NATIONAL BUILDING CODE

FEDERAL REPUBLIC OF NIGERIA

NATIONAL BUILDING CODE

LexisNexis
Butterworths

Members of the LexisNexis Group worldwide

South Africa LexisNexis Butterworths
DURBAN 215 North Ridge Road, Morningside, 4001
JOHANNESBURG Grayston 66, 2 Norwich Close, Sandton, 2196
CAPE TOWN Ground Floor, Waterford House, 2 Ring Road, Century City, 7441

www.lexisnexis.co.za

Argentina LexisNexis Argentina, BUENOS AIRES

Australia LexisNexis, CHATSWOOD, New South Wales

Austria LexisNexis Verlag ARD Orac GmbH & Co KG, VIENNA

Canada LexisNexis Butterworths, MARKHAM, Ontario

Chile LexisNexis ChileLtda, SANTIAGO DE CHILE

Czech Republic Nakladatelstvl Orac sro, PRAGUE

France Editions du Juris-Classeur SA, PARIS

Hong Kong LexisNexis Butterworths, HONG KONG

Hungary HVG-Orac, BUDAPEST

India LexisNexis Butterworths, NEW DELHI

Ireland Butterworths (Ireland) Ltd, DUBLIN

Italy Giuffre Editore, MILAN

Malaysia Malayan Law Journal Sdn Bhd, KUALA LUMPUR LexisNexis Butterworths, WELLINGTON

New Zealand Wydawnictwo Prawnicze LexisNexis, WARSAW LexisNexis Butterworths, SINGAPORE Stampfli

Poland Verlag AG, BERNE LexisNexis Butterworths Tolley, LONDON, WC2A LexisNexis, DAYTON, Ohio

Singapore

Switzerland ISBN 0 409 02361 2

United Kingdom

USA

Printed and bound by Interpak Books Pietermaritzburg

PREFACE TO FIRST EDITION

1. In 1987, the Defunct National Council of Works and Housing directed that a National Building Code be evolved for Nigeria. All the stakeholders in the Building Industry were duly contacted for input. Thereafter the defunct Federal Ministry of Works and Housing organised a National workshop at ASCON, Badagry - Lagos State in 1989. To further fine tune the Draft National Building Code, another workshop was held at the Gateway Hotel, Ijebu-Ode, Ogun State in 1990. The product of the Ijebu-Ode Code was approved by the then National Council on Housing in 1991. Unfortunately this document was not ratified by the then Federal Executive Council for use in the Country.

2. The 1991 approved document was re-presented to the 2nd National Council on Housing and Urban Development held in Port-Harcourt, November, 2005 and the Council directed that the document be widely circulated to all stake holders for input to facilitate the production of an acceptable National Building Code.

3. Consequently, the Draft document underwent some restructuring from three (3) parts to four (4) parts as follows:

(i) Part I changes from *Administration and Environment* to *Administration;*

(ii) Part II forms *Classifications and Requirements,* subdivided into two major divisions: Sections 4 and 5 then Sections 6 - 1 2 respectively. The second division charges the major stakeholders in the Building Industry to produce her own *requirements* as per the *working tools* from Sections 4 and 5.

(iii) Part III forms the Enforcement part of the Codes. The entire Building Process is divided into four (4) convenient stages and developed under two (2) subheadings:

(a) Pre-Design Stage - Requirements and Enforcement;

(b) Design Stage - Requirements and Enforcement;

(c) Construction Stage - Requirements and Enforcement; and

(d) Post-Construction Stage - Requirements and Enforcement.

This approach does not *only* make the enforcement *functional* but its *adaptability* to the Nigerian situation makes it *efficient*

(iv) Part IV is madeup of a separate part namely, *Schedules,* where all *supportive documents, data, tables, information* and all sorts of *relevant* and *approved application forms* to *Part I, II, and III* can be found.

4. The need to evolve a National Building Code arose from the following existing conditions of our cities and environment:

(a) The absence of planning of our towns and cities;

(b) Incessant collapse of buildings, fire infernos, built environment abuse and other disasters;

(c) Dearth of referenced design standards for professionals;

(d) Use of non-professionals and quacks;

(e) Use of untested products and materials;

(f) Lack of maintenance culture.

5. In view of the above, the National Council on Housing and Urban Development deemed it necessary and initiated the process of evolving a National Building Code to put a stop to the

ugly trends in the Building Industry.

It is my hope that this National Building Code will open a new vista in the Building Industry and eliminate or reduce to the bare minimum the incidents of collapsed building syndrome in Nigeria; promote safety and qualitative housing for every Nigerian. To achieve these laudable objectives, every tier of government, (federal, state and local) must imbibe the spirit and intent of this Code. To this end, State Governments are implored to integrate the provisions of this Code into their local laws particularly those relating to Design, Construction and Maintenance (Post Construction) and efficiently monitor the implementation of the Code. I also charge the relevant professional bodies who have participated in producing this Code not to rest on their oars. They should encourage their members to religiously observe the provisions of this Code by organising various seminars to educate their members on the implications of this Code. You should self-regulate yourselves to prevent incessant governmental interventions in the practice of your professions. I must counsel various professional bodies to establish a monitoring unit to ensure effective compliance with the Code and punish erring members within the confines of the ethics of the professions in order to compliment the efforts of the Building Code Enforcement Officers.

Dr. Olusegun Mimiko

Honourable Minister of Housing and Urban Development Abuja,

2nd August 2006.

ACKNOWLEDGEMENTS

The following groups have contributed to the success of the production of this first edition of the National Building Code:

- The seven professions of the Building Industry and their respective Regulatory Bodies, i.e. Architecture, Building, Engineering, Estate Surveying and Valuation, Quantity Surveying, Surveying, and Urban and Regional Planning.
- Resource persons at various stages of the production of the Code.
- All other stakeholders in the Building Industry.

Their valuable contributions are hereby acknowledged.

2nd August 2006.

CONTENTS

DESIGN STAGE

CONSTRUCTION STAGE

POST-CONSTRUCTION STAGE

PART III ENFORCEMENT

PART IV SCHEDULES AND REFERENCES

Sections *Page*

PART I ADMINISTRATION

SECTION 1 CITATION AND COMMENCEMENT

Sections *Page*

SECTION 1 CITATION AND COMMENCEMENT

1.1 PREAMBLE:

The need to evolve a National Building Code arose from the following existing conditions of the cities and the built environment:

(a) Planlessness of our towns and cities;

(b) Incessant collapse of buildings, fire infernos, built environment abuses and other disasters;

(c) Dearth of referenced design standards for professionals;

(d) Use of non-professionals;

(e) Use of untested products and materials;

(f) Lack of adequate regulations and sanctions against offenders.

In view of the above, the National Council on Housing and Urban Development deemed it necessary to initiate the process of evolving a National Building Code with a view to proffer a lasting solution to the hazardous trends in the building construction industry.

Bearing in mind that the draft document approved for the review is based essentially on foreign codes - some of which may not have direct relevance to our environment, another salient objective of the exercise is to encourage Professionals in the building industry to produce the most appropriate Code suited to our environment for subsequent use and application.

1.2 TITLE, AIM AND SCOPE:

1.2.1 Title: *This Code* shall be known as the “National Building Code” hereinafter referred to as “This Code”.

1.2.2 Aim: The aim of this Code is to set minimum standards on Building Pre-design, designs, construction and post-construction stages with a view to ensuring quality, safety and proficiency in the building Industry.

1.2.3 Scope: The provisions of this Code shall, subject to its adoption by the states, apply to and control all matters concerning the design and specification, costing, construction, alteration, addition to, moving, demolition, location, repair and use of any building or structure, for existing or proposed building works within the Federal Republic of Nigeria.

The standards specified in this Code shall constitute the minimum requirement from which other regulations may be derived.

SECTION 2 INTERPRETATIONS, DEFINITIONS AND ABBREVIATIONS

Sections

Sections

SECTION 2 INTERPRETATIONS, DEFINITIONS AND ABBREVIATIONS

2.1 ACCESSORY STRUCTURE: shall mean a building or structure, the use of which is incidental to that of the main building and which is located on the same plot.

2.2 AGRICULTURAL BUILDING: shall mean a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. This structure shall not be a place of human habitation or a place of employment where agricultural products are processed, treated or packaged; nor shall it be a place used by the public.

2.3 AIRPLANE HANGAR (PRIVATE): shall mean a building for the storage of four or less single engine aircraft in which volatile or flammable oil is not handled, stored or kept other than that contained in the fuel storage tank of the plane.

2.4 AIRPLANE HANGAR (PUBLIC): shall mean a building for the storage, care and/or repair of private or commercial airplanes not included in the term “Private Airplane Hangar”.

2.5 ALLEY: shall mean any public way or thoroughfare between 3.0 and 4.8 metres in width, which has been dedicated or reserved for public use.

2.6 ALTER OR ALTERATION: shall mean any change, addition or modification in the design, construction, use or occupancy of any building or structure; or parts thereof; or of any appliance or building service equipment in the building or structure.

2.7 APARTMENT HOUSE: shall mean any building or portion thereof which contains three or more dwelling units and, for the purpose of this Code, includes residential condominiums.

2.8 APPROVED: shall mean approval by the Code Enforcement Division/Section/Unit or other competent authority having jurisdiction.

2.9 APPURTENANT STRUCTURE: shall mean a device or structure attached to the exterior or erected on the roof of a building, designed to support service equipment or used in connection therewith, or for advertising or display purposes, or other similar uses.

2.10 APRON WALL: shall mean that portion of a skeleton wall below the sill of a window.

2.11 AS-BUILT DRAWINGS: shall mean all architectural, structural, mechanical and electrical and other specialist drawings showing the building as built, prepared by registered architects and registered engineers and as-built survey prepared by registered surveyors.

2.12 ATRIUM: shall mean an opening through two or more floor levels other than enclosed stairways, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall.

2.13 ATTIC: shall mean the space between the roof and the ceiling of the top storey or between a dwarf wall and a sloping roof.

2.14 ATTIC (HABITABLE): shall mean an attic which has a stairway as a means of access and egress and in which the ceiling area at a height of 2.25 metres above the attic floor is not more than one-third the area of the next floor below.

2.15 BALCONY: as pertains to assembly buildings shall mean that portion of the seating space of an assembly room, the lowest part of which is raised 1.2 metres or more above the level of the main floor.

2.16 BALCONY: as pertains to Group C, H and F buildings shall mean a platform adjacent to a habitable space the lower part of which is raised 1.2 metres or more above grade.

2.17 BASEMENT: shall mean that portion of a building, which is partly or completely below ground level. This section of the building may be a part of the foundation but shall be specifically different from it, and shall contain humanly useful spaces, set out on one or more floors, but shall not extend beyond 1.20 metres above ground level to the top of ground floor level.

2.18 BAY: as applied to a structure, shall mean the space between two adjacent piers or two adjacent lines of columns.

2.19 BUILDING: shall mean any structure or enclosure of space with a roof and walls for protection of life and property.

2.20 BUILDING AREA: shall mean for purposes of site planning, the greatest horizontal area of a building above ground within the outside surface of exterior walls and the property boundary line.

2.21 BUILDING CONDITION SURVEY REPORT: shall mean a comprehensive report of the actual conditions of all the elements, components and installations of a building prepared by a consortium of registered architects, registered builders, registered engineers and registered quantity surveyors.

2.22 BUILDING HEIGHT (IN STOREYS): shall mean the number of storeys contained between the roof and the floor of the first storey.

2.23 BUILDING LINE: shall mean the line established by law, beyond which a building shall not extend, except as specifically provided by law.

2.24 BUILDING MAINTENANCE MANUAL: shall mean a comprehensive guide, which will include appropriate forms and log books for the maintenance of a building prepared by a consortium of registered architects, registered builders and registered engineers.

2.25 BUILDING PLANS: shall mean design drawings with specifications representing intent to develop a building as prepared by registered architects, structural and services drawings prepared by registered engineers and based on survey plan prepared by a registered surveyor.

2.26 BUILDING WORKS: shall mean the erection, construction, alteration, extension, repair, demolition and removal of a building or structure and shall include work in connection with material change of use and/or improvement to a building.

2.27 CERTIFICATE OF USE AND HABITATION: shall mean the certificate issued by the Code Enforcement Officer, which permits the use of a building in accordance with the provisions of law for the use and occupancy of the building in its several parts together with any special stipulations or conditions of the building permit.

2.28 CHANGE OF USE: shall mean an alteration in the use of an existing building to a new use which imposes other special provisions of law governing design building construction, equipment or means of egress.

2.29 CODE ENFORCEMENT OFFICER (C.E.O): shall mean the officer charged with the administration and enforcement of this Code.

2.30 COMBUSTIBLE MATERIAL OR CONSTRUCTION: shall mean material or construction, which cannot be classified as non-combustible, and does not meet the requirement of non-combustibility as defined in the National Fire Safety Code.

2.31 CONFLAGRATION HAZARD: shall mean the fire risk involved in the spread of fire by exterior exposure to and from adjoining buildings and structures.

2.32 CONTRACT DOCUMENTS: shall mean and include the following:

(a) Contract drawings and specifications prepared by registered architects and registered engineers;

(b) Priced Bills of Quantities prepared by a registered quantity surveyor;

(c) Construction programme, project quality management plan, project health and safety plan prepared by a registered builder;

(d) Conditions of contract;

(e) All-risk insurance for the building works, personnel and equipment.

2.33 CONTRACTOR: shall mean a person or firm who contracts with an owner or his authorised agent to undertake the execution of a project.

2.34 CORRIDOR: shall mean a covered passageway, which limits means of egress to a single path of travel.

2.35 COURT: shall mean a space open and unobstructed to the sky, bounded on three or more sides by walls of a building or other enclosing devices.

2.36 DEAD LOAD: shall mean the weight of all permanent structural and non-structural components of a building.

2.37 DEMOLITION WORKS: shall mean work carried out in the process of pulling down of the super-structure of a building and/or the removal of, or material alteration to the sub-structure, as may be required.

2.38 DEVELOPMENT: shall mean the carrying out of any building, engineering, mining or other operations in, on, over or under any land, or the making of any environmentally significant change in the use of any land or demolition of buildings including the felling of trees and the placing of free-standing erections used for the display of advertisements on the land and the expression “develop” with its grammatical variations shall be construed accordingly.

2.39 DEVELOPMENT PERMIT: shall mean permission to develop any land or building granted by the Planning Authority under the Nigeria Urban and Regional Planning Law.

2.40 DEVELOPMENT PLAN: shall mean a plan indicating how an area of land is to be developed as approved by the appropriate authority.

2.41 DUPLEX: shall mean a residential unit comprising two identical dwellings separated by a common wall.

2.42 DWELLING UNIT: shall mean any building or portion thereof which contains living facilities, including provisions for sleeping, eating, cooking and sanitation, as required by this code for not more than one family.

2.43 ELEMENT: shall mean components of a building or structure such as wall, floor, and roof.

2.44 EARTHQUAKE LOAD: the assumed lateral load acting in any horizontal direction on the structural frame due to the kinetic action of earthquakes.

2.45 EXIT: shall mean that portion of a means of egress which is separated from all other spaces of a building or structure by construction or equipment as required in this code to provide a protected way of travel to the exit discharge.

2.46 FACTORY: shall mean a building or structure where activities such as breaking down, building up, and manufacturing of elements, products, components, and materials are carried out by at least ten (10) people.

2.47 FIRE SERVICE CONNECTION: shall mean a connection for fire department use in supplementing or supplying water for standpipes or sprinkler systems.

2.48 FIRE COMPARTMENT: shall mean an enclosed space in a building that is separated from all other parts of the building by enclosing construction providing a fire separation having a required fire-resistance rating.

2.49 FIRE GRADING: shall mean the fire hazard classification of a building or structure in hours or fractions thereof established for its use group and occupancy.

2.50 FIRE STOPPING: shall mean building materials installed to prevent the movement of flame and gases to other areas of a building through small concealed passages in building components such as floors, walls and stairs.

2.51 FIRE WALL: shall mean a type of fire separation of non-combustible construction which subdivides a building or separates adjoining buildings to resist the spread of fire and which has a fire-resistance rating as prescribed in this code and has the structural stability to remain intact under fire conditions for the required fire-rated time.

2.52 FLOOR AREA (GROSS): shall mean the floor area within the perimeter of the outside walls of the building under consideration, without deduction for hallways, stairs, closets, thickness of walls, columns, or other features.

2.53 FLOOR AREA (NET): for the purpose of determining the number of persons for whom exits are to be provided, net floor area shall be the actual occupied area, not including accessory unoccupied areas or thickness of walls.

2.54 FLOOR FILL: shall mean the fill between the structural floor (arch or slab) and the finished flooring.

2.55 FOUNDATION: shall mean a system or arrangement of structural members through which the loads from a building are transferred to supporting soil or rock.

2.56 GARAGE (PRIVATE): shall mean a garage in which only motor vehicles used by the occupants of the building or buildings on the premises are stored or parked.

2.57 GARAGE (PUBLIC): shall mean any garage other than a private garage and shall include those where provision is made for the servicing, repair, painting or fuel-dispensing to motor vehicles.

2.58 GRADE: as applied to the determination of building height shall mean a reference plane representing the average of finished ground level adjoining the building at all exterior walls. When the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the plot line or, when the plot line is more than 1.8 metres from the building, between the building and a point 1.8 metres from the building.

2.59 GUARD: shall mean a protective barrier around openings in floors or at the open sides of stairs, landings, balconies, mezzanines, galleries, raised walkways or other locations to prevent accidental openings through it.

2.60 HABITABLE SPACE (ROOM): shall mean space in a structure for living, sleeping, eating or cooking. Bathrooms, toilets compartments, closets, halls, storage or utility space, and similar areas, are not considered habitable space.

2.61 HALLWAY: shall mean an enclosed passageway which limits means of egress to a single path of travel.

2.62 HAZARDOUS PRODUCTION MATERIAL (HPM): shall mean a solid, liquid or gas that

has a degree of hazard rating in health, flammability or reactivity as ranked in the relevant building standard, and which is used directly in research, laboratory or production processes.

2.63 HEIGHT OF BUILDING: shall mean the vertical distance from grade to the top of the highest roof beams or coping of a flat roof, or to the average height of the highest gable of a pitched or hipped roof. The height of a stepped or terraced building is the maximum height of any segment of the building.

2.64 HEREAFTER: shall mean after the time that this Code becomes effective.

2.65 HERETOFORE: shall mean before the time that this Code becomes effective.

2.66 HOLLOW: a masonry unit whose net cross-sectional area in any plane parallel to the bearing surface is less than 75% of its gross cross-essential area measured in the same plane.

2.67 HORIZONTAL SERVICE SPACE: shall mean a space such as an attic, duct, ceiling, roof or crawl space oriented essentially in a horizontal plane, concealed and generally inaccessible, through which building service facilities such as pipes, ducts and wiring may pass.

2.68 INSPECTION (SPECIAL): shall mean professional supervision as herein required for the installation, fabrication, erection or placement of components and/or connections requiring special expertise to ensure adequacy.

2.69 IMPACT LOAD: the load resulting from moving machinery, elevators, crane ways, vehicles, and other similar forces and kinetic loads.

2.70 LIVE LOAD: the weight of all non-permanent structural and non-structural components in a building such as occupants and their possessions (furniture, objects, equipment).

2.71 LOAD BEARING: as applied to a building element shall mean subjected to or designed to carry loads in addition to its own dead load, except a wall element subjected only to wind or earthquake loads in addition to its own dead load.

2.72 LOAD: shall mean forces or other actions that arise on structural systems from the weight of all permanent construction, occupants and their possessions, environmental effects, differential settlement and restrained dimensional changes.

