ISO 1167 - 1: 2008 Pipes and fittings of plastics materials- fittings for domestic and industrial waste

BDS ISO 1167 - 2: 2008 pipes- Basic dimensions: Metric series- Part 1: Un-plasticized Poly (Vinyl chloride) (PVC-U).

BDS ISO 1746 : 2008

BDS ISO 2505 : 2008 Thermoplastics pipes fittings and assemblies for the conveyance of fluids -

BDS ISO 2507-2 : 2008 Determination of the resistance to internal pressure- Part 1: General method.

BDS ISO 3114: 2008 Thermoplastics pipes fittings and assemblies for the conveyance of fluids-

BDS ISO 3126 : 2008 Determination of the resistance to internal pressure- Part 2: Preparation of pipe

BDS ISO 3127: 2008 test pieces.

BDS ISO 3501: 2010

BDS ISO 3503: 2010 Rubber or Plastics hoses and tubing-bending tests.

BDS ISO 3633: 2008

BDS ISO 6964: 2010 Thermoplastics pipes- Longitudinal reversion - Test method and parameters.

BDS ISO 4065: 2008

BDS ISO /TR 4191: 2008 Thermoplastics pipes and fittings - Vistat softening temperature- Part 2: Test

BDS ISO 4422 - 1: 2008 conditions for Un-plasticized polyvinylchloride (PVC-U) or chlorinated

BDS ISO 4422 - 2: 2008 polyvinylchloride (PVC-C) pipes and fittings and for high impact resistance

BDS ISO 4422 - 3: 2008 polyvinylchloride (PVC-HI) pipes.

BDS ISO 4422 - 4: 2008

BDS ISO 4422 - 5: 2008 Unplasticized polyvinylchloride (PVC) pipes for potable water supply-Extractability

BDS ISO 4433 - 3: 2008 of lead and tin- Test method.

Plastics piping systems - Plastics components- Determination of dimensions.

Thermoplastics pipes - Determination of resistance to external blows-round-the-clock method.

Assembled joints between fittings and polyethylene (PE) pressure pipes - Test of resistance to pull-out.

Assembled joints between fittings and polyethylene (PE) pressure pipes - Test of leak proofness under internal pressure when subjected to bending.

Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings - Specifications.

Polyolefin pipes and fittings - Determination of carbon black content by calcinations and pyrolysis - Test method and basic specification.

Thermoplastics pipes- Universal wall thickness table.

Unplasticized polyvinylchloride (PVC-U) pipes for water supply-Recommended practice for laying.

Pipes and fittings made of unplasticized polyvinylchloride (PVC-U) for water supply - Specifications - Part 1: General.

Pipes and fittings made of unplasticized polyvinylchloride (PVC-U) for water supply - Specifications - Part 2: Pipes (with or without integral sockets).

Pipes and fittings made of unplasticized polyvinylchloride (PVC-U) for water supply- Specifications - Part 3: Fittings and joints.

Pipes and fittings made of unplasticized polyvinylchloride (PVC-U) for water supply- Specifications- Part 4: Valves and ancillary equipment.

Pipes and fittings made of unplasticized polyvinylchloride (PVC- U) for water supply- Specifications- Part 5: Fitness for purpose of the system.

Thermoplastics pipes- Resistance to liquid chemicals- Classification-Part 3: Unplasticized polyvinylchloride (PVC-U), high- impact polyvinylchloride (PVC-HI) and chlorinated polyvinylchloride (PVC -C) pipes.

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BDS ISO 4435: 2008 Plastic piping systems for non- pressure underground drainage and sewerage-

BDS ISO 4439: 2008 Unplasticized polyvinylchloride (PVC-U).

BDS ISO 6259 - 1: 2008

BDS ISO 6259 - 2: 2008 Unplasticized polyvinylchloride (PVC) pipes and fittings - Determination and specification of density.

BDS ISO 6992: 2008

BDS ISO 9624: 2010 Thermoplastics pipes - Determination of tensile properties - Part 1: General test

BDS ISO 11413: 2010 method.

BDS ISO 12176 - 2: 2010 Thermoplastics pipes - Determination of tensile properties- Part 2: Pipes made of

BDS ISO 12176-3: 2010 unplasticized polyvinylchloride (PVC-U), Chlorinated polyvinylchloride (PVC-C), and

BDS ISO 12176 - 4: 2010 high - impact polyvinylchloride (PVC-HI).

BDS ISO 13479: 2010

BDS ISO 13761: 2010 Unplasticized polyvinylchloride (PVC-U) pipes for drinking water supply -

BDS ISO 13951: 2010 Extractability of cadmium and mercury occurring as impurities.

BDS ISO 13953: 2010

Thermoplastics pipes for fluids under pressure - Mating dimensions of flange adapters and loose backing flanges.

Plastics pipes and fittings - Preparation of test piece assemblies between a polyethylene (PE) pipe and an electro fusion fitting BDS ISO 11414, Plastics pipes and fittings - Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion.

Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Part 2: Electro fusion

Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Part 3: Operator's badge.

Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Part 4: Traceability coding.

Polyolefin pipes for the conveyance of fluids - Determination of resistance to crack propagation - Test method for slow crack growth on notched pipes (notch test).

Plastics pipes and fittings - Pressure reduction factors for polyethylene pipeline systems for use at temperatures above 20°C.

Plastics piping systems - Test method for the resistance of polyolefin pipe/pipe or pipe/fitting assemblies to tensile loading.

Polyethylene (PE) pipes and fittings - Determination of the tensile strength and failure mode of test pieces from a butt-fused joint.

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BDS ISO 13954: 2010 Plastics pipes and fittings - Peel de-cohesion test for polyethylene (PE) electro

BDS ISO 13955: 2010 fusion assemblies of nominal outside diameter greater than or equal to 90 mm.

BDS ISO 13957: 2010

BDS ISO 14236: 2010 Plastics pipes and fittings - Crushing de-cohesion test for polyethylene (PE) electro

BDS ISO 18553: 2010 fusion assemblies.

BDS ISO 18553: 2010

BDS ISO 4427 - 1: 2010 Plastics pipes and fittings - Polyethylene (PE) tapping tees - Test method for impact resistance.

Plastics pipes and fittings - Mechanical-joint compression fittings for use with polyethylene pressure pipes in water supply systems.

Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds.

Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds Amendment 1:2010.

Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part 1: General.

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BDS ISO 4427 - 2: 2010BNBC 2015 FINAL DRAFTPlastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part

2: Pipes.

BDS ISO 4427 - 3: 2010

Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part

BDS ISO 4427 - 5: 2010 3: Fittings.

BDS ISO 4427 - 1: 2010 Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part 5: Fitness for purpose of the system.

BDS ISO 3458: 2010

Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part

BDS ISO 3459: 2010 1: General Technical corrigendum 1: 2010.

ASTM A53/A53M Assembled joints between fittings and polyethylene (PE) pressure pipes - Test of leak proofness under internal pressure.

ASTM A74

ASTM A377 Polyethylene (PE) pressure pipes - Joints assembled with mechanical fittings -
ASTM B42 Internal under pressure test method and requirement.
ASTM B43
ASTM B75 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded
ASTM B88 and Seamless.
ASTM B251
Standard Specification for Cast Iron Soil Pipe and Fittings.
ASTM B302
ASTM B306 Standard Index of Specifications for Ductile-Iron Pressure Pipe.
ASTM B429/B429M
ASTM B447 Standard Specification for Seamless Copper Pipe, Standard Sizes.
ASTM B745/B745M
ASTM C14 Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

ASTM C76 Standard Specification for Seamless Copper Tube.

ASTM C654 Standard Specification for Seamless Copper Water Tube.
ASTM C700
Standard Specification for General Requirements for Wrought Seamless Copper
ASTM D1527 and Copper-Alloy Tube.

ASTM D1785 Standard Specification for Thread-less Copper Pipe, Standard Sizes.

ASTM D2239 Standard Specification for Copper Drainage Tube (DWV).

ASTM D2241 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

Standard Specification for Welded Copper Tube.

Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains.

Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and
Culvert Pipe.

Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer
Pipe.

Standard Specification for Porous Concrete Pipe.

Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength,
and Perforated.

Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe,
Schedules 40 and 80.

Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80,
and 120.

Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on
Controlled Inside Diameter.

Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR
Series).

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ASTM D2321 BNBC 2015 FINAL DRAFT Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2464 Standard Specification for
ASTM D2466 Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80.

ASTM D2609 Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule
ASTM D2661 40
ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
ASTM D2665
ASTM D2672 Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
ASTM D2729
ASTM D2737 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40
ASTM D2751 Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM D2846/D2846M Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
ASTM D2949
Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.
ASTM D3034
Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
ASTM F405
ASTM F409 Standard Specification for Polyethylene (PE) Plastic Tubing.

ASTM F437 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
ASTM F438
Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and
ASTM B209 Cold-Water Distribution Systems.
ASTM F441/F441M
Standard Specification for 3.25-in. Outside Diameter Poly(Vinyl Chloride) (PVC)
ASTM F442/F442M Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM F628 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
ASTM F891
Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
IS 404 (Part-I)
ISO 2531 Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube
ASME/ANSI B16.3 and Tubular Fittings.
ASME/ANSI B16.485
ASME/ANSI B16.9 Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC)
Plastic Pipe Fittings, Schedule 40.

Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).

Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core.

Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core.

Specification for lead pipes Part I for other than chemical purpose.

Ductile Iron pipes, fittings and accessories for pressure pipelines.

Malleable iron threaded fittings: Classes 150 and 300.

Cast Iron threaded fittings.

Factory made wrought steel butt welding fittings.

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ASME/ANSI B16.11 Forged Steel Fittings, Socket-Welding and Threaded.

ASME/ABSI B16.12 Cast-Iron Threaded Drainage Fittings;

ASME/ANSI B16.15

ASME/ANSI B16.18 Cast Copper Alloy Threaded Fittings: Classes 125 and 250.

ASME/ANSI B16.22 Cast Copper Alloy Solder Joint Pressure Fittings.

ASME/ANSI B16.23 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

ASME/ANSI B16.28 Cast Copper Alloy Solder Joint Drainage Fittings (DWV).

ASME/ANSI B16.29 Wrought Steel Butt welding Short radius Elbows and Returns.

Wrought Copper and Wrought Copper Alloy Solder Joint Fittings for solvent

ASME/ANSI B16.32 Drainage Systems.

AWWA C110 Cast Copper Alloy Solder Joint Fittings for Solvent Drainage Systems.

Standard for Grey Iron and Ductile Iron Fittings, 76 mm to 1220 mm (3 in. through 48 inches), for Water and Other Liquids.

2.15.3 Joints and Connections Between Pipes and Fittings

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Applicable standards for joints and connections between pipes and fittings are listed below:

BDS EN 681-1 Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber.

BDS EN 681-2

Elastomeric seals - Materials requirements for pipe joint seals used in water and

ASTM B42 drainage applications - Part 2: Thermoplastic elastomers.

ASTM C425

ASTM C443 Standard Specification for Seamless Copper Pipe, Standard Sizes.

ASTM C564 Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

ASTM D2235

Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber

ASTM D2564 Gaskets.

ASTM D2657 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

ASTM D2661

Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene

ASTM D2846/D2846M (ABS) Plastic Pipe and Fittings.

ASTM D2855 Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.

Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible
ASTM D3212 Elastomeric Seals.

ASTM F402

ASTM F493 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.

Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

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ASTM F628 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40

ASTM F656 Plastic Drain, Waste, and Vent Pipe With a Cellular Core.

ASME/ANSI B1.20.1

Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

Pillar taps used in water supply.

2.15.4 Taps and Valves

Taps and valves shall conform to the following Standards:

BDS 987 BNBC 2015 FINAL DRAFT Sand cast brass screw-down bib taps and stop taps for water services.

BDS 1507 It covers the requirements regarding materials, dimensions, constructions,
BDS 1508 workmanship, finish and testing of tapes for water services.

BDS 1509 Bib taps used in water supply.

BDS EN 200

Stop taps used in water supply specifies the requirements, dimensions

BDS EN 246 construction, materials and test methods of stop taps used in water supply.

BDS EN 248

BDS EN 1112 Pillar taps used in water supply.

BDS EN 1113 Sanitary tapware - Single taps and combination taps for water supply systems of
type 1 and type 2 - General technical specification.

BS 1212 (3 Parts)

BS 1010 Sanitary tapware - General specifications for flow rate regulators.

BS 1968

BS 5433 Sanitary tapware - General specification for electrodeposited coatings of Ni-Cr.

BS 2456

BS 1415 (2 parts) Sanitary tapware - Shower outlets for sanitary tapware for water supply systems

BS 5163 of type 1 and type 2 - General technical specification.

Sanitary tapware - Shower hoses for sanitary tapware for water supply systems of

BS 3377 type 1 and type 2 - General technical specification.

BS 843 Specification for Float Operated Valves (excluding floats).

BS 855 Specification for draw-off taps and stop valves for water services.

Specification for floats for ball valves (copper).

Specification for underground stop valves for water services (copper).

Specification for floats for ball valves (plastic) for cold and hot water.

Mixing valves (manually operated).

Specification for predominantly key-operated cast iron wedge gate valve for water
works.

Specification for boilers for use with domestic solid mineral fuel appliances.

Specification for thermal storage electric water heaters.

Specification for welded steel boilers for central heating and indirect hot water
supply.

2.16 MISCELLANEOUS MATERIALS

2.16.1 Ferrocement

Details including material requirements are given in Chapter 12 Part 6.

2.16.2 Plastics

Plastics may be used in buildings or structures as light transmitting materials such as glazing, skylights, lighting
lenses, luminous ceilings, roof panels, signs and similar purposes. Foam plastics are also used in buildings.

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Applicants for approval of a plastic material shall furnish all necessary technical data required by the Building

Official. The data shall include chemical composition; applicable physical, mechanical and thermal properties such as fire resistance, flammability and flame spread; weather resistance; electrical properties; products of combustion; and coefficient of expansion.

The requirements for light transmitting plastics, including roof panels and foam plastics are given below.