2.73 MAISONETTE: shall mean a self-contained residential unit on more than one floor which is vertically or horizontally separated from one or more similar units in a stack in the same building.

2.74 MATERIAL ALTERATION: shall mean any alteration of an existing building which adversely affects its compliance with the requirements of this Code, for example, the obstruction of corridors which serve as means of escape in case of fire, the blocking of ventilation openings or the substitution of materials or components with inferior fire resistance ratings.

2.75 MATERIAL CHANGE OF USE: shall mean the alteration of the use of land or after occupancy of a building or structure for a purpose other than for which it was originally designed or approved.

2.76 MEANS OF EGRESS: shall mean a continuous and unobstructed path of travel from any point in a building or structure to a public way, and consist of three separate and distinct parts:

(a) the exit access,

(b) the exit, and

(c) the exit discharge.

A means of egress comprises the vertical and horizontal means of travel and shall include intervening room spaces, doors, hallways, corridors passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

2.77 MEMBRANE: as pertains to membrane structures, shall mean a thin, flexible, impervious material capable of being supported by air pressure.

2.78 MEZZANINE(S): shall mean an intermediate level or levels between the floor and ceiling of any room or storey in a building and includes an interior balcony of not more than 30% of the lower floor area.

2.79 MINISTER: shall mean the Minister for Housing and Urban Development.

2.80 MINISTRY: shall mean the Ministry charged with Housing and Urban Development matters.

2.81 NON-COMBUSTIBLE CONSTRUCTION: shall mean that type of construction in which a degree of fire safety is attained by the use of non-combustible materials for structural members and other building assemblies.

2.82 OCCUPANCY: shall mean the purpose for which a piece of land or building or part thereof, is used or intended to be used.

2.83 OCCUPANT LOAD: shall mean the total number of persons for which a building or part thereof is designed to shelter or support (accommodate) at any one time.

2.84 PARTITION: shall mean an interior wall 1-storey or part storey in height that is not load bearing.

2.85 PARTY WALL: A firewall on an interior plot line used or adapted for joint service between two buildings.

2.86 PEDESTRIAN WALKWAY: shall mean a walkway used exclusively as a pedestrian traffic way.

2.87 PENT HOUSE: shall mean an enclosed structure above the top floor of a building other than a roof structure or bulk head, occupying not more than one third of the roof area.

2.88 PERMIT: shall mean an official document or certificate issued by the Code Enforcement Division/Section/Unit authorising the performance of a specified activity regulated by this Code.

2.89 PLOT: shall mean a portion or piece of land considered as a unit as delineated by survey plan.

2.90 POST-DISASTER BUILDING: shall mean a building essential to provide services in the event of a disaster and includes hospitals, fire stations, radio stations, telephone exchanges, power stations, pumping stations, etc.

2.91 POSTED SIGN: shall mean the tablet, card, or plate which defines the use, occupancy, fire grading and floor loads of each storey, floor or parts thereof for which the building or part thereof has been approved.

2.92 PUBLIC BUILDING: as applying to requirements for the design of buildings for physically challenged persons shall mean buildings to which the public is admitted such as assembly halls and theatres, places of worship, etc. taking into consideration the required facilities for the physically challenged persons.

2.93 PUBLIC WAY: shall mean any street, alley or other parcel of land open to the outside air leading to a public street, deeded, dedicated or otherwise permanently appropriated to the public for public use and having a clear width of not less than 3 metres.

2.94 PHYSICALLY CHALLENGED: shall mean people with physical impairment which limits their ability to use a building effectively.

2.95 REGISTERED PROFESSIONAL: shall be a technically and legally qualified person who has a valid registration/licence to practice the profession, issued by the relevant

statutory regulatory bodies established for the control of that profession in Nigeria.

2.96 REQUIRED: as applied to the provisions of this Code, shall be construed to be mandatory.

2.97 RISER: as applied to plumbing, means the vertical supply pipes in a sprinkler system or straw-pipe system.

2.98 RISER: as applied to stairways shall be the vertical interval between two steps (treads).

2.99 SEMI-DETACHED: shall mean two dwelling units separated by a common wall.

2.100 SERVICE CORRIDOR: shall mean a fully enclosed passage used for transporting materials (particularly HPMs) and for purposes other than required exiting.

2.101 SHAFT: shall mean a vertical opening through a building extending through one or more storeys and may be covered or open.

2.102 SHALL: as used in this code shall be construed to be mandatory.

2.103 STREET: is any thoroughfare or public way, not less than 10.0m in width (i.e. 6400mm for vehicles, 600mm and 1200mm for drainage and pedestrian walkway on both sides respectively) which has been dedicated or deeded to the public for public use.

2.104 STRUCTURE: shall mean that which is built or constructed of parts joined together in some definite manner.

2.105 STAND-PIPE (A STANDPIPE SYSTEM): shall mean an arrangement of piping, valves, hose outlets and allied equipment installed in a building or structure, for the purpose, of extinguishing a fire through the discharge of water in streams or sprays from hoses or nozzles attached to such outlets. The water shall be supplied from water supply systems or by pumps, tanks and other equipment necessary to provide adequate supply of water to the outlets.

2.106 STOREY: shall mean that portion of a building which is situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.

2.107 STOREY, FIRST: shall mean the lowest storey having its ceiling more than 1.8m above ground or having its finished floor surface not more than 1.2m below ground for more than 50% of the total perimeter.

2.108 STAIRWAY: shall mean one or more flights of stairs and the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one floor to another. A flight of stairs for the purposes of this Code shall have at least three risers.

2.109 SURVEY PLAN: shall mean a plan which provides perimeter and typographical survey information made in accordance with Survey Regulations prepared and signed by a registered surveyor.

2.110 SOLID: a masonry unit whose net cross-sectional area in any plane parallel to the bearing surface is 75% or more of its cross-sectional area measured in the same plane.

2.111 TENURE: shall mean the duration appointed officers shall serve.

2.112 TERRACE HOUSING: shall mean three or more dwelling units on one or more floors separated from one another by a fire wall.

2.113 THEATRE: shall mean a place of public assembly intended for the production and reviewing of the performing arts or the screening and viewing of motion pictures, and consisting of an auditorium with permanently fixed seats intended solely for an audience.

2.114 TITLE DEED: shall mean a document indicating ownership, location, size, tenure or other requirements of law signed and registered by appropriate authority.

2.115 TREADS: as applied to stairways shall mean the horizontal surfaces separated by a riser.

2.116 USE: shall mean the purpose for which the building or structure is designed, used or intended to be used.

2.117 USE ACCESSORY: shall mean a use incidental to the principal use of a building as defined or limited by the provisions of the local zoning laws.

2.118 USE GROUP: shall mean the classification of a building or structure based on the purpose for which it is intended or used.

2.119 UNSAFE CONDITION: shall mean any condition that could cause hazard to life, safety, or health of any person authorised, or expected to be on or about the premises.

2.120 VENTILATION: shall mean the natural or mechanical process of supplying conditioned or unconditioned air to, or removing stale or foul air from any space.

2.121 VENTILATION CEILING: shall mean a suspended ceiling containing many small apertures through which air, at low pressure, is forced downward from an overhead plenum dimensioned by the concealed space between suspended ceiling and the floor or roof above.

2.122 V.I.P. LATRINE: Ventilated improved pit latrine shall mean an accommodation used for defecation or urination which is not equipped with a flushing water system, but has ventilating pipes with exposed and screened outlets placed at a minimum of 600mm above a flat roof, or 600mm above the eaves of a pitched roof.

2.123 VERTICAL SERVICE SPACE: shall mean a shaft essentially oriented vertically that is provided in a building to facilitate the installation of building services including mechanical, electrical and plumbing installation and facilities such as elevators, refuse chutes and lined chutes.

2.124 WORKING DRAWINGS AND SPECIFICATIONS: shall mean all drawings and specifications prepared by registered architect and registered engineers and issued for construction.

2.125 WRITTEN NOTICE: shall mean a notification in writing delivered to the individual or parties intended.

2.126 YARD: shall mean an unoccupied open space other than a court.

2.127 ZONING: shall mean the reservation of certain specific areas within a community or city for specific types of buildings and structures, or use of land for certain purposes with limitations such as height, plot coverage, and other stipulated requirements.

SECTION 3
THE ESTABLISHMENT OF A BUILDING CODE ADVISORY COMMITTEE (BCAC)

Sections *Page*

SECTION 3 THE ESTABLISHMENT OF A BUILDING CODE ADVISORY COMMITTEE (BCAC)

3.1 A Building Code Advisory Committee (BCAC) hereinafter referred to as “The Committee” is hereby established, and shall be answerable administratively and operationally to the Minister.

It shall be the duty of the Minister to brief the National Council on Housing and Urban Development on activities of the Committee.

3.1.1 Composition: The Committee members shall consist of duly registered practitioners of not less than ten years post-registration experience in the following professions:

— Architecture;

— Building;

— Engineering;

— Urban and Regional Planning;

— Estate Surveying and Valuation;

— Quantity Surveying;

— Land Surveying.

And representatives of:

— Federal Ministry of Environment;

— Federal Ministry of Health;

— Federal Fire Service;

— Standards Organisation of Nigeria;

— Federal Ministry of Housing and Urban Development;

— Relevant Non-Governmental Organisation;

— Six state representatives (relevant to the building industry) each from the six geopolitical zones of the country whose tenure shall be rotational.

3.1.2 Appointment: The Minister charged with the responsibility for housing and urban development matters shall appoint in consultation with relevant professional bodies members of the Committee.

3.1.3 Constitution of the Committee: The Committee shall consist of a Chairman and nineteen members.

3.1.4 Appointment of Chairman: The Chairman of the Committee shall be appointed by the Minister.

3.1.5 Functions:

a) The Committee shall be responsible for the periodic review of this Code and any other functions incidental thereto or assigned to it by the Minister from time to time.

b) The Committee shall recommend for the Minister's approval members of the Technical Sub-committees established under this Code.

3.1.6 Tenure: The members of the Committee and the Sub-committees shall be appointed for a period of three (3) years. They are eligible for re-appointment for another term of three years only.

3.1.7 Quorum: The meeting of the Committee shall form a quorum by the presence of not less than one-third of the members including the Chairman.

3.1.8 Meetings of the Committee:

a) The Committee shall meet at least twice a year.

b) All meetings of the Committee shall be approved by the Minister.

3.1.9 Secretariat: The Ministry shall provide a secretariat for the Committee.

3.1.10 Establishment of Technical Sub-committee: The Minister shall on the recommendation of BCAC, approve the appointment of Technical Sub-committees, representatives of which shall also be members of Committee.

3.1.11 Functions of the Technical Sub-committee: The Sub-committees shall assist the Committee on specialised matters listed hereafter and others that the Committee may assign to it from time to time.

3.1.12 Types of Sub-committees: The following four Technical Sub-committees shall be established with the composition consisting of relevant professionals in the building industry and shall be recommended by the Committee, approved by the Minister:

1. Pre-design - Physical Planning, Health and Environmental subcommittee.
2. Designs - Architectural and Engineering Designs and Specifications Subcommittee.
3. Construction - Materials, Methods and Construction Sub-committee.
4. Post-Construction - Occupancy and Maintenance Sub-committee.

3.1.13 Meetings of the Technical Sub-committee: The Technical Sub-committee shall meet as and as when appropriate.

PART II TECHNICAL (PROFESSIONALS)

SECTION 4 BUILDING DESIGN CLASSIFICATIONS

Sections *Page*

SECTION 4 BUILDING DESIGN CLASSIFICATIONS

4.1 General:

4.1.1 The provisions of this Part shall establish the classification of all buildings and structures as to use group.

4.1.2 The provisions of this Part shall not be deemed to nullify any provisions of the relevant Urban and Regional Planning Law or any other statute of the jurisdiction pertaining to the location or use of buildings.

4.2 Classifications:

4.2.1 Every building or structure whether existing or hereafter erected shall be as classified in this Code according to its use or character of its occupancy into one of the Use Groups listed below:

(i) Use group A — Assembly
(ii) Use group B — Business and Professional
(iii) Use group C — Education
(iv) Use group D — Factory and Industries
(v) Use group E — High Hazard
(vi) Use group F — Institutional
(vii) Use group G — Mercantile
(viii) Use group H — Residential
(ix) Use group I — Storage
(x) Use group J — Mixed Use and Occupancy
(xi) Use group K — Doubtful Use Classification
(xii) Use group L — Utility and Miscellaneous

4.2.1.1 All buildings and structures shall also be graded in accordance with the degree of fire hazard as contained in Part I, section 7 of the National Fire Code.

4.3 USE GROUP A - ASSEMBLY USES

4.3.1 Use Group A: All buildings and structures or parts thereof shall be classified in Use Group A which are used or designed for the gathering together of persons for purposes such as civic, social or religious functions, recreation, food or drink consumption or awaiting transportation. A room or space used for assembly purposes by less than fifty (50) persons and which is accessory to another use group shall be included as part of that main use group.

4.3.2 Use Group A-1 Theatres: This use group shall include all theatres and all other buildings and structures, or parts thereof, intended for the production and viewing of the performing arts or motion pictures and usually provided with fixed seats, including theatres, motion picture theatres and television and radio studios admitting an audience (shall comply with section 8.17).

4.3.3 Use Group A-2 Structures: This use group shall include all buildings and places of public assembly, without theatrical stage accessories, designed for use as dance halls, night clubs and for similar purposes, including all rooms, lobbies and other spaces connected

thereto with a common means of egress and entrance.

4.3.4 Use Group A-3 Structures: This use group shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation, an incidental motion picture, dramatic or theatrical presentations, lectures or other similar purposes without theatrical stage other than a raised platform; and principally used without permanent seating facilities, including art exhibition halls, museums, lecture halls, libraries, restaurants other than night clubs, and recreation centres; and buildings designed for other similar assembly purposes including passenger terminals.

4.3.5 Use Group A-4 Structures: This use group shall include all buildings used as churches, mosques and for other similar religious purposes.

4.3.6 Use Group A-5, Outdoor Assembly: This use group shall include structures used for outdoor assembly intended for participation in or reviewing activities including grandstands, stadiums, amusement park structures and fair or carnival structures. Such structures shall comply with the provisions of this Code for special uses and occupancies (see Chapter 8).

4.4 USE GROUP - B - BUSINESS USES AND PROFESSIONAL USES

4.4.1 General: All buildings and structures, or parts thereof, shall be classified in use Group B which are used for the transaction of business, for the rendering of professional services, or for other services, or for services that involve stocks of goods, wares or merchandise in limited quantities for use incidental to office uses or sample purposes.

4.4.2 List of business and professional uses: The uses listed in Table 4.4.3. are indicative of and shall be classified as Use Group B.

TABLE 4.4.3 USE GROUP B - BUSINESS USES

Animal hospitals, kennels, pounds.
Automobile and other motor vehicle showrooms.
Banks.
Barber's shops.
Beauty shops.
Car wash.
Civic administration.
Clinic out-patient.
Dry cleaning, laundries.
Pick-up and delivery stations and self service.
Electronic data processing.
Fire stations.
Laboratories: testing and research.
Police stations.
Post offices.
Professional services.
Radio and television stations.
Telephone exchanges.
Other similar uses.

4.5 USE GROUP C - EDUCATIONAL USES

4.5.1 General: All buildings and structures or part thereof other than those used for business or vocational training, shall be classified in Use Group C which are used by more than five persons at one time for educational purposes through secondary school including, among others, schools and academics. Educational type uses with a total occupant load of less than 5 shall be classified as Use Group B. School buildings or parts thereof for business or vocational training shall be classified in the same use group as the business or vocation taught.

4.5.2 Day care facilities: A day care facility which provides care for more than 5 persons more than 2 years of age for less than 24 hours per day shall be classified as Use Group H.

4.6 USE GROUP D - FACTORY AND INDUSTRIAL USES

4.6.1 General: All buildings and structures, or part thereof, in which occupants are engaged in performing work or labour in the fabricating, assembling or processing of products or materials shall be classified in Use Group D: including, among others, factories, assembling plants, industrial laboratories and all other industrial and manufacturing uses, except those of Use Group E involving highly combustible, flammable or explosive products and materials.

4.6.2 Use Group D-1 Structures: Factory and industrial use which involve the fabrication or manufacturing of combustible materials which during finishing, packing or processing involve moderate fire hazard shall be classified as Use Group D-1.

4.6.3 Use Group D-2 Structures: Factory and industrial use which involve the fabrication or manufacturing of non-combustible materials which during finishing, packing or processing do not involve a significant fire hazard shall be classified as Use Group D-2. Except as herein provided, building of Use Group D-2 shall comply with the requirements of this Code for buildings of Use Group D-1. The manufacturing processes listed below(Table 4.6.3) shall be indicative of and included in Use Group D-2.

TABLE 4.6.4

USE GROUP D-1 MODERATE HAZARD FACTORY AND INDUSTRIAL USES

Aircraft.	Motion picture and television.
Appliances.	Musical instruments.
Athletic equipment.	Optical goods.

Automobile and other motor vehicles.	
Bakeries.	Paper mills or products.
Beverages, alcoholic.	Plastic products.
Boat Building.	Printing or Publishing.
Brooms or brushes.	Recreational vehicles.
Business machines.	Shoes.
Cameras and photo equipment.	Soaps and detergents.
Canneries, including food products	Sugar refineries.
Clothing.	Textile mills including canvas, cotton, cloth, bagging, burlap, carpets and rags.
Condensed and powered milk manufacture.	Tobacco.
Construction and agriculture machinery disinfectants.	Upholstery and manufacturing shops.
Dry-cleaning using other than flammable liquids in cleaning or dyeing operations or other than classified in Table 5.7.2.(a).	
Electric light plants and power houses	
Electrolytic reducing works.	
Electronics.	
Engines, including rebuilding.	
Film, photographic.	
Food processing.	
Furniture and jute products.	
Laundries.	
Leather and tanneries machinery.	
Mill work and wood working, wood distillation.	

TABLE 4.6.5

USE GROUP D-2 LOW HAZARD FACTORY AND INDUSTRIAL USES

Beverages, non-alcoholic.	Gypsum.
Brick and masonry.	Ice.
Ceramic products.	Metal fabrication and assembly.
Foundries.	Water pumping plants.
Glass products.	

4.7 USE GROUP E - HIGH HAZARD

4.7.1 General: All buildings and structures, or part thereof, shall be classified in Use Group E which are used for the manufacturing, processing, generation or storage of corrosive, highly toxic, highly combustible, flammable or explosive materials that constitute a high fire or explosion hazard, including loose combustible fibres, dust and unstable materials.

4.7.2 List of high hazard uses: The processes, materials and products manufacturers listed in Table 4.7.2(a) are indicative of and shall be classified as Use Group E.

EXCEPTION: The following shall not be classified as Use Group E.

(i) Any building or portion of a building containing less than the exempt amount of those materials shown in Table 4.7.2(b) when maintained in accordance with the Fire Prevention Code listed in the Schedule.

(ii) Buildings containing rooms conforming to the special use and occupancy as stipulated in this Code requirements and the National Fire Safety Code listed in the Schedule for such hazardous material.

(iii) Rooms containing flammable liquids in tightly-closed containers of 4.5 litre capacity or less for retail sale or private use on the premises and in quantities not exceeding 8.2m^2 of room area.

(iv) Rooms used for preparation or storage of food products for retail sale on the premises.

(v) Retail paint salesroom with quantities of paint not exceeding 8.2m^2 of room area.

(vi) Liquor stores and distributors without bulk storage.

(vii) The storage or use of materials for agricultural purposes for use on the premises.

(viii) Closed systems housing flammable or combustible liquids or gases used for the operation of machinery or equipment.