2.16.2.1 Light Transmitting Plastics

An approved light transmitting plastic shall be any thermoplastic, thermosetting or reinforced thermosetting plastic material which has a self-ignition temperature of 343oC or greater when tested in accordance with , Test Method for Ignition Properties of Plastics; a smoke density rating not greater than 450 when tested in the manner intended for use in accordance with ASTM E84 Test Method for Surface Burning Characteristics of Building Materials; or not greater than 75 when tested in the thickness intended for use in accordance with ASTM D2843 Test Method for Density of Smoke from the Burning or Decomposition of Plastics; and which conforms to one of the following combustibility classifications:

Class C1 : Plastic materials which have a burning extent of 25 mm or less when tested at a nominal thickness of 1.5 mm, or in the thickness intended for use, in accordance with ASTM D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in Horizontal Position; or
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Class C2: Plastic materials which have a burning rate of 63 mm/min or less when tested at a nominal thickness of 1.5 mm, or in the thickness intended for use, in accordance with ASTM D635.

2.16.2.2 Foam Plastics

All foam plastics and foam plastic cores of manufactured assemblies shall have a flame spread rating of not more than 75 and shall have a smoke developed rating of not more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E84.

All foam plastics, unless otherwise indicated in this Section, shall be separated from the interior of a building by an approved thermal barrier of 13 mm gypsum wall board or equivalent thermal barrier material which will limit the average temperature rise of the unexposed surface to not more than 121oC after 15 minutes of fire exposure complying with the standard time-temperature curve of ASTM E119 Test Methods for Fire Tests of Building Construction and Materials. The thermal barrier shall be installed in such a manner that it will stay in place for a minimum of 15 minutes under the same testing conditions. The thermal barrier is not required when the foam plastic is protected by a 25 mm minimum thickness of masonry or concrete.

2.16.2.3 Applicable Standards

A list of applicable Standards for plastics is given below:

BDS 885:1979 Method for measuring viscosity number and K-value of PVC resins.

BDS 886:1978 Method for direct measuring the specific gravity of plastics.

BDS 887:1978 Method for measuring deformation under heat of flexible rigid PVC compounds.

BDS 888:1978 Method for measuring temperature of deflection under load.

BDS 889:1978 Method for measuring the Vicat Softening Temperature (VST) of thermoplastics.

BDS 890:1978 Method for measuring the water absorption at room temperature and boiling water absorption of plastics.

BDS 891:1978 Method for measuring the flexural modulus of plastics.

BDS 892:1978 Method for measuring the resistance to tear propagation of flexible plastics, film or sheeting.

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ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

ASTM D638 Standard Test Method for Tensile Properties of Plastics.

ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics.

ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1003 Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

ASTM D1044 Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

ASTM D1204 Standard Test Method for Linear Dimensional Changes of Non-rigid Thermoplastic Sheeting or Film at Elevated Temperature.

ASTM D1593 Standard Specification for Non-rigid Vinyl Chloride Plastic Film and Sheeting.

ASTM D2103 Standard Specification for Polyethylene Film and Sheeting.

ASTM D2126 Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.

ASTM D2843 Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

ASTM D3294 Standard Specification for PTFE Resin Molded Sheet and Molded Basic Shapes.

ASTM D3678 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Interior-Profile Extrusions.

ASTM D3679 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding.

ASTM D3841 Standard Specification for Glass-Fiber-Reinforced Polyester Plastic Panels.

ASTM D4802 Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.

ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.

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2.16.3 Ballies and Wood Poles

Ballies of Sal/Gazari, Sundari and Garjan are used in building construction. These shall be free from rots, knots and sap, and straight and uniform in size. These should conform to the following Standards:

BDS 809:1973 Specification for wood poles for overhead power and telecommunication lines.

ASTM D25 Standard Specification for Round Timber Piles.

IS 3337

IS 1900 Specification for Ballies for general purposes.

IS 6711

Method of testing wood poles.

Code of practice for maintenance of wood poles for overhead power and telecommunications lines.

2.16.4 Bamboos

The following standards shall be applicable for bamboos used for structural and nonstructural purposes:

IS 1902 Code of Practice for Preservation of Bamboo and Cane for Non-structural Purposes;

IS 6874 Method of Tests for Round Bamboos.

IS 8242 Methods of Tests for Split Bamboo.

IS 8295 Specification for Bamboo Chicks, Part I Fine.

IS 9096 Code of Practice for Preservation of Bamboos for Structural Purposes.

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2.16.5 Fillers, Stoppers and Putties

These shall conform to the following standards:

IS 110 Specification for ready mixed paint, brushing, grey filler, for enamels, for use over primers.

IS 345 Specification for wood filler, transparent, liquid.

IS 419 Specification for putty for use on window frames.

IS 421 Specification for jointing paste, for bedding moldings on coaching stock.

IS 423 Specification for plastic wood, for joiners' filler.

IS 424 Specification for plastic asphalt.

IS 3709 Specification for mastic cement for bedding of metal windows.

IS 7164 Specification for Stopper.

2.16.6 Wire Ropes and Wire Products

These materials shall conform to the following standards:BNBC 2015 FINAL DRAFT

ASTM A116 Standard Specification for Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.

ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.

ASTM A368 Standard Specification for Stainless Steel Wire Strand.

ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

ASTM A475 Standard Specification for Zinc-Coated Steel Wire Strand.

ASTM A492 Standard Specification for Stainless Steel Rope Wire.

ASTM A510 Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

ASTM A586 Standard Specification for Zinc-Coated Parallel and Helical Steel Wire Structural Strand.

ASTM A603 Standard Specification for Zinc-Coated Steel Structural Wire Rope.

ASTM A817 Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric. and Marcellled Tension Wire.

ASTM A824 Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence.

ASTM F1183 Standard Specification for Aluminum Alloy Chain Link Fence Fabric.

IS 2365 Specification for Steel Wire Suspension Ropes for Lifts, Elevators and Hoists.

2.16.7 Waterproofing and Damp-proofing Materials

Waterproofing and damp-proofing materials shall conform to the following standards:

ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and
ASTM D43 Waterproofing.

ASTM D146

ASTM D173 Standard Specification for Coal Tar Primer Used in Roofing, Damp proofing, and
Waterproofing.

Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven
Fabrics for Roofing and Waterproofing.

Standard Specification for Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing.

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ASTM D6380 Standard Specification for Asphalt Roll Roofing (Organic Felt).
ASTM

D226/D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and
ASTM D227 Waterproofing.

ASTM D449 Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and
ASTM D450 Waterproofing.

ASTM D1327 Standard Specification for Asphalt Used in Damp proofing and Waterproofing.

ASTM D1668 Standard Specification for Coal-Tar Pitch Used in Roofing, Damp proofing, and
Waterproofing.

ASTM D2178

ASTM D2626 Standard Specification for Bitumen-Saturated Woven Burlap Fabrics Used in Roofing and
Waterproofing.

ASTM D3468

Standard Specification for Glass Fabrics (Woven and Treated) for Roofing and
Waterproofing.

Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in
Roofing..

Standard Specification for Liquid-Applied Neoprene and Chloro-sulfonated Polyethylene
Used in Roofing and Waterproofing.

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2.16.8 Glazed Tiles and Tile-setting Mortars

Glazed tiles shall conform to the following standards:

BDS 1301:1990 Specification for glazed earthenware wall tiles.

ASTM C126

Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and
ANSI A137.1 Solid Masonry Units.

BS 6431

Specification for Ceramic Tile.

Ceramic floor and wall tiles (Part 1 to 23).

2.16.8.1 Mortars for Ceramic Wall and Floor Tile

(a) Portland Cement Mortars: Portland cement mortars for installing ceramic wall and floor tile shall comply with ANSI A108.1 and be of the compositions indicated in Table 5.2.1.

(b) Dry-set Portland Cement Mortars: Premixed prepared Portland cement mortars, which require only the addition of water and which are used in the installation of ceramic tile, shall comply with ANSI A 118.1. The shear bond strength for tile set in such mortar shall be as required in accordance with that standard. Tile set in dry-set Portland cement mortar shall be installed in accordance with ANSI A 108.5.

(c) Electrically Conductive Dry-Set Mortars: Premixed prepared Portland cement mortars, which require only the addition of water and which comply with ANSI A 118.2, shall be used in the installation of electrically conductive ceramic tile. Tile set in electrically conductive dry-set mortar shall be installed in accordance with ANSI A 108.7.

(d) Latex-modified Portland Cement Mortars: Latex-modified Portland cement thin set mortars in which Latex is added to dry-set mortar as a replacement for all or part of the gauging water which are used for the installation of ceramic tile shall comply with ANSI A 118.4. Tile set in latex-modified Portland cement mortar shall be installed in accordance with ANSI A 108.5.

(e) Epoxy Mortar: Chemical-resistant epoxy for setting and grouting ceramic tile shall comply with ANSI A 118.3-2009. Tile set and grouted with epoxy shall be installed in accordance with ANSI A 108.6.

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(f) Furan Mortar and Grout: Chemical resistant furan mortar and grout which are used to install ceramic tile shall comply with ANSI A 118.5. Tile set and grouted with furan shall be installed in accordance with ANSI A 108.8.

(g) Modified Epoxy-Emulsion Mortar and Grout: Modified epoxy-emulsion mortar and grout which are used to install ceramic tile shall comply with ANSI A 118.8. Tile set and grouted with modified epoxy-emulsion mortar and grout shall be installed in accordance with ANSI A 108.9.

(h) Organic Adhesives: Water-resistant organic adhesives used for the installation of ceramic tile shall comply with ANSI A 136.1. The shear bond strength after water immersion shall not be less than 0.25 kN/mm² for Type I adhesive, and not less than 0.13 kN/mm² for Type II adhesive when tested in accordance with ANSI A 136.1. Tile set in organic adhesive shall be installed in accordance with ANSI A 108.4.

(i) Portland Cement Grouts: Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A 118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A 108.10.

2.16.8.2 Applicable Standards

A list of applicable Standards for tiles, mortars and adhesives is given below:

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BDS 1301 : 1990 Specification for Glazed Earthenware Wall Tiles.