(ix) Cleaning establishment which utilise combustible liquid solvents having a flash point of 60 degrees C, or higher in closed systems employing equipment listed by an approved testing laboratory, provided this use is separated from all other areas of the building by 1 hour fire-resistance rated construction.

(x) Cleaning establishments which utilise a liquid solvent having a flash point at or above 93 degrees C.

(xi) Refrigeration systems.

(xii) The retail stores without bulk storage.

TABLE 4.7.2.(a) USE GROUP E - HIGH HAZARD USES

— Bulk storage of tires.

— Combustible dust and any similar material sufficiently comminute for suspension in still air which, when so suspended, is capable of self-sustained combustion.

— Combustible fibres and any similar readily ignitable and free burning fibres such as cotton wool, sisal, henequen, jute, hemp, tow, cocoa fibre, baled wastepaper, kapok, hay, straw, excelsior and other like material.

— Combustible liquids having flash points at or above 38 degrees C. Combustible liquids shall be subdivided as follows:

— Class II liquids shall include those having flash points at or above 38 degrees C., and below 60 degrees C.,

— Class III-A liquids shall include those having flash points at or above 60 degrees C. and below 93 degrees C.

— Corrosive liquids which, when in contact with living tissue, will cause severe damage to such tissue by chemical action or are liable to cause fire when in contact with organic matter or with certain chemicals such as acids and alkaline caustic liquids.

— Explosive material and any chemical compound, mixture or device, the primary and com mon purpose of which is to function by explosion with substantially simultaneous release of gas and heat, the resultant pressure being capable of destructive effects.

— Flammable liquids having a flash point below 23 degrees C (73 degrees F.) and having a vapour pressure not exceeding (276 kpa at 38 degrees C, and may be subdivided as follows:

— Class 1-A shall include those having flash point below 23 degrees C. (73 degrees F.) and having a boiling point below 38 degrees
— Class 1-B shall include those having flash point below 23 degrees C. (73 degrees F.) and having a boiling point at or above 38 degrees C
— Class 1-C shall include those having flash below 23 degrees C. and below 38 degrees
— The flash point of liquids having a flash point at or below 79 degrees C F.) except for fuel oils and certain viscous materials, shall be determined in accordance with ASTM D56 listed in the Schedule.
— The flash point of liquids having a flash point above 79 degrees C., except for fuel oils, shall be determined with ASTM D92 listed in the Schedule.
— The flash point of fuel oil and certain viscous materials having a flash point or below 75 degrees C. shall be determined in accordance with ASTM D93 listed in the Schedule.
— Flammable gas having a flammability range with air greater than 1 percent by volume which is a liquid while under pressure and having a vapour pressure in excess of 186 KPa at a temperature of 38 degrees C.
— Flammable solids and any similar solid substance other than one classified as explosive, which is liable to cause fires through friction, through absorption of moisture, through spontaneous chemical change or as a result of retained heat from manufacturing or processing.
— Liquefied petroleum gas which is composed predominantly of the following hydrocarbons or mixtures of them, such as: propane, propylene, butane (normal butane or isobutane) and butylenes.
— Nitromethane which is a combustible liquid which at 315 degrees C. and to 6309 KPa de composes explosively and is an unstable material.
— Oxidising materials and any similar substances that readily yield oxygen to stimulate com bustion, such as sodium-nitrate, potassium chlorate and pyroxylin plastic.
— Organic peroxide.

— Unstable materials which polymerise, decompose, condense or become self-reactive when exposed to air, water, stock or pressure.

TABLE 4.7.2.(*b*)

EXEMPT AMOUNTS OF HAZARDOUS MATERIALS LIQUIDS AND CHEMICALS

MATERIAL	MAXIMUM QUANTITIES

1.	Flammable liquids	
	Class 1-A	120 litres
	Class 1-B	240 litres
	Class 1-C	360 litres
2.	Combustible liquids	
	Class II	480 litres
	Class III-A	1000 litres
3.	Combination flammable liquids	480 litres
4.	Flammable gases	84m^3 at one atmosphere of pressure at 21°C
5.	Liquefied flammable gases	240 litres
6.	Combustible fibres-loose	2.8m^3
7.	Combustible fibres-baled	28m^3
8.	Flammable solids	227. kg
9.	Unstable materials	No exemptions
10.	Corrosive liquids	220 litres
11.	Oxidising material-gases	168m^3
12.	Oxidising materials-liquids	200 litres
13.	Oxidising material-solids	227. kg
14.	Organic peroxides	4.54 kg
15.	Nitromethane (unstable materials)	No exemptions
16.	Ammonium nitrate	454 kg
17.	Ammonium nitrate compound mixtures containing more than 60% nitrate by weight	454 kg
18.	Highly toxic material and poisonous gas	No exemptions
19.	Smokeless powder	9.08 kgd
20.	Black sporting powder	2.27 kgd

Notes:

a) Containing not more than the exempt amounts of Class 1-A, 1-B or 1-C flammable liquids.

b) The maximum quantities shall be increased by 100 percent in areas which are not accessible to the public. In buildings where automatic fire suppression systems are installed, the maximum quantities shall be increased by 100 percent in the areas accessible to the public.

c) Tank storage up to 2,640 litres for fuel burning equipment meeting the requirements of the mechanical code or the fire prevention code listed in the Schedule shall be permitted.

d) Maximum quantities in the amount specified by NFiPA 495 shall be permitted when stored in accordance with NFiPA 495 listed in the Schedule.

e) 1 gallon = 0.00379m^3 or 4 litres: 1 cubic foot = 0.028m^3: 1 pound = 0.454 kg.

4.8 USE GROUP F - INSTITUTIONAL USE

4.8.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group F in which people suffering from physical limitations because of health or age are harboured

for medical or other care or treatment, or in which people are detained for penal or correction purposes, or in which the liberty of the inmates is restricted.

4.8.2 Use Group F-1: This use group shall include buildings or parts thereof housing six or more individuals who, because of age, mental disability or other reasons, must live in a supervised environment but who are physically capable of responding to an emergency situation without personal assistance. The following types of facilities when accommodating persons of the above description shall be classified as an F-1 facility: board and care facility, half-way house, group home, social rehabilitation facility, alcohol and drug centre and convalescent facility. A facility such as the above with five or less occupants shall be classified as a residential use group.

4.8.3 Use Group F-2: This use group shall include buildings or parts thereof used for medical, surgical, psychiatric, nursing or custodial care on a 24-hour basis of six or more persons who are not capable of self-protection. The following types of facilities, when accommodating persons of the above description, shall be classified as F-2 facilities: hospital, nursing home (both intermediate care facility). A facility such as the above with five or less occupants shall be classified as a residential use group.

4.8.4 Child care facility: A child care facility which accommodates more than five children of 4 years of age or less shall be classified as Use Group F-2.

4.8.5 Use Group F-3: This use group shall include buildings or parts thereof inhabited by six or more persons who are under some restraint or security. The F-3 facility is occupied by persons who are generally incapable of self-protection due to security measures not under the occupants' control. The following types of facilities when accommodating persons of the above description shall be classified as F-3 facilities: prisons, jails, reformatories, detention centres, correctional centres and pre-release centres. Buildings of Use Group F-3 shall be classified as one of the sub-classifications indicated in sections 4.8.7 through 4.8.10.

4.8.6 Use Conditions I: This use condition shall include all buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress without restrain. A Use Condition I facility shall be classified in Use Group H.

4.8.7 Use Conditions II: This use condition shall include all buildings in which free movement is allowed from sleeping areas, and any other occupied smoke compartment to one or more other smoke compartments. Egress to the exterior is impeded by locked exits.

4.8.8 Use Condition III: This use condition shall include all buildings in which free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping rooms and group activity space, with egress impeded by remote control release of means of egress from such smoke compartment to another smoke compartment.

4.8.9 Use Condition IV: This use condition shall include all buildings in which free movement is restricted from an occupied space. Remote controlled release is provided to permit movement from all sleeping rooms, activity space and other occupied areas within the smoke compartment and to other smoke compartments.

4.8.10 Use Condition V: This use condition shall include those classified in Use Group G which are used for display and sales purposes involving stocks of goods, wares or merchandise incidental to such purposes and accessible to the public; including, among others, retail stores, motor fuel service stations, shops and salesroom and markets. Highly combustible goods shall be limited to small quantities that do not constitute a high hazard; and if not so limited, the construction shall comply with the requirements for Use Group E as set forth in the provisions of section 4.7.2 and Tables 4.7.2.(a) and
4.7.2. (b).

4.9 USE GROUP G - MERCANTILE USES

4.9.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group G which are used for display and sales purposes involving stocks of goods, wares or merchandise incidental to such purposes and accessible to the public; including, among others, retail stores, motor fuel service stations, shops and salesroom and markets. Highly combustible goods shall be limited to small quantities that do not constitute a high hazard; and if not so limited, the construction shall comply with the requirements for Use Group E as set forth in the provisions of section 4.7.2 and Tables
4.7.2. (a) and 4.7.(b).

4.10 USE GROUP H - RESIDENTIAL USES

4.10.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group H in which families or households live, or in which sleeping accommodations are provided for individuals with or without dining facilities, excluding those that are classified as institutional buildings.

4.10.2 Use Group H-1 Structures: This use group shall include all hotels, motels, boarding houses and similar buildings arranged for shelter and sleeping accommodations and in which the occupants are primarily transient in nature.

4.10.3 Use Group H-2 Structures: This use group shall include all multiple-family dwellings having more than two dwelling units, except as provided in sections 12.2. and
12.3 for multiple single-family dwelling units, and shall also include all boarding houses and similar buildings arranged for shelter and sleeping accommodations in which the occupants are primarily not transient in nature.

4.10.4 Dormitories: A dormitory facility which accommodates more than five persons more than 4 years of age shall be classified as Use Group H-2.

4.10.5 Use Group H-3 Structure: This use group shall include all buildings arranged for the use of one or two family dwelling units, including not more than five lodgers or boarders per family, and as provided in sections 12.2 and 12.3 for multiple single-family dwelling units.

4.10.6 Child care facilities: A child care facility which accommodates five or less children of any age shall be classified as Use Group H-3.

4.10.7 Use Group H-4 Structures: This use group shall include all detached one-or- two family dwellings not more than three storeys in height, and their accessory structures.

4.11 USE GROUP I - STORAGE USES

4.11.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group I which are used primarily for the storage of goods, wares or merchandise, except those of Use Group E that involve highly combustible or explosive products or materials; including, among others, warehouse, storehouses and freight depots.

4.11.2 List of moderate hazard uses: Buildings used for the storage of moderate hazard contents which are likely to burn with moderate rapidity, but which do not produce either poisonous gases, fumes or explosives, including, among others, the materials listed in Table 4.11.1., shall be classified in Use Group I-1.

TABLE 4.11.1.

USE GROUP I-1 STORAGE USES, MODERATE HAZARD

Bags, cloth, burlap and paper.	Linoleum.
Bamboo and rattan.	Livestock shelters.
Baskets.	Lumber yards.
Belting, canvas and leather.	Motor vehicle repair shops.
Books and paper in rolls or packs.	Petroleum warehouses for storage of lubricating oils with a flash point of 93.33 degrees Celsius (200 degrees Farenheit) or higher.
Boots and shoes.	Photo engraving.
Buttons, including cloth. Covered, pearl or bone.	Public garages (Group 1) and stables.
Cardboard and cardboard boxes.	Silk.
Clothing, woollen wearing apparel.	Soap.
Cordage.	Sugar.
Furniture.	Tobacco, cigars, cigarettes and snuff.
Furs.	Upholstering and mattress manufacturing.
Glue, mucilage, paste and size.	Wax candles.
Horn and combs, other than celluloid.	
Leather, enamelling.	
Japanning.	

TABLE 4.11.2.(a)

USE GROUP I-1 STORAGE USES, NON-COMBUSTIBLE

Asbestos.

Beer or wine up to 12% alcohol in metal, glass or ceramic containers.

Cement in bags.

Chalk.

Foods in non-combustible containers.

Fresh fruits and vegetables in non-plastic trays or containers.

Frozen foods.

Glass.

Glass bottles, empty or filled with washers and dryers.

Gypsum.

Meats.

Metal cabinets.

Metal desks with plastic tops and trim metal parts.

Mirrors.

New empty metal cans.

Porcelain and pottery.

TABLE 4.11.2.(b) USE GROUP I-1 STORAGE USES LOW - HAZARD

Cement bags.
Crayons.
Dairy products in non-waxed coated paper containers.
Electrical motors.
Ivory.
New empty plastic cans.
Open parking structures.
Oil filled and types of distribution transformers.
Public garages (Group 2).
Stoves.
Talc and Soap stones.

4.12 USE GROUP J - MIXED USE AND OCCUPANCY

4.12.1 Two or more uses: When a building is occupied for two or more uses, not included in the same group, one of the following sections 4.12.2 through 4.12.5 shall apply.

4.12.2 Non-separate uses: The provisions of the code applying to each use shall apply to such parts of the building as come within that use group; and if there are conflicting provisions, the requirements securing the greater public safety shall apply to the entire building.

4.12.3 Separated uses: The mixed uses shall be completely separated, both horizontally and vertically, by fire separation walls and floor/ceiling assemblies having a fire resistance rating corresponding to the highest fire grading prescribed in Table 12.2.3. for the separate uses. Each part of the building shall be separately classified to use. (The most restrictive height and area limitations in this code for the mixed uses shall apply to the entire building, or except as otherwise provided for in this code.) (See local by-laws).

4.12.4 Separate buildings: The mixed uses shall be completely separated by fire walls having a fire resistance rating corresponding to the highest fire grading prescribed in Table 29.3. for the separate uses. Each use group shall then comply with the provisions of this code applicable to that group.

4.12.5 Incidental uses: Where the use is supplemental to the main use of the building and the area devoted to such use does not occupy more than 10 percent of the area of any floor, the building shall be classified according to the main use. Where the incidental use is a higher hazard than the main use, it shall be constructed and segregated by fire resistance rated construction as required in section 4.12.3 except that specific use areas within buildings of Use Groups F-2 and F-3 shall conform to sections 4.11.2 and
4.12.7 respectively.

4.13 USE GROUP K - DOUBTFUL USE CLASSIFICATION

4.13.1 General: When a building or structure is proposed for a use not specifically provided for in this Code or the classification of which is doubtful, such building or structure shall be included in the use group which it most nearly resembles in respect to the existing or proposed life and fire hazard and it shall be so classified by the Code Enforcement Officer.

4.14 USE GROUP L - UTILITY AND MISCELLANEOUS

4.14.1 General: Buildings and structures of an accessory character and miscellaneous structures not classified in any specific use group shall be constructed, equipped and

maintained to meet the requirements of this Code commensurate with the fire and life hazard incidental to their use. Utility and miscellaneous uses shall include fences over (1.83 metres) high, tanks, towers, retaining walls and buildings such as private garages, carports, sheds and agricultural buildings.

4.14.2 High hazard uses: A place of public assembly or education shall not be permitted in a building classified in Use Group E.

4.14.3 Means of egress: The means of egress requirements shall be applied in accordance with Section 10.

4.14.4 Open parking facilities beneath other use groups: (Open parking structures constructed under Use Groups A, F, B, G and H shall not exceed the height and area limitations permitted under section 8.8). The height and area of the structure for the occupancy above the open parking facility shall be in accordance with section 11.2.0. The height of the entire building shall be the distance defined in section 4.2 and shall not exceed the limitations for the upper occupancy in section 11.2.6. Fire separation for wall assemblies and floor/ceiling assemblies between the parking occupancy and the upper occupancy shall correspond to the highest fire grading prescribed in Table 12.2.3. for the uses involved. The type of construction shall apply to each occupancy individually, except that all structural members including main bracing within the open parking structure necessary to the support of the upper occupancy shall be protected with more restrictive fire resistant assemblies of the occupancies involved as shown in Table 6.1. Exit facilities for the upper occupancy shall conform to section 10 and shall be separated from the parking area by walls having at least a 2-hour fire resistance- rating as required by Table 6.1. and self-closing doors complying with section 12.2.18. Means of egress from the opening parking facility shall comply with section 10.10.

SECTION 5 BUILDING CONSTRUCTION CLASSIFICATIONS

Sections *Page*

SECTION 5 BUILDING CONSTRUCTION CLASSIFICATIONS

5.1 SCOPE

5.1.1 The provisions of this Part shall control the classification of all buildings as to type of construction.

5.1.2 Application of other laws: The provisions of this Part shall not be deemed to nullify any provisions of the zoning law or any other statute of the jurisdiction pertaining to the location, or type of construction of buildings, except as is specifically required by the provisions of this code.

5.2 CONSTRUCTION CLASSIFICATION

5.2.1 General: All buildings and structures erected or to be erected, altered or extended in height or area shall be classified in any one or in a combination of the five construction types defined in Table 5.1 and Sections 5.2.2 through to 5.2.6.

5.2.2 False designation: A building shall not be designated a given type of construction unless it conforms to the minimum requirements for that type. It shall be unlawful to post, or use, or designate, or advertise a building as of a given type of construction for the higher type but the designed construction classification of the building shall be that of the lesser type, unless all the requirements for the higher type are fulfilled.

5.2.3 Minimum requirements: When a type of construction is used that is superior to the minimum herein required for any specified use, height and area of the building, nothing in this Code shall be construed to require full compliance with the specifications for the higher type; but the designated construction classification of the building shall be that of the lesser type, unless all the requirements for the higher type are fulfilled.

5.2.4 Non combustibility requirements: Where a structure or a part of a structure is required to be constructed of non-combustible construction, the use of combustible elements shall be permitted subject to the limitations of this section without altering the construction classification.

5.2.5 Roofs, floors and walls: Combustible elements in roofs, floors and walls are permitted by this Code to be used for the following components:

a. Interior finish and trim materials as regulated by Sections 12.2.24, 12.2.25 and 12.2.26.
b. Light-transmitting plastics as permitted by this Code.
c. Fire-retardant treated wood as permitted by Section 12.2.24.
d. Mastic and caulking materials applied to provide flexible seals between components of exterior wall construction.
e. Roof covering materials as regulated by Section 2301.0.
f. Thermal and sound insulation as permitted by Sections 12.2.10.4, 12.2.30.
g. Exterior veneer and trim as permitted by Sections 12.2.28.2 and 2105.0.
h. Nailing or furring strips as permitted by Sections 12.2.1.4 and 12.2.25.
i. Windows and doors as permitted by Section 12.2.9.5.
j. Heavy timber as permitted by Sections 10.8.11 and 12.2.16.2.
k. Partitions as permitted by Section 12.2.7.6.

l. Roof structures as permitted by Section 12.2.29.

5.2.6 Ducts: Non-metallic ducts as permitted by the mechanical code listed in the Schedule.

5.2.7 Piping: Combustible piping materials as permitted by the mechanical and plumbing codes listed in the Schedule.

5.2.8 Electrical: Insulated electrical wiring and related components as regulated by Electrical Code listed in the Schedule.

5.2.9 Telephone: Insulated telephone wiring and related components as regulated by the telephone code listed in the Schedule.

5.3 TYPE 1 CONSTRUCTION

5.3.1 General: Buildings and structures of Type 1 Construction are those in which the walls, partitions, structural elements, floors, ceilings, roofs, and the exits are constructed and protected with approved non-combustible materials to afford the fire resistance rating specified in Table 6.1. except as otherwise specifically regulated by the provisions of Section 12.2. Type 1 buildings shall be further classified as Types 1A and 1B. Fire-retardant treated wood shall only be used as specified in Table 6.1. and Section 12.2.5.

TYPE 1 FIRE-RESISTIVE BUILDINGS

5.3.1.1 Definition: The structural elements in Type 1 fire-resistive buildings shall be of steel, iron, concrete or masonry. Walls and permanent partitions shall be of noncombustible fire-resistive construction except that permanent non-load bearing partitions of one-hour or two-hour fire-resistive construction, which are not part of a shaft enclosure, may have fire-retardant treated wood (see Section 4.2) within the assembly. Materials of construction and fire-resistive requirements shall be as specified in Section 6.

5.3.2 Structural framework: Structural framework shall be of structural steel or iron (please refer to Section 5.4 on material - wood and steel). For additional requirements for Group E Occupancies, see Section 7.5.2.

5.3.3 Exterior Walls and Openings:

5.3.3.1 Exterior walls: Exterior walls and all structural members shall comply with the requirements specified in Section 7.1.3 and the fire-resistive provisions set forth in Table 6.1.

EXCEPTIONS:

i Non-load bearing walls fronting on public ways or yards having a width of at least 12 metres may be of unprotected non-combustible construction.

ii In Group H, Division 1, and B Occupancies, exterior load bearing walls may be of two-hour fire-resistive non-combustible construction where openings are permitted.

iii Other than in Group E Occupancies, exterior non-load bearing walls may be of one-hour fire-resistive non-combustible construction where unprotected openings are permitted and two-hour fire-resistive non-combustible construction where fire protection of openings is required.

5.3.3.2 Openings in walls: All openings in exterior walls shall conform to the requirements of Section 7.1.3.2 and shall be protected by a fire assembly having a three-fourths- hour fire-protection rating when they are less than 6.0m from an adjacent property line or the centre line of a public way.

No openings shall be permitted in exterior walls of Groups A, C, F, E and B, Division 1, 2 and 3 Occupancies less than 1.5m from the property line, and no openings in Group B, Division 4, H and G Occupancies less than 0.9m from the property line.

5.3.4 Floors: Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistive floors, the space between the floor slab and the under-side of the

wood flooring shall be filled with non-combustible material or fire-stopped in such a manner that there will be no open spaces under the flooring which will exceed 9.3m^2 in area and such space shall be filled solidly under all permanent partitions so that there is no communication under the flooring between adjoining rooms.

Exceptions

i Fire-stopping need not be provided in such floors when at or below grade level in gymnasiums.

ii Fire-stopping need be provided only at the juncture of each alternate lane and at the ends of each lane in a bowling facility.

5.3.5 Stair construction: Stairs and stair platforms shall be constructed of reinforced concrete, iron or steel with treads and risers of concrete, iron or steel. Brick, marble, tile or other hard non-combustible materials may be used for the finish of such treads and risers.
Stairs shall be designed and constructed as specified in Section 7.3.

5.3.6 Roofs: Roofs and their members other than the structural frame more than 7.5m above any floor, balcony or gallery may be of unprotected non-combustible materials. Heavy timber members in accordance with Section 6.6.5 may be used for such unprotected members in one-storey buildings (ground and first floor).

When every part of the structural framework of the roof of a Group A or H Occupancy is not less than 7.5m above any floor, balcony or gallery, fire protection of all members of the roof construction including those of the structural frame may be omitted. Heavy timber members in accordance with Section 6.6.5 may be used for such unprotected noncombustible or heavy timber construction conforming to Section 6.6.5.2 may be less than 7.5m above any floor, balcony or gallery of a Group A, Division 2.1 Occupancy having an occupant load of 10,000 persons or more when all of the following conditions are met:

a. The building is not more than one storey in height, except for multilevel area located under the roof and used for locker rooms, exits, concession stands, mechanical rooms and others with access to the assembly room.

b. The area in which the roof clearance is less than 7.5m does not exceed 35 percent of the area encompassed by the exterior walls.

c. An approved supervised automatic sprinkler system shall be installed throughout.

Where every part of the structural steel framework of the roof of a Group A or H Occupancy is more than 5.4m and less than 7.5m above any floor, balcony or gallery, the roof construction shall be protected by a ceiling of not less than one-hour fire-resistive construction. Roof covering shall be fire-retardant roofing as specified in Section (please refer to Chapter on material). Special provisions for Group B, Division 2 office buildings and Group H, Division 1 Occupancies.

5.3.7 Scope: This section shall apply to all Group B, Division 2 office buildings and Group H, Division 1 Occupancies, each having floors used for human occupancy located more than 22.5m above the lowest level of fire department vehicle access. Such buildings shall be provided with either an approved automatic sprinkler system in accordance with Section 6.3.7.3 or safe areas of refuge (compartmentation) in accordance with Section 6.3.7.12.

5.3.7.1 Certificate of compliance: All mechanical and electrical equipment and other required life safety systems shall be approved and installed in accordance with approved plans and specifications pursuant to this section and shall be tested and proved to be in proper working condition to the satisfaction of the building maintained in accordance with the National Fire Safety Code as may be prescribed from time to time.

5.3.7.2 Automatic sprinkler system: When provided as required in Section 6.3.7 the

automatic sprinkler system shall be provided as appropriate. The sprinkler system shall be designed using the parameters set forth in U.B.C Standard No. 38-1 and the following:

a. Shut-off valves and a water flow device shall be provided for each floor. The sprinkler riser may be combined with the standpipe riser.

b. In seismic zones, in addition to the main water supply, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus 3800 litres per minute additional for the total standpipe system shall be provided. This supply shall be automatically available if the principal supply fails and shall have a duration of 30 minutes.

5.3.7.3 Smoke detection systems: At least one approved smoke detector suitable for the intended use shall be installed:

a. In every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room.

b. In the main return and exhaust air plenum of each air-conditioning system and located in a serviceable area downstream of the last duct inlet.

c. At each connection to a vertical duct or riser serving two or more stories from a return-air duct or plenum of an air-conditioning system. In Group H, Division 1 Occupancies, an approved smoke detector may be used in each return-air-riser carrying not more than 2.40m^3 and serving not more than 10 air inlet openings.

The actuation of any detector required by this section shall operate the voice alarm system and shall place into operation all equipment necessary to prevent the recirculation of smoke.

5.3.7.4 Alarm and communication systems: The alarm and communication systems shall be designed and installed so that damage to any terminal unit or speaker will not render more than one zone of the system inoperative. The voice alarm and public address system may be a combined system. When approved the fire department communications system may be combined with the voice alarm system and the public address system. Three communication systems which may be combined as set forth above shall be provided as follows:

5.3.7.4.1 Voice alarm system: The operation of any smoke detector, sprinkler, water flow device or manual fire alarm station shall automatically sound an alert signal to the desired areas followed by voice instructions giving appropriate information and direction to the occupants. The central control station shall contain controls for the voice alarm system so that a selective or general voice alarm may be manually initiated.

The system shall be supervised to cause the activation of an audible trouble signal in the central control station upon interruption or failure of the audio path including amplifiers, speaker wiring, switches and electrical contacts and shall detect openings, shorts and grounds which might impair the function of the system. The alarm shall be designed to be heard clearly by all occupants within the building or designated portions thereof as is required for the public address system.

5.3.7.4.2 Public address system: A public address communication system designed to be clearly heard by all occupants of the building shall operate from the central control station. It shall be established on a selective or general basis to the following terminal areas:

a. Lifts.
b. Lift lobbies.
c. Corridors.
d. Exit stairways.
e. Rooms and tenant spaces exceeding 93m^2 in area.
f. Dwelling units in apartment houses.
g. Hotel guest rooms or suites.

5.3.7.4.3 Fire department communication system: A two-way fire department communication system shall be provided for fire department use. It shall operate between the central control station and every lift, lift lobby and entry to every enclosed exit stairway.

5.3.7.4.4 Central control station: A central control station for fire department operations shall be provided in a location approved by the fire department. It shall contain:

a. The voice alarm and public address system panels.
b. The fire department communications panel.
c. Fire detection and alarm system enunciator panels.
d. Enunciator visually indicating the location of the lifts and whether they are operational.
e. Status indicators and controls for air-handling systems.
f. Controls for unlocking all stairway doors simultaneously.
g. Sprinkler valve and water-flow detector display panels.
h. Standby power controls and status indicators.
i. A telephone for fire department use with controlled access to the public telephone system.

5.3.7.5 Smoke control: Natural or mechanical ventilation for the removal of products of combustion shall be provided in every storey and shall consist of one of the following:

i Panels or windows in the exterior walls which can be opened remotely from an approved location other than the fire floor. Such venting facilities shall be provided at the rate of 1.86m^2 per 15 lineal metre^2 of exterior wall in each storey and shall be distributed around the perimeter at not more than 15m intervals. Such windows or panels and their controls shall be clearly identified.

Exception: When a complete automatic sprinkler system is installed, windows or panels manually openable from within the fire floor or approved fixed tempered glass may be used in lieu of the remotely operated openable panels and windows. Such windows shall be clearly identified and shall be of the size and spacing called for in this section.

ii When a complete and approved automatic sprinkler system is installed, the mechanical air-handling equipment may be designed to accomplish smoke removal. Under fire conditions, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building. The air-handling system shall provide a minimum of one exhaust air change every 10 minutes for the area involved.

iii Any other approved design which will produce equivalent results.

5.3.7.6 Lifts. Lifts and lift lobbies shall comply with the provisions of Section 9.1 and the following:

NOTE: A bank of lifts is a group of lifts or a single lift controlled by a common operating system; that is, all those lifts which respond to a single call button constitute a bank of lifts. There is no limit on the number of cars which may be in a bank or group but there may be not more than four cars within a common hoistway.

a. Lifts on all floors shall open into lift lobbies which are separated from the remainder of the building, including corridors and other exits, by walls extending from the floor to the underside of the fire-resistive floor or roof above. Such walls shall be of not less than one-hour fire-resistive construction. Openings through such walls shall conform to Section 10.11.8.

Exceptions

i The main entrance level lift lobby in office buildings.

ii Lift lobbies located within an atrium complying with the provisions of Section 1715.

b. Each lift lobby shall be provided with an approved smoke detector located on the lobby ceiling. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only. The smoke detector is to operate before the optical density reaches

j. 09 per meter. The detector may serve to close the lobby doors.

c. Lift hoistways shall not be vented through a lift machine room. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extend to not less than 30cm below the shaft vent to inhibit the passage of smoke into the machine room.

5.3.7.7 Standby Power, Light and Emergency Systems

1. **Standby power:** Standby power generating system conforming to U.B.C Standard No.18-1 shall be provided. The system shall be equipped with suitable means for automatically starting the generator set upon failure of the normal electrical supply systems and for automatic transfer of all functions required by this section at full power within 60 seconds of such normal service failure. Systems supervisions with manual start and transfer features shall be provided at the central control station. An on-premise fuel supply sufficient for not less than two hours full demand operation of the system shall be provided. The standby system shall have a capacity and rating that would supply all equipment required to be operational at the same time. The generating capacity need not be sized to operate all the connected electrical equipment simultaneously. All power, lighting, signal and communication facilities specified in (d), (e), (f), (g), (h), (i) and (j) as applicable; fire pumps required to maintain pressure, standby lighting and normal circuits supplying exit signs and exit illumination shall be transferable to the standby source.
2. **Standby lighting:** Standby lighting shall be provided as follows:
   a. Separate lighting circuits and fixtures sufficient to provide light with an intensity of not less than one foot-candle measured at floor level in all exit corridors, stairways, smoke proof enclosures, elevator cars and lobbies and other areas which are clearly a part of the escape route.
   b. All circuits supply lighting for the central control station and mechanical equipment room.
3. **Emergency system:** The following are classified as emergency systems and shall

operate within 10 seconds of failure of the normal power supply:

a. Exit sign and exit illumination is required by Sections 10.24 and 10.25.

b. Lift car lighting.

5.3.7.8 EXITS: Exits shall comply with other requirements of this Code and the following:

1. All stairway doors which are locked from the stairway side shall have the capacity of being unlocked simultaneously without unlatching upon a signal from the central control station.
2. A telephone or other two-way communications system connected to an approved emergency service which operates continuously shall be provided at not less than every fifth floor in each required stairway where other provisions of this Code permit the doors to be locked.

5.3.7.9 Seismic considerations: In Seismic Zones, the anchorage of mechanical and electrical equipment required for life safety systems, including fire pumps and lift drive and suspension systems, shall be designed in accordance with the requirements of Section (refer to Chapter 24).

5.3.7.10 Areas of Refuge (Compartmentation) Alternate: Areas of refuge conforming to the following may be provided as an alternate to the automatic sprinkler system.

a. Every storey shall be divided into two or more areas of approximately the same size with no single area exceeding 139m^2. The wall and door shall be constructed as required for a horizontal exit in Section 10.15.

b. Each area of refuge (compartment) shall contain one lift to the main floor and a minimum of one enclosed exit stairway.

c. Openings in exterior walls, where such openings are within 1.5m of each other horizontally on vertically adjacent floors, shall be protected by approved flame barriers either extending 76cm beyond the exterior wall in the plane of the floor or by approved vertical panels not less than 0.9m in height above the floor.

d. Horizontal exit walls used for compartmenting a building shall have a fire-resistance rating of not less than two hours. Duct penetrations of this wall shall not be permitted. Ferrous or copper piping and conduit may penetrate or pass through the wall only if the openings are caulked with impervious noncombustible materials sufficiently tight to prevent the transfer of smoke or combustion gases from one side of the wall to the other and are so maintained. The fire door serving as the horizontal exit between compartments shall be so installed, fitted and gasketed that it will provide a substantial barrier to the passage of smoke.

e. The fire-resistive floor or the floor-ceiling construction shall extend to and be tight against the exterior wall so that the fire-resistive integrity between storeys is maintained. Penetrations or other installations shall not impair the fire- resistive integrity of the floor-ceiling assembly.

f. A manual fire alarm system (pull boxes) shall be installed in accordance with U.B.C Standard No.18.1.

5.3.7.11 Automatic sprinkler system alternatives: When a complete approved automatic sprinkler system complying with this Section is installed in a building, the following modifications of code requirements are permitted.

a. The fire-resistive time periods set forth in Table 6.1 may be reduced by one hour for interior load bearing walls, exterior load bearing and non-load bearing walls, roofs and the beams supporting roofs, provided they do not frame into columns. Vertical shafts other than stairway enclosures and lift shafts may be reduced to one hour when sprinklers are installed within the shafts at alternate floors. The fire-resistive

time period reduction as specified herein shall not apply to exterior load bearing and non-load bearing walls whose fire-resistive rating has already been reduced under the exceptions contained within Section
6.3.3.1 or 6.3.4.

b. Except for corridors in Group B, Division 2 and Group H, Division 1 Occupancies and partitions separating dwelling units or guest rooms, all interior nonload bearing partitions required to be one-hour fire-resistive construction by Table 6.1 may be of non-combustible construction without a fire-resistive time period.
c. Fixed tempered glass may be used in lieu of openable panels for smoke control purposes.
d. Travel distance from the most remote point in the floor area to a horizontal exit or to an enclosed stairway may be 90m.
e. The manually operated fire alarm system required in the compartmented building is not required.

f. Spandrel walls, eyebrows and compartmentation are not required; however, the fire resistance of the floors and juncture of exterior walls with each floor must be maintained.

g. Fire dampers, other than those needed to protect floor-ceiling assemblies to maintain the fire resistance of the assembly, are not required except for those which may be necessary to bypass smoke to the outside, those provided to convert from recirculated air to 100 percent outside air, and those which may be required to protect the fresh air supply intake against smoke which may be outside the building.

h. Emergency windows required by Section 7.8.4 are not required.

5.4 TYPE 2 CONSTRUCTION

5.4.1 General: Buildings and structures of Type 2 construction are those in which the walls, partitions, structural elements, floors, ceilings, roofs, and the exits are constructed of approved non-combustible materials meeting the fire resistance rating requirements specified in Table 6.1, except as further regulated in Section 12.2 Type 2 buildings shall be further classified as Types 2A, 2B, and 2C. Fire-retardant treated wood shall only be used as specified in Table 6.1 and Section 12.2.5.

TYPE 2 BUILDINGS

5.4.1.1 Definition

a. The structural elements in Type 2 fire-resistive buildings shall be of steel, iron, concrete or masonry.

b. The structural elements of Type 2 one-hour or 2-N buildings shall be of non-combustible materials.

c. Walls and permanent partitions of Type 2-F.R. buildings shall be of noncombustible fire-resistive construction, except that permanent non-load bearing partitions of one-hour or two-hour fire-resistive construction which are not part of a shaft enclosure may have fire-retardant treated wood (see Section 4.2) within the assembly, provided fire-resistive requirements are maintained.

d. Walls and permanent partitions of Type 2-N buildings shall be of noncombustible materials.

e. Materials of construction and fire-resistive requirements shall be as specified in Section 6.

For requirements due to occupancy, see Section 7.

5.4.2 STRUCTURAL FRAMEWORK: Structural framework shall be as specified (refer to Chapter on materials - iron, concrete and masonry).

5.4.3 Exterior walls and openings

Exterior walls: Exterior walls and all structural members shall comply with the requirements specified in Section 7.1.3 and the fire resistive provisions set forth in Table 6.1 in Type 2-N and Type 2 one-hour buildings, exterior walls shall comply with the fire-resistive requirements set forth in Section 7.1.3. and Table 7.1.3.

Exceptions

i Non-load bearing walls fronting on public ways or yards having a width of at least 12m may be of unprotected non-combustible construction.

ii In Groups H, Division 1, and B Occupancies, exterior non-load bearing walls of Type 2-F.R. buildings may be of two-hour fire-resistive non-combustible construction where openings are permitted.

iii In other than Group E Occupancies, exterior non-load bearing walls of Type 2- F.R. buildings may be of one-hour fire-resistive non-combustible construction where unprotected openings are permitted and two-hour fire-resistive noncombustible construction where fire protection of openings is required.

iv In a Group B Occupancy a fire-resistive time period will not be required for an exterior wall of a one-storey Type 2-N building, provided the floor area of the building does not exceed 93m^2 and such wall is located not less than 1.5m from a property line.

5.4.3.1 Openings in walls: All openings in exterior walls of Type II-F.R. buildings shall conform to the requirements of Section 7.1.3.2 and shall be protected by a fire assembly having a one-hour fire-protection rating when they are less than 6m from an adjacent property line or the center line of a public way. No openings shall be permitted in exterior walls of Type 2-F.R. buildings housing Groups A, C, F, H and B, Division 1, 2 and 3 Occupancies less than 1.5m from the property line, and no openings in Groups B, Division 4, H, and G Occupancies less than 900mm from the property line. Openings in exterior walls located where protected openings are required by Table 7.1.3 shall be protected by fixed fire windows or automatic-closing fire windows or self-closing doors having a fire protection rating of at least one hour and shall comply with Section 7.1.3.

5.4.4 Floors: Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistive floors of Type 2-F.R. buildings, the space between the floor slab and the underside of the wood flooring shall be filled with non-combustible material or fire stopped in such a manner that there will be no open spaces under the flooring which will exceed 9.3m^2 in area and such space shall be filled solidly under all permanent partitions so that there is no communication under the flooring between adjoining rooms.

Exception: Firestopping need not be provided in such floors when at or below grade level in gymnasiums.

Floor construction of Type 2 one-hour and Type 2-N buildings shall be of non-combustible material, provided, however, that a wood surface or finish may be applied over such non-combustible material.

5.4.5 Stair construction: Stairs and stair platforms of Type 2-F.R. buildings shall be constructed of reinforced concrete, iron or steel with treads and risers of concrete, iron or steel. Brick, marble, tile or other hard non-combustible materials may be used for the finish of such treads and risers. Stairs of Type 2 one-hour and Type 2-N buildings shall be of non-combustible construction. Stair shall be designed and constructed as specified in Chapter 10.