ASTM C126

Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick,
ANSI A108.1 and Solid Masonry Units.

ANSI A108.4

Specification for the Installation of Ceramic Tile with Portland Cement Mortar.

ANSI A108.5 Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting
Epoxy Adhesive.

ANSI A108.6

Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland
ANSI A108.7 Cement Mortar.

ANSI A108.8 Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and
ANSI A108.9 Grouting Epoxy.

ANSI A108.10

ANSI A118.1 Specification for Electrically Conductive Ceramic Tile Installed with Conductive Dry-

ANSI A118.2 Set Portland Cement Mortar.

ANSI A118.3

Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout.

ANSI A118.4

ANSI A118.5 Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

ANSI A118.6

ANSI A118.8 Installation of Grout in Tile work.

ANSI A136.1 Specification for Dry-Set Portland Cement Mortar.

ANSI A137.1

BS 6431 Specifications for Conductive Dry-set Portland Cement Mortar.

BS 6431 Part 1

Specifications for Chemical Resistant Water Cleanable Tile Setting and Grouting
Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

Specifications Furan Latex - Portland Cement Mortar.

Specifications for Chemical Resistant Furan.

Specifications for Ceramic Tile Grouts.

Specifications for Modified Epoxy Emulsion Mortar/Grout.

Organic Adhesives for Installation of Ceramic Tile.

Specifications for Ceramic Tile.

Floor and wall tiles.

Specification for classification and making, including definitions and characteristics.

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BS 6431 Part 2 Specification for struded ceramic tiles with low water absorption ($E < 3\%$) Group A1.

BS 6431 Part 3

BS 6431 Part 3 Sec 3.1 Extruded ceramic tiles with a water absorption of $3\% < 6\%$. Group A 11a.

BS 6431 Part 3 Sec 3.2

BS 6431 Part 4 Specification for general products.

BS 6431 Part 4

BS 6431 Part 4 Sec 4.2 Specification for products Terre Cuite, Cotto, Baldosion Catalan.

BS 6431 Part 5

Extruded Ceramic Tiles with a Water Absorption of $6\% < E < 10\%$. Group A11b.

BS 6431 Part 6

Specification for General Products.

BS 6431 Part 7

Specification for Specific Products (Terre Cuite, Cotto, Baldosion Catalan).

BS 6431 Part 8

Specification for extruded ceramic tiles with a water absorption of $E > 10\%$, Group A111.

Specification for dust-pre-stressed ceramic tiles with a low-water absorption ($E < 3\%$) Group B1.

Specification for dust-pre-stressed ceramic tiles with a water absorption of $3\% < E \leq 6\%$. Group B11a;

Specification for dust-pre-stressed ceramic tiles with water absorption of $6\% < E \leq 10\%$. Group B11b;

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BS 6431 Part 9 Specification for dust-pre-stressed ceramic tiles with a water absorption of $E > 10\%$. Group B111.

BS 6431 Part 10 Method for determination of dimensions and surface quality.

BS 6431 Part 11 Method for determination of water absorption.

BS 6431 Part 12 Method for determination of modulus of.

BS 6431 Part 13 Method for determination of scratch hardness of surface according to Mohs.

BS 6431 Part 14 Method for determination of resistance to abrasion of unglazed tiles.

BS 6431 Part 15 Method for determination of linear thermal expansion.

BS 6431 Part 16 Method for determination of resistance to thermal shock.

BS 6431 Part 17 Method for determination of crazing resistance-glazed tiles.

BS 6431 Part 18 Method for determination of chemical resistance-unglazed tiles.

BS 6431 Part 19 Method for determination of chemical resistance-unglazed tiles.

BS 6431 Part 20 Method for determination of resistance to surface abrasion-glazed tiles.

BS 6431 Part 23 Specification for sampling and basis for acceptance.

2.16.9 Refractories

Refractories shall conform to the following Standards:

BDS 1493: 1994 Glossary of terms used in refractory.

BDS 1494: 1994 Dimension of refractory bricks.

BDS 1495: 1994 High aluminum refractory bricks.

ISO 528 Refractory products-determination of pyrometric cone equivalent (refractoriness).

ISO 1109 Refractory products-classification of dense shaped refractory products.

ISO 1146 Pyrometric reference cones for laboratory use-specification.

ISO 1893 Refractory products-determination of refractoriness-under-load (differential with rising temperature).

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ISO 1927 BNBC 2015 FINAL DRAFT Prepared unshaped refractory materials (dense and insulating) classification.

ISO 2245

ISO 2477 Shaped insulating refractory products-classification.

ISO 2478 Shaped insulating refractory products-determination of permanent change in dimensions on heating.

ISO 3187

ISO 5013 Dense shaped refractory products-determination of permanent change in

ISO 5014 dimensions on heating.

ISO 5016

Refractory products-determination of creep in compression.