5.4.6 Roof construction

Roofs shall be of non-combustible construction, except that in Type 2-F.R and Type 2 one-hour buildings, roofs may be as specified in Section 6.3.6. Roof covering shall be a fire-retardant roofing as specified (refer to Chapter on material).

SPECIAL PROVISIONS FOR GROUP B, DIVISION 2 OFFICE BUILDINGS AND GROUP H, DIVISION 1 OCCUPANCIES

5.4.7 Type 2-F.R, buildings shall comply with the special provisions on high-rise buildings in Section 6.3.7.

Exception: The reduction provisions for roofs in Section 6.3.7.13.(a) are not permitted.

5.5 TYPE 3 CONSTRUCTIONS

5.5.1 General: Buildings and structures of Type 3 construction are those in which the exterior, fire and party walls are constructed of masonry or other approved noncombustible materials of the required fire resistance rating and structural properties, and the floors, roofs and interior framing are wholly or partly of wood or of metal or other approved construction; the fire and party walls are ground supported, except that girders and their supports carrying walls of masonry shall be protected to afford the same degree of fire-resistance rating of the walls supported thereon; and all structural elements shall have the required fire resistance rating specified in Table 6.1.

5.5.2 TYPE 3A AND TYPE 3B STRUCTURES

5.5.2.1 Type 3A: Structures of Type 3A construction shall include all Type 3 buildings in which the interior structural elements are wholly or partly of fire protected wood of not less than 50mm nominal thickness, or of other approved protected combustible materials, or of metal protected and insulated to afford the fire-resistance rating specified in Table 6.1.

5.5.2.2 Type 3B: Structures of Type 3B construction shall include all Type 3 buildings in which the interior structural members are of wood of not less than 50mm nominal thickness or consist of other combustible or non-combustible materials with protection of less than 1-hour fire resistance rating.

5.5.3 Structural framework: Structural framework shall be of steel or iron as specified (refer to Chapter on materials, concrete, wood).

5.5.4 Exterior walls, openings and partitions

5.5.4.1 Exterior Walls: Exterior walls shall be constructed of non-combustible materials and shall comply with the fire-resistive requirements set forth in Section 7.1.3 and Table 6.1.

EXCEPTION:

i Non-load bearing walls fronting on public ways, or yards having a width of at least 12m may be unprotected when entirely of non-combustible materials.

ii In other than Groups E and F Occupancies, exterior non-loadbearing walls may be non-combustible one-hour fire resistive where unprotected openings are permitted and non-combustible two-hour fire resistive where protection of openings is required.

iii In Group H, Division 1 and B Occupancies, exterior non-loadbearing walls may be two-hour fire resistive where openings are permitted.

iv Approved fire-retardant treated wood framing may be used within the assembly of exterior walls as permitted by Exception i, ii and iii, provided the required fire resistance is maintained and the exposed outer and inner faces of such walls are non-combustible.

v Wood columns and arches conforming to heavy timber sizes may be used externally where exterior walls are permitted to be unprotected; non-combustible exterior walls are permitted.

5.5.4.2 Openings in walls: Openings in exterior walls shall conform to the requirements of Section 7.1.3.2 and shall be protected by a fire assembly having a three-fourths-hour fire-resistive rating when they are less than 6m from an adjacent property line or the centre line of a public way. No openings shall be permitted in exterior walls of Groups A, C, F, E and B, Division 1, 2 and 3 Occupancies less than 1.5m from the property line, and no openings in Groups B, Division 4. H and G Occupancies less than 900mm from the property line.

5.5.4.3 Partitions: Load bearing partitions, when constructed of wood, shall comply with Section 29.16.3.

5.5.5 Stair construction: Stairs in buildings not exceeding three storeys in height may be

constructed of any material permitted by this Code. In buildings more than three storeys in height, stairs shall be constructed as required for Type I buildings.

5.5.6 Roofs: Roof coverings shall be as specified (refer to Chapter on materials, roof).

5.6 TYPE 4 CONSTRUCTION

5.6.1 General: Buildings and structures of Type 4 construction are those in which the exterior walls are of non-combustible materials having a fire resistance rating not less than that specified in Table 6.1 and the interior structural members are of solid or laminated wood without concealed spaces. The elements of Type 4 construction shall comply with the provisions of this Section (see Chapter 22 for construction details).

5.6.1.1 Definition: Structural elements of Type IV buildings may be of any materials permitted by this Code.

Type IV construction shall conform to Chapter 18 except that permanent partitions and members of the structural frame may be of other materials, provided they have a fire resistance of not less than one hour.

5.6.2 Structural Framework

5.6.2.1 Columns: Wooden columns shall be sawn or glued laminated and shall be not less than 203mm nominal, in any dimension when supporting floor loads and not less than 150mm nominal, in width and not less than 203mm, in depth when supporting roof and ceiling loads only. Columns shall be continuous or superimposed and connected in an approved manner.

5.6.2.2 Floor framing: Beams and girders of wood shall be sawn or glued laminated timber and shall be not less than 150mm, in width and not less than 254mm, in depth. Framed sawn or glued laminated timber arches which spring from the floor line and support floor loads shall be not less than 203mm in any dimension. Framed timber trusses supporting floor loads shall have members of not less than 203mm, in any dimension.

5.6.2.3 Roof framing: Framed or glued laminated arches for roof construction which spring from the floor line or from base and do not support floor loads shall have members not less than 150mm, in width and not less than 203mm, in depth for the lower half of the height and not less than 150mm, in depth for the upper half. Framed or glued laminated arches for roof construction which spring from the top of walls or wall abutments, framed timber trusses, and other roof framing which does not support floor loads shall have members not less than 100mm, in width and not less than 150mm, in depth. Spaced members shall be composed of two or more pieces not less than 75mm, in thickness when blocked solidly throughout their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate of not less than 50mm, in thickness, secured to the underside of the members. Splice plates shall be not less than 75mm, in width.

5.6.2.4 Flooring: Floors shall be without concealed spaces and shall be of sawn or glued laminated timber, splined, or tongue and groove, of not less than 75mm in thickness covered with 25mm, dimension tongue and groove flooring, laid crosswise or diagonally, or 12mm plywood or 12mm particle board, or of timber not less than 100mm, in width, set on edge close together and well spiked, and covered with 25mm flooring, or 12mm plywood, or 25mm particle board. The timber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall be covered by a moulding fastened to the wall such that 25mm spaces shall be covered by a moulding fastened to the wall either above or below the floor and so arranged that it will not obstruct the swelling or shrinkage movements of the floor, or corbelling of masonry walls under floor shall be used in place of moulding.

5.6.2.5 Roofs: Roofs shall be without concealed spaces and roof decks shall be sawn or glued laminated, splined or tongue and groove plank, not less than 50mm, in thickness,

280mm thick interior plywood (exterior quality glue) or of timber not less than 75mm, in width, set on edge close together and laid as required for floors. Other types of decking shall only be used if providing equivalent fire resistance rating and structural properties.

5.6.2.6 Walls: Walls shall be of solid wood construction formed by not less than two layers or 25mm matched boards or laminated construction or a 100mm thickness, or of 1- hour fire resistance rated construction.

5.6.2.7 Exterior structural members: Wood columns and arches conforming to heavy timber sizes shall only be used externally where a fire separation distance of 6100mm or more is provided.

5.6.3 Exterior walls, openings and partitions

5.6.3.1 Exterior Walls: Exterior walls shall be constructed of non-combustible materials and shall comply with the fire-resistive requirements set forth in Section 7.13 and Table No. 6-A.

Exceptions

i Non-load bearing walls fronting on public ways, or yards having a width of at least 12m may be unprotected when entirely of non-combustible material.

ii In other than Groups E and F-1 occupancies exterior non-load bearing walls may be non-combustible one-hour fire resistive where unprotected openings are permitted and non-combustible two-hour fire resistive where protection of openings is required.

iii In Groups H, Division 1, and B Occupancies exterior non-combustible loadbear- ing walls may be two-hour fire retardant treated wood framing may be used within the assembly of exterior walls as permitted by exceptions i, ii and iii, provided the required fire resistance is maintained and the exposed outer and inner faces of such walls are non-combustible.

iv Wooden columns and arches conforming to heavy timber sizes may be used externally where exterior walls are permitted to be unprotected, non-combustible construction or where one-hour fire-resistive non-combustible exterior walls are permitted.

5.6.3.2 Openings in walls: Openings in exterior walls shall conform to the requirements of Section 7.1.3.2 and shall be protected by a fire assembly having a three-fourths-hour fire-resistive rating when they are less than 6m from an adjacent property line or the centre line of a public way. No openings shall be permitted in exterior walls of Groups A, C, F, E and B, Division 1, 2 and 3 Occupancies less than 1.5m from the property line and no openings in Groups B, Division 4, H and G Occupancies less than 1.5m from the property line.

5.6.3.3 Partitions: Load bearing partitions, when constructed of wood, shall comply with Section 29.16.3

5.6.4 Stair construction: Stairs shall be constructed as specified in Section 6.6.5. In buildings more than three storeys in height, stairs shall be constructed as for Type I build-ings. Stairs shall comply with the requirements of Section 10.

5.6.5 Heavy timber construction:

5.6.5.1 General: Details of heavy timber construction shall be in accordance with the provisions of this section. Unless otherwise specified, all dimensions are as defined in Section (refer to Section 10.22).

5.6.5.2 Columns: Wood columns may be of sawn timber or structural glued-laminated timber not less than 200mm in any dimension when supporting roof or floor loads except as specified in Section 6.6.5.4. Columns shall be continuous or superimposed and connected in

an approved manner.

5.6.5.3 Floor framing: Beams and girders may be of sawn timber or structural glued-laminated timber and shall be not less than 150mm in width and not less than 250mm in depth. Framed sawn timber or structural glued-laminated timber arches, which spring from the floor line and support floor loads, shall be not less than 200mm in any dimension.

5.6.5.4 Roof framing: Framed sawn timber arches or structural glued-laminated timber arches for roof construction, which spring from the floor line and do not support floor loads, shall have members not less than 150mm in width and not less than 200mm in depth for the lower half of the height and not less than 150mm in depth for the upper half. Framed sawn timber or structural glued-laminated timber arches for roof construction which spring from the top of walls or wall abutments, framed timber or structural glued- laminated timber trusses, and other roof framing which does not support floor loads, shall have members not less than 100mm in width and not less than 150mm in depth. Spaced members may be composed of two or more pieces not less than 75mm in thickness, when blocked solidly throughout their intervening spaces, or when such spaces are tightly closed by a continuous wood cover plate of not less than 50mm in thickness, secured to the underside of the members. Splice plates shall be not less than 750mm in thickness. When protected by an approved automatic sprinkler system under the roof deck, framing members shall be not less than 750mm in thickness.

5.6.5.5 Floors: Floors shall be without concealed spaces. Floors shall be of timber, splined or tongue and groove, of not less than 7.5cm or 75mm in thickness covered with 2.50cm tongue-and-groove flooring laid crosswide or diagonally, or 12.5mm plywood, or of timber not less than 100mm in width set on edge close together and well spiked, and covered with 25mm flooring or 12.5mm plywood. The timber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than 12.5mm to walls. Such 12.5mm space shall be covered, by a moulding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbelling of masonry walls under floors may be used in place of such moulding.

5.6.5.6 Roof decks: Roofs shall be without concealed spaces and roof decks shall be of timber, splined or tongue and groove, of not less than 50mm thickness, or 25mm boards with tongue and groove plywood with exterior quality glue, or of a double thickness of 25mm boards with tongue-and-groove joints, or with staggered joints, of timber not less than 75mm in width, set on edge close together and laid as required for floors.

5.6.5.7 Construction details. Approved wall plate or hangers shall be provided where wooden beams, girders or trusses rest on masonry or concrete walls. Girders and beams shall be closely fitted around columns, and adjoining ends shall be cross-strutted and tied to each other, or interstrutted and tied by caps or ties, to transfer horizontal loads across the joints. Wooden wedge may be placed on top of columns which support roof loads only. Where intermediate beams are used to support a floor, they shall rest on top of the girders, or shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be closely fitted.

In heavy timber roof construction, every roof girder and at least every alternate roof beam shall be anchored to its supporting member; roof decks, where supported by a wall, shall be anchored to such wall at intervals not exceeding 6m. Every monitor and every sawtooth construction shall be anchored to the main roof construction. Such anchors shall consist of steel or iron bolts of sufficient strength to resist vertical uplift of the roof.

5.6.5.8 Mechanically laminated floors and roof decks: Mechanically laminated floors and roof decks conforming to Section 29.16.4 may be used as heavy timber floors or roof decks, provided the minimum thickness and other applicable requirements of the section are followed.

5.6.5.9 Partitions: Partitions shall be of solid wood construction formed by not less than two layers of 25mm matched boards or laminated construction of 100mm thickness, or of one-hour fire-resistive construction.

5.6.5.10 Stairs: Stairs shall be constructed with wood treads and risers of not less than 50mm thickness, except where built on laminated or timber inclines as required for floors, when they may be of 37.5mm thickness or may be constructed as required in Type I buildings. Stair stringers shall be a minimum of 75mm in thickness and not less than 250mm in depth.

5.7 TYPE 5 CONSTRUCTIONS

5.7.1 General: Buildings and structures of Type 5 construction are those in which the exterior walls, load bearing walls, partitions, floors and roofs are constructed of any materials permitted by this Code and in which the structural elements have the required fire resistance ratings specified in Table 6.1. Type 5 buildings shall be further classified as Types 5A and 5B.

5.7.2 Definition: Type 5 buildings may be of any materials allowed by this Code. Type V one-hour buildings shall be of one-hour fire-resistive construction throughout. Materials of construction and fire-resistive requirements shall be as specified in Section 6. For requirements due to occupancy, see Section 6 to 7 inclusive.

5.7.3 Structural framework: Structural framework shall be of steel or iron as specified (refer to Section on materials, concrete, masonry and wood).

Exterior walls and openings: Exterior walls shall comply with fire-resistive requirements set forth in Section 7.1.3 and Table 7.1.3. Opening in exterior walls located where protected openings are required by Table 7.1.3 shall be protected by fixed fire windows or automatic-closing fire windows or self-closing doors having a fire-protection rating of at least one-hour and shall comply with Section 7.1.3.

5.7.5 Stair construction: Stair construction may be of any type permitted in this Code and shall conform to the requirements of Section 10.

5.8 Construction and General Requirements

5.8.1 General: The requirements of Chapter 6 are for the various types of constructions and represent varying degrees of public safety and resistance to fire. Every building shall be classified by the Code Enforcement Officer into one of the types of construction set forth in Table 6.1. Any building which does not entirely conform to a type of construction set forth in Table 6.1 shall be classified by a building official into a type having an equal or lesser degree of fire resistance. A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type which meets the minimum requirements based on occupancy (Part II) even though certain features of such building actually conform to a higher type of construction.

Where specific materials, types of construction or fire-resistive protection are required, such requirements shall be the minimum requirements, and any materials, types of construction or fire-resistive protection which will afford equal or greater public safety or resistance to fire, as specified in Section 7.1.4.5 may be considered a separate building for classification of types of construction. When there is no such separation, the area of the entire building shall not exceed the least area permitted for the types of construction involved.

5.9 Structural Frame: The structural frame shall be considered to be the columns and the

girders, beams, trusses and spandrils having direct connections to the columns and all other members which are essential to the stability of the building as a whole. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.

5.10 Usable Space Under Floors: Usable space under the first storey shall be enclosed except in Groups H, Division 3 and G Occupancies and such enclosure when constructed of metal or wood shall be protected on the side of the usable space as required for one- hour fire-resistive construction. Doors shall be self-closing, of non-combustible construction or solid wood core, not less than 44mm in thickness.

5.11 ROOF

Roof coverings shall be as specified in Section 3202 (b).

Exception to Table No. 6.1

5.11.1 General: The provisions of this Section are exceptions to the construction requirements of Table No. 6.1, Chapters 5, 6 and 7.

5.11.2 Fixed partitions

5.11.2.1 Stores and offices: Interior non-load-bearing partitions dividing portions of stores, offices or similar places occupied by one tenant only and which do not establish a corridor serving an occupant load of 30 persons or more may be constructed of:

a. Non-combustible materials.

b. Fire-retardant-treated wood.

c. One-hour fire resistive construction.

d. Wood panels or similar light construction up to three quarters the height of the room in which placed; when more than three quarters the height of the room, such partitions shall have not less than the upper one quarter of the partition constructed of glass.

5.11.2.2 Hotels and apartments: Interior no-load bearing partitions within 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 may be constructed of:

a. Non-combustible materials or fire-retardant-treated wood in buildings of any type of construction; or

b. combustible framing with non-combustible materials applied to the framing in buildings of Type 3 or 4 construction. Openings to such corridors shall be equipped with doors conforming to Section 10.11 regardless of the occupant load served.

5.11.2.3 Light-transmitting plastic: may be used in or as partitions, provided they meet the requirements of this Code.

5.11.2.4 Folding, portable or moveable partitions: Approved folding, portable or moveable partitions need not have a fire-resistive rating, provided:

i They do not block required exits (without providing alternative conforming exits) and they do not establish an exit corridor.

ii Their location is restricted by means of permanent tracks, guides or other approved methods.

iii Flammability shall be limited to materials having a flame-spread classification conforming to Chapter 29.

5.11.2.5 Walls fronting on streets or yard: Regardless of fire-resistive requirements for exterior walls certain elements of the walls fronting on streets or yards having a width of 12m may be constructed as follows:

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 4.5m above grade level.

ii Wood veneer of boards not less than 37.5mm thickness or exterior type panels not less than 12mm nominal thickness may be applied to walls, provided the veneer does not exceed 4.5m above ground base level, and further provided such veneer shall be placed either directly against non-combustible surfaces or furred out from such surfaces not to exceed 41mm with all concealed spaces fire- stopped as provided in Chapter 29. Where boards, panels and furring as described above comply with Chapter 4 as fire-retardant treated wood suitable for exterior exposure, the height above grade may be increased to 10.5m.

5.11.3 Trim: Trims, picture moulds, chair rails, baseboards, handrails and show-window backing may be of wood. Unprotected wood doors and windows may be used except where openings are required to be fire protected. Foam plastic trim covering not more than 10 percent of the wall or ceiling area may be used, provided such trim i has a density of no less than 320kg per cubic meter, ii has a maximum thickness of 12mm and a maximum width of 100mm, and iii has a flame-spread rating no greater than 75%. Materials used for interior finish of walls and ceiling, including wainscoting, shall be specified in Chapter 29.

5.11.4 Loading platforms: Exterior loading platforms may be of heavy timber construction with wood floors not less than 50mm thickness. Such timber construction shall not be carried through the exterior walls.

5.11.5 Insulating boards: Combustible insulating boards may be used under finished flooring.

5.12 SHAFT ENCLOSURES

5.12.1 General: Openings extending vertically through floors shall be enclosed in a shaft of fire-resistive construction having the time period set forth in Table No. 6.1 for “Shaft Enclosures” Protection for stairways shall be as specified in Sections 10.11 to 10.19 see Section 9.2.4 for exception in group B, Division 4 Occupancies and Section 8.8 and 12.1.5 for open parking garages.

Exceptions

i Other than Group I occupancies, an enclosure will not be required for openings which serve only one adjacent floor and are not connected with openings serving other floors and which are not concealed within the building construction.

ii In buildings housing Group B Occupancies equipped with automatic sprinkler systems throughout, enclosures shall not be required for escalators where the top of the escalator opening at each storey is provided with a draft curtain and automatic fire sprinklers are installed around the perimeter of the opening within 600mm of the draft curtain. The draft curtain shall enclose the perimeter of the unenclosed opening and extend from the ceiling downward at 30cm on all sides. The spacing between sprinklers shall not exceed 1.8m.

iii In Type 5 buildings, chutes and dumbwaiter shafts with a cross-sectional area of not more than 0.84m^2 may be unenclosed if lined on the inside with lath and plaster or gypsum wallboard, with not less than Gauge 26 galvanised sheet metal gauge with all joints in such sheet metal lock lapped. All openings into any such enclosure shall be protected by metal or metal-clad jambs, casing or frames.

iv Exit enclosures shall conform to the applicable provisions of Sections 10.11 to

10.19

v In one and two-storey buildings of other than Group I Occupancies, shafts for air vents and for ducts or piping which extend through not more than two floors need not comply wit Table 6.1.

vii Air vents and non-combustible piping installed in walls of buildings passing through three floors or less need not comply with Table 6.1. Such shafts shall be effectively draft-stopped at each floor or ceiling.

viii Non-combustible pipe and conduit may be installed and maintained within the cavity of fire-resistive walls, provided both the floor and wall penetrations are tightly sealed with a non-combustible material impervious to the passage of smoke.

x In buildings with Group E, Division 6 Occupancies, a fabrication area may have mechanical, duct and piping penetrations which extend through not more than two floors within that fabrication area. Penetrations for tubing, piping, conduit or duct shall be effectively draft-stopped at the top floor level. The fabrication area, including the area through which the ductwork and piping extend, shall be considered a single conditioned environment.

5.12.2 Protection of openings: Every opening into a shaft shall be protected by a self enclosing fire assembly conforming to Section 12.2.4.5 and having a fire protection rating of one hour for openings through one and a half hours openings through two-hour walls.

Exceptions

i Openings to the exterior may be unprotected when permitted by Table 7.1.3.

ii Openings produced by air ducts piercing shaft enclosure walls may be protected by fire dampers conforming to U.B.C. Standard No. 43-7.

5.12.3 Rubbish and linen chutes: In other than Group H, Division 3 Occupancies, rubbish and linen chutes shall terminate in rooms separated from the remainder of the building by a one-hour fire-resistive occupancy separation. Openings into chutes and termination rooms shall not be located in exit corridors or stairways.

5.13 WEATHER PROTECTION

5.13.1 Weather resistive barriers: All weather-exposed surfaces shall have a weather-resistive barrier to protect the interior wall covering. Such barrier shall be equal to that provided for in U.B.C Standard No. 17-1 for Kraft waterproof building paper or U.B.C. Standard No. 32-1 for asphalt-saturated rag felt. Building paper and felt shall be free from holes and breaks other than those created by fasteners and construction system due to attaching of the building paper, and shall be applied over studs or sheathing of all exterior walls. Such felt or paper shall be applied weatherboard fashion, lapped not less than 50mm at horizontal joints and not less than 150mm at vertical joints. Weather-protected barrier may be omitted in the following cases:

i When exterior covering is of approved weatherproof panels.

ii In black-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.

5.13.2 Flashing and counter-flashing: Exterior openings exposed to the weather shall be flashed in such a manner as to make them weatherproof. All parapets shall be provided with coping of approved materials. All flashing, counter-flashing and coping, when of metal, shall be of not less than 26 guage corrosion-resistant metal.

5.13.3 Waterproofing weather-exposed areas: Balconies, landings, exterior stairways and similar surfaces exposed to the weather and sealed underneath shall be waterproofed.

5.13.4 Damp-proofing foundation walls: Unless otherwise approved by the Code Enforcement Division/Section/Unit, foundation walls enclosing a basement below finished grade shall be damp proofed outside by approved methods and materials.

5.14 MEMBERS CARRYING MASONRY OR CONCRETE

5.14.1 General: All members carrying masonry or concrete walls in buildings over one storey in height shall be fire protected with not less than one-hour fire protection.

Exception

i Fire protection may be omitted from the bottom flange of lintels spanning not over 1.8m shelf angles, or plates that are not a part of the structural frame.

5.15 PARAPET

5.15.1 General: Where parapets are provided on exterior walls of buildings, the following shall apply in the construction; method:

i Parapets shall have the same degree of fire resistance required for the wall upon which they are erected and on any side adjacent to a roof surface shall have non-combustible faces for the uppermost 450mm, including counter-flashing and coping materials.

ii The height of the parapet shall not be less than 750mm above the point where the roof surface and the wall intercept. Where the roof slopes toward a parapet at slopes greater than 1.6, the parapet shall extend to the same height as any portion of the roof that is within the distance where protection of walls would be required, but in no case shall the height be less than 750mm.

5.16 PROJECTIONS

5.16.1 General: Cornices, eave overhangs, exterior balconies and similar architectural appendages extending beyond the floor area as defined in Section 4, shall conform to the requirements of this section (see Section 10 for additional requirements applicable to exterior exit balconies and stairways). Projections from walls of Type 1 or 2 construction shall be of non-combustible materials. Projections from walls of Type 3, 4 or 5 construction may be of non-combustible or combustible materials. Combustible projections located where openings are not permitted or where protection of openings is required shall be of one-hour fire-resistance or heavy timber construction conforming to Section 12.2. Projections shall not extend more than 300mm into the areas where openings are prohibited. For combustible ornamentation, see Section 6.

5.17 GUARDRAILS

5.17.1 General: All unenclosed floor and roof openings, open and glazed sides of landings and tramps, balconies or porches which are more than 750mm above ground level or floor grade below, and roofs used for other than service of the building shall be protected by a guardrail. Guardrails shall not be more than 1100mm in height. Open guardrail and stair railings shall have intermediate rails or an ornamental pattern such that a sphere 150mm in diameter cannot pass through. The height of stair railings on open sides may be as specified

in Sections 10.17 and 10.20 in lieu of providing a guardrail. Ramps shall, in addition, have handrails when required by Section 10.29.

Exceptions

i Guardrails need not be provided on the loading side of loading docks.

ii Guardrails for Group H, Division 3 Occupancies may be 900mm in height.

iii Interior guardrails within individual dwelling units or guest rooms of Group U, Division 1 Occupancies may be 900mm in height.

iv The open space between the intermediate rails or ornamental pattern of guardrails in areas of commercial and industrial-type occupancies which are not accessible to the public may be increased such that a 300mm diameter sphere cannot pass through.

v Guardrails on a balcony immediately in front of the first row of fixed seats and which are not at the end of an aisle may be 660mm in height.

vi Guardrails need not be provided on the auditorium side of a stage or enclosed platform.

5.18 FOAM PLASTIC INSULATION

5.18.1 General: The provisions of this section shall govern the requirements and uses of foam plastic in buildings and structures. For trim, see Section 6.11.6. Except where otherwise noted in this Section, all foam plastics used in building 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 U.B.C Standard No. 42-1. All packages and containers of the foam plastic ingredients shall bear the label of an approved agency showing either the flame-spread rating or smoke-developed rating of the product at the thickness tested or the use for which the product has been listed. The interior of the building shall be separated from the foam plastic by an approved thermal barrier having an index of 15 when tested in accordance with U.B.C. Standard No. 17-3. The thermal barrier shall be installed in such a manner that it will remain in place for the time of its index classification based upon approved diversified tests.

5.18.2 Specific requirements: Unless otherwise specifically approved as provided by section 6.18 or by other sections of this code, foam plastics may be used as follows:

5.18.2.1 Masonry or concrete construction: Foam plastics may be used without the thermal barrier described above, regardless of the type of construction, when the foam plastic is covered by a minimum of 25mm thickness of masonry or concrete in a wall, floor or roof system.

5.18.2.2 Attics and crawl spaces: Within an attic or crawl space where entry is made only for service of utilities, foam plastics shall be protected against ignition by 38 mm thick mineral fibre insulation, 6mm thick plywood, hardboard or gypsum wallboard, corrosion-resistant sheet metal having a base metal thickness in a manner that the foam plastic is not exposed.

5.18.2.3 Cold storage construction: Foam plastics installed and meeting the requirements of Section 6.18.1 above when tested in a thickness of 100mm may be used in a thickness up to 254mm in cold storage buildings, ice plants, food-processing rooms and similar areas. For rooms within a building, the foam plastic shall be protected by a thermal barrier on both sides having an index of 15.

Foam plastics may be used in free-standing coolers and freezers without the thermal barrier

when the foam plastic has a flame-spread rating of 25 or less when tested in the thickness intended for use, is covered by not less than 0.81mm of aluminium or corrosion-resistant steel having a base metal thickness not less than 0.40mm at any point and is protected by an automatic sprinkler system. When such a cooler or freezers is within a building, both the cooler and freezer and that part of the building in which the room is located shall be sprinklered.

Exception
Freestanding walk-in coolers and freezer units having an aggregate floor area less than 37.2m^2 need meet only the flame-spread and smoke requirements of Section 6.18.1 above.

5.18.2.4 Metal-clad building units: Foam plastic insulation having a flame spread of 25 or less may be used without the thermal barrier in or on walls in a thickness of not more than 100mm when the foam plastic is covered by a thickness of not less than 0.80mm aluminium or corrosion-resistant steel having a base metal thickness not less than
0. 40mm at any point and the area is protected with automatic sprinklers. Such walls shall not be used where non-combustible or fire-resistive construction is required.

5.18.2.5 Roofing: Foam plastics meeting the requirements of Section 6.18.1 may be used as part of a roof covering assembly, provided the assembly with the foam plastic insulation is a Class A, B or C roof covering when tested in accordance with U.B.C. Standard No. 32-7. Foam plastic which is part of a Class A, B or C roof covering assembly need not meet the requirements of Section 6.18.2.1 provided the assembly with the foam plastic also meets the requirements of U.B.C Standard No. 17-4.

Any roof covering installed with this Code and the manufacturer's instructions may be applied over foam plastic when the foam is separated from the interior of the building by plywood sheathing not less than 12mm in thickness bonded with exterior quality glue, with edges supported by blocking, tongue-and-grooved joints or other approved type of edge support, or an equivalent material. The thermal barrier requirement is waived. For all roof applications, the smoke-developed rating shall not be limited.

5.18.2.6 Doors: Where doors are permitted without a fire-resistive rating, foam plastic having a flame-spread rating of 75 or less may be used as a core material when the door facing is metal having a minimum thickness of 0.80mm aluminium or steel having a base metal thickness not less than 0.41mm at any point. The thermal barrier requirement is waived.

5.18.2.7 Siding backer board: Foam plastic of not more than 196.3KJ per square metre as determined by U.B.C. Standard No. 17-2 may be used as siding backer board with a maximum thickness of 12mm, provided it is separated from the interior of the building by not less than 50mm of mineral fibre insulation or equivalent in lieu of the thermal barrier, or when it is applied as residing over existing wall construction.

5.18.3 Specific approval: Plastic foam or assemblies using foam plastics may be specifically approved based on approved test such as, but not limited to, tunnel tests conducted in accordance with U.B.C Standard No. 175 and an ignition temperature test establishing a minimum self-ignition temperature of 323.9^{o}C, under U.B.C. Standard No. 52-3. The specific approval may be based on the end use, quantity, location and similar considerations where such tests would not be applicable or practical.

5.19 INSULATION

5.19.1 General: Thermal and acoustic insulation located on or within floor-ceiling and roof-

ceiling assemblies, attic spaces, crawl spaces, walls, partitions and insulation on pipes and tubing shall comply with this section. Duct insulation and insulation in plenums shall conform to the requirements of the Mechanical Code this as listed in the Schedule.

Exception

The use of combustible roof insulation shall be permitted, provided it is covered with approved roof covering applied directly thereto. For foam plastic, see Section 6.18. Insulation shall be of a rigid type suitable for application to a roof covering. Where fire-retardant roof coverings are required, insulation shall be of a type approved for the type of deck and the built-up roofing applied. Vapour barrier shall be installed between the deck and the insulation where excessive moisture conditions are anticipated within the building.

5.19.2 Insulation and covering on pipe and tubing: Insulation and covering on pipe and tubing shall have a flame-spread rating not exceeding 25 and a smoke density not exceeding 450 when tested in accordance with (U.B.C. Standard No. 42-1.)

Exception

Foam plastic insulation shall comply with Section 6.18.

5.19.3 Insulation: All insulation materials including facings, such as vapour barriers or breather papers installed within floor-ceiling assemblies, roof-ceiling assemblies, walls, crawl spaces or attics, shall have a flame spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with U.B.C. Standard No. 42-1 of this Code.

Exceptions

(i) Foam plastic insulation shall comply with Section 6.18.

(ii) When such materials are installed in concealed spaces of Types 3, 4 and 5 construction, the flame spread and smoke-developed limitations do not apply to facings, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or finish.

5.20 SOLAR ENERGY COLLECTORS

5.20.1 General: Collectors which function as building components shall comply with the applicable provisions of this Code. Collectors located above or upon a roof and not functioning as a building component shall not reduce the required fire resistance nor fire-retardant classification of the roof covering materials.

Exceptions

i Collectors installed on one- and two-family dwellings.

ii Non-combustible conductors located on buildings not over three storeys in height or 837m^2 in total floor area.

iii Collectors that comply with the requirements for solar collectors.

5.21 ATRIUMS

5.21.1 General: Buildings of other than Group E Occupancy with automatic sprinkler protection throughout may have atriums complying with the provisions of this Section. Such atriums shall have a minimum operating area and dimension as set forth in Table No. 6.21.

5.21.2 Smoke-control system: A mechanically operated air-handling system shall be installed that will exhaust smoke either entering or developed within the atrium. Exhaust openings shall be located in the ceiling or in a smoke trap area immediately adjacent to the ceiling of the atrium. The lowest level of the exhaust openings shall be located above the top of the highest portion of door openings into the atrium. Supply opening sized to provide minimum of 50 percent of the exhaust volume shall be located at the lowest level of the

atrium.

When the height of the atrium is 16.5m or less, supply air may be introduced by gravity, provided smoke control is accomplished. When the height of the atrium is more than 16.5m, supply air shall be introduced mechanically from the floor of the atrium and be directed vertically toward the exhaust outlets. In atriums over six storeys in height or where tenant spaces above the second storey are open to the atrium, supplemental supply air may be introduced at upper levels. The exhaust and supply system for the atrium shall operate automatically upon the actuation of the automatic sprinkler system within the atrium or areas open to the atrium or by the actuation of two or more smoke detectors required by this section. The exhaust and supply equipment shall also be manually operable by controls designed for fire department use. The smoke-control system may be separate or integrated with other air-handling systems. When the smoke-control mode is actuated, air-handling systems which would interfere with the smoke-control system shall be automatically shut down.

Enclosed tenant spaces shall be provided with a smoke-control system complying with the requirements of a sprinklered building in Section 12.1.20.

The atrium smoke-control system shall exhaust not less than the following quantities of air:

5.21.2.1 For atriums having a volume of not more than 18000m^3, including the volume of any levels not physically separated from the atriums, not less than six air-changes per hour or less than 1200m^3 per minute. A lesser rate is acceptable if it can be shown by test that smoke will not spread beyond the perimeter of the atrium.

5.21.2.2 For atriums having a volume of more than 18000m^3, including the volume of any levels not physically separated from the atrium, not less than four air changes per hour. Smoke detectors which will automatically operate the atrium smoke-control system shall be installed at the perimeter and on the ceiling of the atrium and on the ceiling of each floor level that is open to the atrium. In floor levels open to the atrium, such detectors shall be within 4.5m of the atrium. Detectors shall be located in accordance with their listing.

5.21.3 Enclosure of atriums: Atriums shall be separated from adjacent spaces by not less than one-hour fire-resistive construction.

Exception

i Open exit balconies are permitted within the atrium.

ii Openings in the atrium enclosure other than fixed glazing shall be protected by smoke-and draft-control assemblies conforming to Section 10.11.

iii Other tight-fitting doors which have automatic closing system, in accordance with Chapter 4, by actuation of a smoke detector, or used when protected as required for glazed opening in exception vi b below.

iv Fixed glazed openings in the atrium enclosures shall be equipped with fire windows having a fire-resistive rating of not less than one-hour, and the total area of such openings shall not exceed 25 percent of the area of the common wall between the atrium and the room into which the opening is provided.

v In Group H, Division 1 Occupancies, openings may be unprotected when the floor area of each guest room or dwelling unit does not exceed 93m^2 and each room or unit has an approved exit not entering the atrium.

vi Guest rooms, dwelling units and tenant spaces may be separated from the atrium by approved fixed wired glass set in steel frames. In lieu thereof, tempered or laminated glass may be used, subject to the following:

a. The glass shall be protected by a sprinkler system equipped with 64°C heads. The sprinkler system shall completely wet the entire surface of the glass wall when actuated. Where there are walking surfaces on both sides of the glass, both sides of the glass shall be so protected.

b. The glass shall be in a gasketed frame so installed that the glazing system may deflect without breaking the glass before the sprinkler system operates.

c. Obstructions such as curtain rods, drapery traverse rods, curtains, drapes or similar materials, shall not be installed between the sprinkler and the glass. The separation between the tenant space and the atrium as specified within exception iv may be omitted on a maximum of any three floors levels, provided the remaining floor levels are separated as specified herein.

d. **Travel distance:** When a required exit enters the atrium space, the travel distance from the doorway of the tenant space to an enclosed stairway, horizontal exit, exterior door or exit passageway shall not exceed 30m.

e. **Group F Occupancy exits:** In Occupancies, other than jails, prisons and reformatories, sleeping rooms shall not be permitted to have required exits through the atrium.

f. **Occupancy separation exceptions:** The vertical portion of the occupancy separation which is adjacent to the atrium may be omitted between a Group B, Division 2 Occupancy office or sales area of Group A, Division 3 Occupancy and Group H, Division 1 apartment or guest room located on another level.

g. **Standby power:** The smoke-control system for the atrium and the smoke-control system for the tenant space are to be provided with standby power as required in Section 9.2.9.8.

h. **Interior finish:** The interior finish or walls and ceilings of the atrium and all unseparated tenant spaces allowed under the last paragraph of sub-section c above shall be Class I with no reduction in class for sprinkler protection.

i. **Inspection of the smoke-control system:** All operating parts of the smoke-control systems shall be tested by an approved inspection agency or by the owner or his representative when so approved. Such inspections shall be made every three months and a log of the tests be kept by the testing agency. The log shall be on the premises and available for examination by fire

department personnel.

k. **Combustible furnishing in atriums:** The quantity of combustible furnishings in atriums shall not exceed that specified in the National Fire Safety Code.

5.22 MEZZANINES

5.22.1 General: Rooms may contain mezzanine floors when constructed in accordance with the following:

5.22.1.1 The construction of a mezzanine shall be consistent with the requirements for the type of construction in which the mezzanine is located, but the fire-resistive time period need not exceed one hour for unenclosed mezzanine constructed in accordance with Section 6.22.1.4. The clear height above and below the mezzanine floor construction shall be not less than 2.1m.

5.22.1.2 There shall be not more than two levels of mezzanines in a room. However, there is no limitation on the number of mezzanines within a room.

5.22.1.3 The aggregate area of mezzanines within a room shall not exceed one third the area of the room in which they are located. Intermediate floor levels that are 2m or more above grade shall be considered a storey when the area of such level exceeds one third the area of the room in which it is located.

5.22.1.4 All portions of a mezzanine shall open to the room in which it is located. The side of the mezzanine which is open to the room shall be unobstructed except for columns and posts and protective walls or railings not more than 1100mm in height.