ISO 5017

Refractory products-determination of modulus of rupture at elevated temperatures.

ISO 5018

ISO 5019 - 1 Refractory products-determination of modulus of rupture at ambient temperature.

ISO 5019 - 2

ISO 5019 - 3 Shaped insulating refractory products-determination of bulk density and true porosity.

ISO 5419 - 4

ISO 5015 - 6 Dense shaped refractory products-determination of bulk density, apparent porosity

ISO 5022 and true porosity.

ISO 5417

ISO 8656 Refractory materials-determination of true density.

ISO 8840 Refractory bricks-dimensions-Part 1: Rectangular bricks.

ISO 8890 Refractory bricks-dimensions-Part 2: Arch bricks;

ISO 8894 - 1

Refractory bricks-dimensions-Part 3: Rectangular checker bricks for regenerative

ISO 8894 - 2 furnace.

ISO 8895 Refractory bricks-dimensions-Part 4: Dome bricks for electric arc furnace roofs.

ISO 9205

ISO 10080 Refractory bricks-dimensions-Part 6: Basic bricks for oxygen steel making converters.

ISO 10081

Shaped refractory products-sampling and acceptance testing.

Refractory bricks for use in rotary kilns-dimensions.

Refractory products-sampling of raw materials and unshaped products- Part 1:
Sampling scheme.

Refractory materials-determination of bulk density of granular materials (grain
density).

Dense shaped refractory products-determination of resistance to sulfuric acid.

Refractory materials-determination of thermal conductivity- Part 1: Hot-wire
method (cross-array).

Refractory materials-determination of thermal conductivity- Part 2: Hot-wire
method (parallel).

Shaped Insulating refractory products-determination of cold crushing strength.

Refractory bricks for use in rotary kilns-hot-face identification marking.

Refractory products-classification of dense, shaped acid-resisting products.

Basic refractory products-classification- Part I: Products containing less than 7%

residual carbon.

2.16.10 Thermal Insulating Materials

Thermal insulation may be in the following physical forms:

- Loose fill dry granules or nodules poured or below in place;
- Flexible or semi rigid blankets and bolts of wool like material;
- Rigid boards and blocks;

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- Membrane reflective insulation;
- Spray applied mineral fibre or insulating concrete;
- Poured in plain-insulating concrete;
- Foamed in place-polyurethane;
- Gypsum plaster.

Thermal insulating materials shall conform to the Standards listed below:

ASTM C167 Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.

ASTM C177

Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission

ASTM C195 Properties by Means of the Guarded-Hot-Plate Apparatus.

ASTM C196

ASTM C208 Standard Specification for Mineral Fiber Thermal Insulating Cement.

ASTM C209

ASTM C1363 Standard Specification for Expanded or Exfoliated Vermiculite Thermal Insulating Cement

ASTM C240 Standard Specification for Cellulosic Fiber Insulating Board.

ASTM C335

ASTM C411 Standard Test Methods for Cellulosic Fiber Insulating Board.

ASTM C449 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

ASTM C516

ASTM C518 Standard Test Methods of Testing Cellular Glass Insulation Block.

Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.

Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

Standard Specification for Vermiculite Loose Fill Thermal Insulation.

Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

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ASTM C520 Standard Test Methods for Density of Granular Loose Fill Insulations.
ASTM C533
ASTM Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
C534/C534M
ASTM C547 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in
ASTM C549 Sheet and Tubular Form.
ASTM C552
ASTM C553 Standard Specification for Mineral Fiber Pipe Insulation.

ASTM C578 Standard Specification for Perlite Loose Fill Insulation.
ASTM C591
Standard Specification for Cellular Glass Thermal Insulation.
ASTM C592
Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and
ASTM C610 Industrial Applications.
ASTM C612
ASTM C665 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

Standard Specification for Un-faced Preformed Rigid Cellular Polyisocyanurate Thermal
Insulation.

Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation
(Metal-Mesh Covered) (Industrial Type).

Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.

Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame
Construction and Manufactured Housing.

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ASTM C726 Standard Specification for Mineral Fiber Roof Insulation Board.
ASTM C728 Standard Specification for Perlite Thermal Insulation Board.
ASTM C739 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
ASTM C764 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.
ASTM C916 Standard Specification for Adhesives for Duct Thermal Insulation.
ASTM C991 Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
ASTM C1014 Standard Specification for Spray-Applied Mineral Fiber Thermal and Sound Absorbing
Insulation.
ASTM C1029 Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
ASTM C1071 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound
Absorbing Material).

2.16.11 Screw Threads and Rivets

These shall conform to the following standards:
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IS 554 Dimensions for pipe threads where pressure tight joints are required on the threads.
IS 1929 Specification for hot forged steel rivets for hot closing (12 to 36 mm diameter).
IS 2155 Specification for cold-forged solid steel rivets for hot closing (6 to 16 mm diameter).
IS 2643 Dimensions for pipe threads for fastening purposes.
Part I - Basic profile and dimensions.
IS 2907 Part II - Tolerances.
IS 2998 Part III - Limits of sizes.
IS 10102 Specification for non-ferrous rivets (1.6 mm to 10 mm).
Specification for cold forged steel rivets for cold closing (1 to 16 mm diameter).
Technical supply conditions for rivets.

2.16.12 Sealants

Sealants shall conform to the following Standards:

ASTM C509 Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
ASTM C542 Standard Specification for Lock-Strip Gaskets.
ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
ASTM C716 Standard Specification for Installing Lock-Strip Gaskets and Infill Glazing Materials.
ASTM C719 Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
ASTM C1193 Standard Guide for Use of Joint Sealants.
ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
ASTM C834 Standard Specification for Latex Sealants.
ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
ASTM C920 Standard Specification for Elastomeric Joint Sealants.

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ASTM C1193 Standard Guide for Use of Joint Sealants.
ASTM D2628
Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete
ASTM D6690 Pavements.

ASTM D3406 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
ASTM D3667
ASTM D3771 Standard Specification for Joint Sealant, Hot-Applied, Elastomeric-Type, for Portland
ASTM D3832 Cement Concrete Pavements.
ISO 3934
Standard Specification for Rubber Seals Used in Flat-Plate Solar Collectors.
ISO 4633
Standard Specification for Rubber Seals Used in Concentrating Solar Collectors.
ISO 4635
Standard Specification for Rubber Seals Contacting Liquids in Solar Energy Systems.
ISO 5892
Rubber building gaskets-materials in preformed solid vulcanizates used for sealing glazing
ISO 6447 and panels-specification.
ISO 9331

Rubber seals-joint rings for water supply, drainage and sewerage pipelines-specifications for materials

Rubber, vulcanized-preformed compression seals for use between concrete motorway paving sections-specifications for material.

Rubber Building Gaskets-Materials for Preformed Solid Vulcanized Structural Gaskets-Specification;

Rubber seals-joint rings used for gas supply pipes and fittings- specification for material.

Rubber seals joint rings for hot water supply pipelines up to 110o C specifications for the material.

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2.16.13 Joints and Jointing Products

Joints and jointing products shall conform to the following Standards:

ISO 2444 Joints in buildings-vocabulary.

ISO 3867

ISO 3869 Agglomerated cork-material of expansion joints for construction and building test-methods.

ISO 3934 Agglomerated cork-filler material of expansion joints for construction and buildings - characteristics, sampling and packing.

ISO 4633

Rubber building gaskets-materials in preformed solid vulcanizates used for sealing glazing

ISO 4635 and panels-specification.

ISO 5892 Rubber seals-joint rings for water supply, drainage and sewerage pipelines-specification for materials.

ISO 6447

ISO 6589 Rubber, vulcanized-preformed compression seals for use between concrete motor way

ISO 7389 paving sections-specification for material.

ISO 7390

ISO 7727 Rubber building gaskets-materials for preformed solid vulcanized structural gaskets-specification.

ISO 8339

Rubber seals-joint rings used for gas supply pipes and fittings-specification for material.

Joints in building-laboratory method of test for air permeability of joints.

Building construction-jointing products-determination of elastic recovery.

Building construction-jointing products-determination of resistance to flow.

Joints in building-principles for jointing of building components-accommodation of dimensional deviations during construction.

Building construction-jointing products-sealants-determination of tensile properties.

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ISO 8340 Building construction-jointing products-sealants-determination of tensile properties at ISO 8394 maintained extension.

ISO 9046

ISO 9047 Building construction-jointing products-determination of extrudability of one-component

ISO 9631 sealants.

ISO 10563

ISO 10590 Building construction-sealants-determination of adhesion/ cohesion properties at constant

ISO 10591 temperature.

Building construction-sealants-determination of adhesion/ cohesion properties at variable temperatures.

Rubber seals-joint rings for hot water supply pipelines up to 110oC specifications for the material.

Building construction-sealants for joints-determination of change in mass and volume.

Building construction-sealants-determination of adhesion/cohesion properties at maintained extension after immersion in water.

Building construction-sealants-determination of adhesion/cohesion properties after immersion in water.

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2.16.14 Glass and Glazing

The applicable Standards for glass and glazing are listed below:

ASTM C1036 Standard Specification for Flat Glass.

ASTM C1048

Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated

ANSI Z 97.1 Glass.

CPSC 16 CFR Safety Performance Specifications and Methods of Tests for Transport Safety Glazing Materials Used in Building.

Safety Standard for Architectural Glazing Materials. Part 1201A.

2.17 CGI SHEET ROOFING AND WALLING

Galvanized corrugated steel sheets conforming to BDS 868, Galvanized Corrugated Sheet Roof and Wall Coverings, may be used over structural framing for construction of roofs and walls. Requirements for various roofing materials including CGI sheet have been specified in Sec 2.13 above.

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