Exceptions

i Partitioning may be installed, provided the aggregate floor area of the enclosed space does not exceed 10 percent of the area of the mezzanine or an occupant load not exceeding 10, whichever is greater.

ii Mezzanines having two or more exits need not open into the storey in which they are located, provided at least one of the exits gives direct access to a protected exit corridor, an exit court, enclosed exit stairway, exterior exit, balcony or exit passageway.

iii In industry facilities, mezzanines used for control equipment may be glazed on all sides.

iv Two exits shall be provided from a mezzanine when two exits are required by Table No.10.10 or when the area of the mezzanine exceeds 186m^2 whichever is the more restrictive.

v The occupant load of the mezzanine shall be added to the occupant load of the storey or room in which it is located.

TABLE 5-1

TYPES OF CONSTRUCTION-FIRE RESISTIVE REQUIREMENTS (IN HOURS)

For details see chapters under Occupancy and Types of Construction and for exception see Section 6.11.2

TYPE 1 TYPE 2 NON-COMBUSTIBLE					TYPE 3		TYPE 4	TYPE 5	
BUILDING ELEMENT	Fire resistive	Fire resistive	1 -hr	N	1 -hr	N	H.T	1-HR	N
Exterior bearing walls	4 Sec 29.8.9	4 Sec 29.8	1	N	4 29.8	4 29.8	4 29.8	1	N
Interior bearing walls	3	2	1	N	1	N	1	1	N
Exterior non-loadbearing walls	4 Sec 29.8.9	4 Sec 29.8	1 Sec 29.8	N	4 29.8	4 29.8	4 29.8	1	N
Structural frame	3	2	1	N	1	N	1 orH.T	1	N
Partitions-permanent	12	12	12	N	1	N	1 or H.T	1	N
Shaft enclosures	2	2	1	1	1	1	1	1 29.17	1 29.17
Floors-ceilings/floors	2	2	1	N	1	N	H.T	1	N
Roofs-ceilings/roofs	2 Sec 29.10.7	1 Sec 29.10.7	1 Sec 29.10.7	N	1	N	H.T	1	N
Exterior doors and windows	Sec 29.8.9	29.8.9	29.8.9	29.8.9	29.8	29.8	29.8	29.8	29.8

N - No general requirements for fire resistance.

H. T - Heavy Timber.

I. Structural frame elements in the exterior wall shall be protected against external fire exposure as required for exterior load bearing walls or the structural frame, whichever is greater.

2. Fire-retardant treated wood (see Section 8.4.1.1) may be used in the assembly, provided fire-resistance requirements are maintained. See Chapter 12.2.

TABLE 5.2.1 ATRIUM OPENING AND AREA

HEIGHT IN STOREYS	MINIMUM CLEAR OPENING [M]	MINIMUM AREA (M^2)
3-4	6m	36
5-7	9m	81
8 OR MORE	12m	144

1 The specified dimensions are the diameter of inscribed circles whose centres fall on a common axis for the full height of the atrium.

PRE-DESIGN STAGE SECTION 6

ENVIRONMENTAL AND GENERAL BUILDING REQUIREMENTS

Sections ***Page***

SECTION 6

ENVIRONMENTAL AND GENERAL BUILDING REQUIREMENTS

6.1 ENVIRONMENTAL REQUIREMENTS

6.1.1 General: The provisions of this Section shall govern the means of light, ventilation and sound transmission control required in all buildings intended for human occupancy. Every building and structure hereafter erected and every building, room or space which use has been changed shall be constructed, arranged and equipped to conform to the requirements of this Section.

6.1.2 Buildings on same plot: Where more than one building is hereafter placed on a plot, or where a building is placed on the same plot with existing buildings, for the purpose of this Chapter the uncovered plot area should constitute adequate sources of light and ventilation for all buildings intended for human occupancy.

6.1.3 Working drawings

6.1.3.1 General: Plans for all buildings and structures other than buildings of Use Group H-2, H3, and F1 which are designed for human occupancy and for which means of artificial lighting and ventilation are required, the application shall include sufficient details and description of the mechanical system to be installed as herein required or as specified in the mechanical code listed in the Schedule.

6.1.3.2 Alterations: A building shall not hereafter be altered or rearranged so as to reduce either the size of a room, or the fresh air supply, or the amount of available natural light to less than that required for buildings hereafter erected; or to create an additional room unless made to conform to the requirements of Section 7.3.3 and 7.3.8. The Code Enforcement Division/Section/Unit shall permit new rooms to be of the same height as existing rooms in the same storey unless in the Code Enforcement Division/Section/Unit's opinion greater provision of artificial light and ventilation is deemed necessary to insure healthful living conditions.

6.1.3.3 Uncovered yard and court area: A building shall not be hereafter enlarged, nor shall the plot on which it is located be diminished, so as to decrease the required courts or yards to less than that prescribed in this Part for the lighting and ventilation of new buildings.

6.2 INTERIOR REQUIREMENTS

6.2.1 Light and ventilation required

6.2.1.1 Light required: Every room or space intended for human occupancy shall have natural and or artificial light.

a. Bathroom and toilet room lighting: Every bathroom and toilet room shall be provided with natural and or artificial light. The illumination shall have an average intensity of 50 lux measured at a level of 75cm above the floor.

b. Ventilation required: Every room or space intended for human occupancy shall be provided with natural and or mechanical ventilation.

6.2.2 Natural light

6.2.2.1 General: In the application of the provisions of this Part, the standard of natural light for all habitable and occupiable rooms, unless otherwise specifically required by the provisions of Section 7.2 for special uses and occupancies, shall be based on 2691 lux of illumination on the vertical plane adjacent to the exterior of the light transmitting device in the enclosure wall

and shall be adequate to provide an average illumination of
64.58 lux over the area of the room, at a height of 75cm above the floor level.

6.2.2.1.1 Adjoining spaces: Where natural light for rooms or spaces without exterior glazing areas is provided through an adjoining room, the unobstructed opening to the adjoining room shall be at least 8 percent of the floor area of the interior room or space, but not less than 2.4m^2. The exterior glazing area shall be based on the total floor area being served.

6.2.2.2 Stairways: Interior stairways shall be provided with an exterior glazing area of not less than 1.0m^2 on every floor through which the stairway passes.

6.2.3 Artificial light

6.2.3.1 General: Artificial light shall be capable of providing a minimum illumination as specified for natural light.

6.2.4 Natural ventilation

6.2.4.1 General: Natural ventilation of an occupied space shall be through windows, doors, louvres or other natural openings to the outdoor air.

6.2.4.2 Ventilation area required: The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

6.2.4.2.1 Adjoining spaces: Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the unobstructed opening to the adjoining rooms shall be at least 8 percent of the floor area of interior room or space, but not less than 2.4m^2. The ventilation openings to the outdoors shall be based on the total floor area being ventilated.

6.2.4.2.2 Openings below grade: Openings below grade shall be acceptable for natural ventilation provided the outside horizontal clear space measured perpendicular to the opening is one and one-half times the depth below the average adjoining grade.

6.2.4.3 Contaminants exhausted: Contaminants in the breathing atmosphere shall be exhausted to the outdoor air in accordance with the mechanical code listed in the Schedule.

6.2.4.4 Openings on yards or courts: Natural ventilation shall be provided by openings onto yards or courts which comply with the requirements of Sections 6.2.8,
6.2.9 and 6.2.10.

6.2.5 Mechanical ventilation

6.2.5.1 General: Mechanical ventilation shall conform to the requirements of the mechanical code listed in the Schedule.

6.2.6 Room dimensions

6.2.6.1 Ceiling heights: Habitable (spaces) rooms, other than kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than 2.4m. Hallways, corridors, bathrooms, toilet rooms, kitchens and habitable basements for use as a recreation room only shall have a ceiling height of not less than 2.2m measured to the lowest projection from the ceiling.

Exception: In buildings of Use Group H-3, the maximum projection below the required ceiling height of beams and girders spaced not less than 1.2m on center shall be 15cm.

a. Use Group A,B,C and G. A clear height from finished floor to ceiling or lowest projection of not less than 2.4m shall be provided in all exit access and occupi- able rooms of structures of Use Group A, B,C and G.
b. Sloping ceilings: If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one-half the area thereof. In no case should any portion of a habitable space, have a ceiling height of less than 1.5m.
c. Dropped ceiling: If any room has a dropped ceiling, the prescribed ceiling height is required in two-thirds of the area thereof, but the height of the dropped portion of the ceiling shall not be less than 2.2m.

6.2.6.2 Floor area: Every dwelling unit shall have at least one room which shall have not less

than 14m^2 of floor area. Other habitable rooms except kitchens shall have an area of not less than 10.8m^2.

6.2.6.3 Width: A habitable room other than a kitchen shall not be less than 3.0m in any dimension.

6.2.7 VENTILATION OF SPECIAL SPACES

6.2.7.1 Roof spaces

a. Enclosed attics and rafters: Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters, shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain. The openings shall be covered with corrosion resistant mesh not less than 6mm nor more than 12mm in any direction.

b. Ventilating area: In all cases, roof spaces shall be provided with adequate ventilation opening located on the eaves, or other suitable locations, and properly protected with corrosion resistant mesh.

6.2.7.2 Crawl spaces: Crawl space areas, other than those used as an under floor plenum, shall be ventilated by an approved mechanical means or by openings in exterior foundation walls. Openings shall be located as close to corners as practicable and shall provide cross ventilation on at least two approximately opposite sides. The openings shall be covered with corrosion resistant mesh not less than 6mm nor more than 12mm in any direction.

a. Opening size: Openings shall have a net area of not less than 0.1m^2 for each 15m^2 of foundation space. Where an approved vapour barrier is installed over the ground surface, the required net area of openings shall be reduced to

10 percent of the above and vents shall have manually operable louvres.

6.2.7.3 Alternative mechanical ventilation: Enclosed attic, rafter and crawl spaces which are not ventilated as herein required shall be equipped with a mechanical ventilation system conforming to the requirements of the mechanical code listed in the Schedule.

6.2.8 COURTS

6.2.8.1 General: All courts required to serve rooms for natural light or ventilation purposes shall comply with the requirements of this section.

6.2.8.2 Minimum width: Every such court shall have a minimum width to height ratio of 1.4 but not less than 1.5m for outer courts and not less than 3.0m for inner courts.

a. Irregular court width: In the case of irregular or gore shaped courts, the required minimum width of a court shall be the average width, provided that such a court shall not be less than 1.5m at any point.

6.2.8.3 Area of court: The cross-sectional area of a required court shall be not less than one and one-half times the square of its width; nor shall the length of any court be more than twice its width.

6.2.8.4 Access to court: A door or other means of access shall be provided at the bottom of every court that is not otherwise conveniently accessible for purposes of cleaning.

6.2.8.5 Air intakes: Every court serving one or more habitable rooms that are enclosed on all sides, shall be connected at the lowest end by an open passage of fire resistance construction.

Such intake or passage shall have a cross-sectional area of not less than 2.0m^2 and shall remain fully open at both ends and unobstructed for its full size and lengths, except that grilles of non-combustible construction are permitted at the ends of the intake.

a. Fire resistance rating: The walls, floors and ceiling of such intakes or passages shall have fire resistance rating of not less than 2 hours in buildings of Types 1,2,3, or 4 construction and not less than 1 hour in Type 5 construction.

6.2.8.6 Court drainage: The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system comply with the plumbing code listed in the Schedule.

6.2.8.7 Open wells or shafts: When a court has a cross-sectional area of width to height dimensions less than as specified in sections 6.2.8.1 and 6.2.8.3, the court shall be regarded as an open well or a shaft and shall not be habitable.

6.2.8.8 Set-back: There shall be provided adequate set-back and air-spaces as stipulated by local regulations by-laws to ensure adequate levels of ventilation and lighting.

6.2.8.9 Other use groups: In buildings of other than Use Group H2, H3, F1 or F3, rear yards shall be provided to serve all habitable and occupiable rooms requiring light and ventilation from such source. The lowest level of such yards shall begin at the sill level of the second storey windows, with a depth of not less than 3m for a height of 10m and shall increase 75mm for each additional 30cm of height above that level.

6.2.9 OBSTRUCTION OF COURTS AND YARDS

6.2.9.1 Permissible projections: Every required court and yard shall remain unobstructed for its required area and full height, except for the projections permitted in
Section 6.3.7. In Use Groups H and F, clothes poles, arbors, garden trellises and other such accessories shall not be prohibited in the open spaces at ground level.

6.2.9.2 Motor vehicle parking: When approved, the use of required court and yard areas for automobile parking spaces or private garages not exceeding one storey in height when accessory to and only for the use of the occupants of a Use Group H building is permitted, provided required windows for light and ventilation are not obstructed thereby and local setback regulations are met.

6.2.10 WINDOW CLEANING SAFEGUARDS

6.2.10.1 General: All buildings and structures over 15m or four storeys in height, in which the windows are cleaned from the outside, shall be provided with anchors or other approved safety devices for all window openings. Such anchors, belt terminals or other devices shall be of approved design, and constructed of corrosion-resistive materials securely attached to the window frames or anchored in the enclosure walls of the building. Cast iron or cast bronze anchors shall be prohibited.

6.2.11 SOUND TRANSMISSION CONTROL IN RESIDENTIAL BUILDINGS

6.2.11.1 Scope: This section shall apply to all common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units or between a dwelling unit and adjacent public areas such as halls, corridors, stairs or service areas in all buildings of Use Group H.

6.2.11.2 Airborne noise: Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 45 for airborne noise when tested in accordance with ASTM E90 listed in the Schedule. This requirement shall not apply to dwelling unit entrance doors, but such doors shall be tight-fitting to the frame and sill.

6.2.11.3 Airborne sound: Floor/ceiling assemblies between dwelling units and between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 45 when tested in accordance with ASTM E492 listed in the Schedule.

6.2.11.4 Tested assemblies: When approved, assemblies of building construction listed in GA 600, NCMA TEK 69A and BIA TN 5A listed in the Schedule shall be accepted as having the STC and IIC ratings specified therein for determining compliance with the requirements of this

Section.

6.3 GENERAL BUILDING LIMITATIONS

6.3.1 General

6.3.1.1 The provisions of this Part shall control the height and area of all buildings hereafter erected, and extensions to existing buildings hereafter altered or enlarged as a function of the type of construction, use group, exterior exposure and accessibility of buildings and structures for fire fighting purposes.

6.3.2 GENERAL AREA AND HEIGHT LIMITATIONS

6.3.2.1 General: The areas and heights of all buildings and structures shall be governed by the type of construction and the use group classification as defined in Chapter 5 and 6 and shall comply with the applicable provisions of the local building regulations and by-laws.

6.3.2.2. STREET ENCROACHMENTS

6.3.2.3 General: Except as herein provided, a part of any building hereafter erected and additions to an existing building heretofore erected shall not project beyond the plot line or beyond the building line when such line is established by the zoning law or any other statute controlling building construction.

6.3.2.4 Below grade: A part of a building hereafter erected below grade that is necessary for structural support of the building shall not project beyond the plot lines, except that the footings of street walls or their supports located at least 2.4m below grade shall not project more than 30cm beyond the street plot line.

6.3.2.5 Projections necessary for safety: In any specific application, the Code Enforcement Division/Section/Unit is authorised to designate by approved rules such architectural features and accessories which are deemed desirable or necessary for the health and safety of the public and the maximum extent to which they shall project beyond the street plot line or the building line where such is established by statute, subject to all provisions and restrictions that are otherwise prescribed by law, ordinance or rule of the authorities having jurisdiction over streets or public spaces.

6.3.2.6 Permit revocable: Any permit granted or permission expressed or implied in the provisions of this code to construct a building so as to project beyond the street plot line or building line shall be revocable by the jurisdiction at will.

6.3.2.7 Existing encroachments: Parts of existing buildings and structures which already project beyond the street plot line or building line are not required to be altered until their removal is directed by the proper authorities of the jurisdiction.

6.3.3 PERMISSIBLE STREET PROJECTIONS

6.3.3.1 General: Subject to such provisions as are otherwise prescribed by law or ordinance, or by rules of the authorities having jurisdiction over streets, highways, and public spaces, the following projections, as described in Sections 6.3.6.2 through 6.3.6.7, shall be permitted beyond the street plot line or the building line in existing built- up neighbourhoods.

6.3.3.2 Cornices and eaves: Main cornices or roof eaves located at least 3.6m above the curb level shall project not more than 900mm.

6.3.3.3 Architectural decorations: Belt courses, lintels, sills, architraves, pediments and similar architectural decorations shall project not more than 100mm when less than 3m above the curb level, and not more than 250mm when 3m or more above the curb level.

6.3.3.4 Ornamental columns: Ornamental columns, or pilasters, including the bases and moldings which emphasize the main entrance of the building, shall project not more than 300mm.

6.3.3.5 Entrance steps: Entrance steps and doors shall project not more than 300mm and

shall be guarded by check pieces not less than 900mm high, or shall be located between ornamental columns or pilasters.

6.3.3.6 Oriel windows: Oriel windows with the lowest portion at least 3m above the curb level shall project not more than 750mm.

6.3.3.7 Balconies: Balconies located at least 3m above the curb level shall project not more than 900mm, except that when the balcony is required in connection with a fore escape or exterior stairway as an element of a means of egress, the projection shall not exceed 1.2m.

6.3.3.8 Awnings: Retractable or fixed awnings shall have clearances above the grade, and shall be installed in accordance with the requirements of Section 6.3.6.3.

6.3.3.9 Awning covers or boxes: Awning covers or boxes located at least 2.4m above the curb level shall not projected more than 900mm. Awnings or boxes should be located within the property line.

6.3.3.10 Marquee: For the purpose of this section, a marquee shall include any object or decoration attached to or a part of the said marquee. No marquee should project beyond the property line.

6.3.3.10.1 Projection and clearance: The horizontal clearance between a marquee and the curb line shall be not less than 600mm. A marquee projecting more than two- thirds of the distance from the property line to the curb line shall not be less than 3m above the ground or pavement below.

6.3.3.10.2 Thickness: The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not exceed 900mm when the marquee projects more than two-thirds of the distance from the property line to the curb line, and shall not exceed 2.7m when the marquee is less than two-thirds of the distance from the property line to the curb line.

6.3.3.10.3 Roof construction: Where the roof or any part thereof is a skylight, the materials shall consist of approved plastics, or wired glass not less than 6mm thick with a single pane not more than 450mm wide. Every roof and skylight of a marquee shall be sloped to downspouts which shall conduct any drainage from the marquee in a manner not to spill over the sidewalk.

6.3.3.10.4 Location prohibited: Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and not to obstruct the clear passage of stairways or exit discharge from the building or the installation or maintenance of street lighting.

6.3.3.10.5 Construction: A marquee shall be supported entirely from the building and constructed of non-combustible material. Marquees shall be designed and constructed to withstand wind or other lateral loads and live loads as required in Part 5 of this Code. Structural members shall be protected to prevent deterioration.

6.3.3.10.6 Vaults: Vaults below the sidewalk level shall extend not closer than 900mm to the curb line, and the construction and use of such vaults shall be subject to the terms and conditions of the authority of legislative body having jurisdiction.

6.3.3.10.7 Areaways: Areaways shall not project more than 1.2m beyond the street plot line provided that every such areaway shall be covered over at the street grade by an approved grating of metal or other non-combustible material.

6.3.4 PERMISSIBLE YARD AND COURT ENCROACHMENTS

6.3.4.1 General: A part of any building or structure shall not extend into side courts, inner courts or yards required for light and ventilation of habitable and occupiable rooms by the provisions of this Chapter or by the zoning law or other statutes controlling building construction, except as hereinafter provided; but the encroachment shall not exceed 20 percent of the area of yard or court required for light and ventilation purposes.

6.3.4.2 Exterior stairways and fire escape: Outside stairways, smoke proof tower balconies, fire escapes or other required elements of a means of egress shall not project more than 1.2m beyond the face of the wall.

6.3.5 SPECIAL AND TEMPORARY PROJECTIONS

6.3.5.1 Alley projections: The permissible projection beyond street plot lines shall apply in general to building projections into alleyways, except as is modified by the authority having jurisdiction or by special restriction.

6.3.5.2 Special permits: When authorised by special permit, vestibule and storm doors shall be erected for periods of time not exceeding seven months in any one year, and shall not project more than 900mm or more than one-fourth the width of the sidewalk beyond the street plot line. Temporary entrance awnings shall be erected with a minimum clearance of 2.1m to the lowest portion of the hood or awning when supported on removable steel, or other approved non-combustible supports.

6.3.6 AWNINGS AND CANOPIES

6.3.6.1 Permit: A permit shall be obtained from the Code Enforcement Officer for the erection, repair or replacement of any fixed awning, canopy or hood except as provided in Section 11.10.2, and for any retractable awning located at the first floor level and extending over the public street or over any portion of a court or yard beside a building serving as a passage from a required exit or exit discharge to a public street.

6.3.6.2 Exemption from permit: A permit shall not be required for the erection, repair or replacement of fixed or retractable awnings installed on buildings of Use Group H-3 unless they project over public property, or for retractable awnings installed above the first floor or where the awning does not project over the public street or over any court or yard serving as a passage from a required exit to a public street.

6.3.6.3 Retractable awnings: There shall be a minimum clearance of 2.1m from the sidewalk to the lowest part of the framework to any fixed portion of any retractable awning, except that the bottom of the valance of canvas awning shall have a minimum clearance of 2m above the sidewalk. Retractable awnings shall be securely fastened to the building and shall not extend closer than 300mm from the curb line. They shall be equipped with a mechanism or device for raising and holding the awning in a retracted or closed position against the face of the building. Retractable awnings should not project beyond the property line.

6.3.6.4 Fixed or permanent awnings: The clearance from the sidewalk to the lowest part of any fixed or permanent awnings shall be the same as required in Section 6.3.6.3 for retractable awnings. Fixed or permanent awnings installed above the first floor shall not project more than 1.2m. Fixed or permanent awnings should not project beyond the property line.

6.3.6.5 Canopies: Canopies shall be constructed of a metal framework, with an approved covering, attached to the building at the inner end and supported at the outer end by not less than 600mm in from the curb line. The horizontal portion of the framework shall be not less than 2.4m nor more than 3.6m above the sidewalk and the clearance between the covering or valance and the sidewalk shall be not less than 2.1m.

6.3.6.6 Special applications of awnings: Rigid awnings supported in whole or part by members resting on the ground and used for patio covers, car ports, country house or other similar uses shall comply with the requirements of Section 6.3.6.7 for design and construction.

Such structures shall be braced as required to provide rigidity.

6.3.6.7 Design and construction: Fixed awnings, canopies and similar structures shall be designed and constructed to withstand wind or other lateral loads and live loads as required by Part 5 of this Code with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration.

6.3.7 TEMPORARY STRUCTURES

6.3.7.1 General: Pursuant to a variance granted by the Board of Appeals under the provisions of Section 13.8, the Code Enforcement Officer shall issue a permit for temporary construction as approved by the Board of Appeals. Such permits shall be limited as to time of service, but such temporary constructions shall not be permitted for more than one year.

6.3.7.2 Special approval: All temporary construction shall conform to structural strength, fire safety, means of egress, light, ventilation and sanitary requirements of this Code necessary to ensure the public health, safety and general welfare.

6.3.7.3 Termination of approval: The Code Enforcement Officer is hereby authorised to terminate such special approval and to order the demolition of any such construction at his discretion, or as directed by a decision of the Board of Appeals.

6.3.8 PHYSICALLY CHALLENGED AND AGED

6.3.8.1 Where required: The provisions of this Section shall apply to all buildings and portions thereof of Use Groups A, B, C, F, G and H.

6.3.8.2 Exceptions

i. Mechanical, storage and similar types of incidental spaces.
ii. Mezzanines and balconies in Use Groups A and C provided accessible seating accommodations are available and the services are identical.
iii. Use Group H-3.
iv. Use Group F-1 with 20 or less occupants.

6.3.8.3 Modifications: Where it can be demonstrated that one or more of the following provisions is not applicable to the proposed use and occupancy, requests for modifications shall be considered in accordance with Section 10.23.

6.3.8.4 General level access: Buildings having accessibility at occupiable grade levels, where a public elevator is not provided, shall not be required to comply with this section at floors above such levels if facilities normally sought and used by the public elevator service.

6.3.8.5 Use Group B: This Section shall not apply to the floors above grade in buildings of Use Group B where such buildings do not exceed 93m^2 in area per floor, do provide accessibility at grade floor levels, and do not provide public elevator service.

6.3.8.6 Use Group H-1: Those buildings of Use Group H-1 containing more than 20 bedroom units shall be made accessible to physically handicapped persons in accordance with this section. The number of bedroom units accessible to physically handicapped persons shall not be less than the following:

i. 21 through 99, one unit; and
ii. 100 and over, one unit plus one for each additional 100 units or fraction thereof.

To determine the total number of accessible units, more than one structure on a building site shall be considered as one building. The bedroom units allocated for the physically handicapped shall be proportionately distributed throughout all types of units. Access to additional floors without public facilities is not required.

6.3.8.7 Use Group H-2: Those building of Use Group H-2 containing more than 20 dwelling units shall be made accessible to physically handicapped persons in accordance with this Section.

The number of dwelling units accessible to physically handicapped persons shall be not less than the following:

i. 21 through 99, one unit; and

ii. 100 and over, one unit plus one for each additional 100 units or fraction thereof.

To determine the total number of accessible units, more than one structure on a building site shall be considered as one building. The dwelling units allocated for the physically handicapped shall be proportionately distributed throughout all types of units. Laundry and storage facilities shall be accessible from the barrier-free units. Access to additional floors without public facilities is not required.

6.3.8.8 Accessible buildings and facilities: Buildings and facilities required to be accessible by this Section shall comply with A117.1 listed in the Schedule, except as provided in Section 10.16.0 for ramps.

6.3.8.9 Seating accommodations: Places of assembly and education shall have not less than two seating arrangements for persons in wheelchairs.

6.3.9 SPECIAL HISTORIC BUILDINGS AND DISTRICTS

6.3.9.1 Approval: The provisions of this Code relating to the construction, repair, alteration, enlargement, restoration and moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the State or Local Government Authority as historic buildings, subject to the approval of the board of appeals, when such buildings are judged by the Code Enforcement Officer to be safe and in the interest of public health, safety and welfare regarding any proposed construction, alteration, repair, enlargement and relocation. All such approvals shall be based on the applicant's complete submission of professional architectural and engineering plans and specifications bearing the professional seal of the designer.

DESIGN STAGE

SECTION 7 ARCHITECTURAL DESIGN REQUIREMENTS

Sections

SECTION 7
ARCHITECTURAL DESIGN REQUIREMENTS

7.1 BUILDING DESIGN REQUIREMENTS

7.1.1 General

7.1.1.1 Occupancy classified: Every building or structure whether existing or hereafter erected shall be as classified in this Code according to its use or character of its occupancy into one of the Use Groups listed in paragraph 5.2.1 and as defined in Part 3, Table 7.1.3 below.

Any occupancy not mentioned specifically or in doubt shall be as classified in this Code and included in the Use Group which it most nearly falls into, based on the existing fire hazard rating of that Group.

7.1.1.2 Change in use: No change shall be made in the character of occupancies or use of any building which would place the building in a different division of the same group of occupancy or in a different group of occupancies, unless such building is made to comply with the requirements of this Code for such division or group of occupancy.

Exception

i The character of the occupancy of existing buildings may be changed subject to the approval of the code enforcement officer and the building may be occupied for purposes in other groups without conforming to all the requirements of this Code for those groups, provided the new or proposed use is less hazardous, based on life and fire risk, than the existing use.

ii No change in the character of occupancy of a building shall be made without a Certificate of Use and Occupancy as required in Section 3.10.2 of this Code.

The Code Enforcement Division/Section/Unit may issue a Certificate of Use and Occupancy pursuant to the intent of the above exception having certified that the building complies with all provisions of this Code.

7.1.1.3 Mixed occupancy

7.1.1.3.1 General: When a building is used for more than one occupancy purpose, each part of the building comprising a distinct “Occupancy,” as described in Part III, shall be separated from any other occupancy as specified in Section 7.1.2.5.

Exceptions

i Where an approved spray booth constructed in accordance with the National Fire Safety Code is installed, such booth need not be separated from other Group C Occupancies or from Group B Occupancies.

ii The following occupancies need not be separated from the uses to which they are accessory:

a. Assembly rooms having a floor area of not over 70m^2.
b. Administrative and clerical offices and similar rooms do not exceed 25 percent of the floor area of the major use when not related to Group E Division 1 and Group E, Division 1 and 2 Occupancies.
c. Gift shops, administrative offices and similar rooms in Group H, Division 1 Occupancies not exceeding 10 percent of the floor area of the major use.
d. The kitchen serving the dining area of which it is a part.

iii An occupancy separation need not be provided between a Group H, Division 1

Occupancy and a carport having no enclosed uses above, provided the carport is entirely open on two or more sides.

7.1.1.3.2 When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed therein. The area of the building shall be such that the sum of the ratios of the actual area for each separate occupancy divided by the total allowable area for each separate occupancy shall not exceed one.

Where minor accessory uses do not occupy more than 10 percent of the area of any floor of a building, nor more than the basic area permitted in the occupancy by Table

7.1.4 for such minor use, for the purpose of determining allowable area, the major use of the building shall determine the occupancy classification, provided the uses are separated as specified in Section 7.1.2.5. Except for buildings containing Group H, Division 1 through Division 1 and Division 6 Occupancies, the provisions of this Paragraph are applicable to buildings constructed under the provisions of Section

7.1.5.2 for unlimited area.

An occupancy shall not be located above the storey or height set forth in Table 7.1.6 except as provided in Section 7.1.6. When a mixed occupancy building contains a Group E, Division 6 Occupancy, the portion containing the Group E, Division 6 Occupancy shall not exceed three storeys or 16.8m in height.

7.1.1.3.3 Forms of occupancy separation: Occupancy separations shall be vertical or horizontal or both or, when necessary, of such other form as may be required to afford a complete separation between the various occupancy divisions in the building.

Where the occupancy separation is horizontal, structural members supporting the separation shall be protected by equivalent fire-resistive construction.

7.1.1.3.4 Types of occupancy separations: Occupancy separations shall be classed as “four-hour fire-resistive”, “three-hour fire-resistive,” “two-hour fire resistive,” and “one- hour fire resistive.” (see U.B.C. Standard No.43-7 for fire dampers in air ducts piercing occupancy separations.)

i A “four-hour fire resistive occupancy separation” shall have no openings therein and shall be of not less than four-hour fire resistive construction.

ii A “three-hour fire resistive occupancy separation” shall be of not less than three-hour fire-resistive construction. All openings in walls forming such separation shall be protected by a fire assembly having a three-hour fire protection rating. The total width of all openings in any three-hour fire resistive occupancy separation wall in any one storey shall not exceed 25 percent of the length of the wall in that storey and no single opening shall have an area greater than 11 m^2.

All openings in floors forming a “three-hour fire-resistive occupancy separation” shall be protected by vertical enclosures extending above and below such openings. The walls of such vertical enclosures shall be of not less than two- hour fire-resistive construction and all openings therein shall be protected by a fire assembly having a one and a half hour fire-protection rating.

iii A “two-hour fire resistive occupancy separation” shall be of not less than two- hour fire resistive construction. All openings in such separation shall be protected by a fire assembly having a one and a half-hour fire protection rating.

iv A “one-hour fire resistive occupancy separation” shall be of not less than one- hour fire resistive construction. All openings in such separation shall be protected by a fire assembly having a one-hour fire-protection rating.

7.1.1.3.5 Fire ratings for occupancy separations: Occupancy separations shall be provided between the various groups and divisions of occupancies as set forth in Table

7.1.2.
Exceptions

i In Group A, Division 1 Occupancies a three-hour occupancy separation is permitted from a Group B, Division 1 Occupancy used only as a garage for the parking of passenger motor vehicles provided no repair or fueling is done.

ii In Group H, Division 1 Occupancies, a one-hour occupancy separation is permitted from a Group B, Division 1 Occupancy used only as a parking garage for private or pleasure-type motor vehicles with no repair or fueling.

iii In the one-hour occupancy separation between a Group H, Division 3 and Group C occupancy, the separation may be limited to the installation of materials approved for one-hour fire resistive construction on the garage side and a self-closing, tight-fitting solid wood door 35mm in thickness will be permitted in lieu of a one-hour fire assembly. Fire dampers need not be installed in air ducts passing through the wall, floor or ceiling separating a Group H, Division 3, Occupancy from a Group G Occupancy, provided such ducts within the Group G Occupancy are constructed of steel having a thickness not less than 0.48mm (galvanized sheet gauge 26) and have no openings into the Group G Occupancy.

7.1.1.4 LOCATION ON PROPERTY

7.1.1.4.1 General: Buildings shall adjoin or have access to a public way or yard on not less than one side. Required yards shall be permanently maintained. For the purpose of this Section, the centre line of an adjoining public way shall be considered an adjacent property line. Eaves over required windows shall be, not less than 762mm from the side and rear property lines. For eaves, See Section 6.16.

7.1.1.4.2 Fire resistance walls. Exterior walls shall have fire resistance and opening protection as set forth in Table 7.1.3, Part III, and in accordance with such additional provisions as are set forth in Part IV and Part VII. Distance shall be measured at right angles from the property line. The above provisions shall not apply to walls at right angles to the property line.

Projections beyond the exterior wall shall not extend beyond:

i A point one-third the distance to the property line from an exterior wall; or

ii A point one-third the distance from an assumed vertical plane located where fire-resistive protection of openings is first required due to location on property, whichever is the least restrictive;

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

7.1.1.4.3 Buildings on same property and buildings containing courts: For the purposes of determining the required wall and opening protection and roof-covering requirements, buildings on the same property and court walls of buildings over one storey in height shall be assumed to have a property line between them.

Exception In court walls where opening protection is required such protection may be omitted, provided

a. not more than two levels open into the court,

b. the aggregate area of the building including the court is within the allowable area, and

c. the building is not classified as a Group 1 occupancy.

When a new building is to be erected on the same property as an existing building, the location of the assumed property line in relation to the existing building shall be such that the exterior wall and opening protection of the existing building meet the criteria as set forth in

Table 7.1.3 and Part 4.
Exception

i Two or more buildings on the same property may be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Section 7.1.4 for a single building.

ii When the buildings so considered house different occupancies or are of different types of construction, the area shall be that allowed for the most restricted occupancy or construction.

7.1.1.5 Allowable floor area:

7.1.1.5.1 One-storey areas: The area of a one-storey building shall not exceed the limits set forth in Table 7.1.4. except as provided in Section 7.1.5.

7.1.1.5.2 Areas of buildings over one storey: The total combined floor area for multistorey buildings may be twice that permitted by Table 7.1.4 for one storey buildings, and the floor area of any single storey shall not exceed that permitted for a one-storey building.

7.1.1.5.3 Mezzanines: Unless considered as a separate storey, the floor area of all mezzanines shall be included in calculating the allowable floor area of the storeys in which the mezzanines are located.

7.1.1.5.4 Basements: A basement need not be included in the total allowable area, provided such basement does not exceed the area permitted for a one storey building.

7.1.1.5.5 Area separation walls: Each portion of a building separated by one or more area separation walls may be considered a separate building, provided the area separation walls meet the following requirements:

Area separation walls shall be not less than four-hour fire resistive construction in Types 1,2-F.R,3 and 4 buildings and two-hour fire resistive construction in Types II one- hour, 2-N or 5 buildings. The total width of all openings in such walls shall not exceed 25 percent of the length of the wall in each storey. All openings shall be protected by a fire assembly having a three-hour fire-protection rating in four-hour fire-resistive walls and one and a half fire-protection rating in two-hour fire-resistive walls.

Area separation walls shall extend to the outer edges of horizontal projecting elements such as balconies, roof overhangs, canopies, awnings or architectural projections.

When horizontal projecting elements do not contain concealed spaces, the area separation wall need only extend through the concealed space to the outer edges of the projecting elements. The exterior walls and the projecting elements above shall be of not less than one-hour fire-resistive construction for a distance not less than the depth of the projecting elements on both sides of the area separation wall. Openings within such widths shall be protected by fire assemblies having a fire-protection rating of not less than one-hour.

Area separation walls and the projecting elements above shall be of not less than one- hour fire-resistive construction for a distance not less than the depth of the projecting elements on both sides of the area separation wall. Openings within such widths shall be protected by fire assemblies having a fire-protection rating of not less than one-hour. Area separation walls shall extend from the foundation to a point at least 762mm above the roof.

Exception

i Area separation walls terminate at the underside of the roof sheathing, deck or slab, provided the roof-ceiling assembly is of at least two-hour fire-resistive construction.

ii Two-hour fire-resistive area separation walls may terminate at the underside of the roof sheathing, deck or slab, provided:

a. Where the roof-ceiling framing elements are parallel to the walls, such framing and elements supporting such framing shall be of not less than one-hour fire-

resistive construction for a width of not less than 1524mm on each side of the wall.

b. Where roof-ceiling framing elements are perpendicular to the wall, the entire span of such framing and elements supporting such framing shall be of not less than one-hour fire-resistive construction.

c. Openings in the roof shall not be located within 1524mm of the area separation wall.

iii Two-hour area separation walls may terminate at roofs of entirely noncombustible construction.

iv Parapets of area separation walls shall have non-combustible faces for the uppermost 450mm, including counterflashing and coping materials.

v Where an area separation wall separates portions of a building having different heights, such wall may terminate at a point 750mm above the lower roof level, provided the exterior wall for a height of 3048mm above the lower roof is of one-hour fire-resistive construction with openings protected by assemblies having a one-hour fire-protection rating.

7.1.1.5.6 The area separation wall may terminate at the underside of the roof sheathing, deck or slab of the lower roof, provided:

a. Where the roof-ceiling framing elements are parallel to the wall, such framing and elements supporting such framing shall be of not less than one-hour fire- resistive construction for a width of 3048mm along the wall at the lower roof.

b. Where the lower roof-ceiling framing elements are perpendicular to the wall, the entire span of such framing and elements supporting such framing shall be of not less than one-hour fire-resistive construction.

c. Openings in the lower roof shall not be located within 3048mm of the area separation wall. (see Chapter 5 for special occupancy provisions).

7.1.1.6 Allowable area increase

7.1.1.6.1 General: The floor area specified in Section 7.1.4 may be increased by one of the following:

7.1.1.6.1.1 Separation on two sides: Where public ways or yards more than 6100mm in width extend along and adjoin two sides of the building, floor areas may be increased at a rate of 4 percent for each meter by which the minimum width exceeds 6100mm, but the increase shall not exceed 50 percent.

7.1.1.6.1.2 Separation on three sides: Where public ways or yards more than 6100mm in width extend along and adjoin three sides of the building, floor areas may be increased at a rate of 8 percent for each meter by which the minimum width exceeds 6100mm but the increase shall not exceed 100 percent.

7.1.1.6.1.3 Separation on all sides: Where public ways or yards more than 6100mm in width extend on all sides of a building and adjoin the entire perimeter, floor areas may be increased at a rate of 16 percent for each meter by which the minimum exceeds 6100mm. Such increases shall not exceed 100 percent, except that greater increases shall be permitted for the following occupancies:

i Group B, Division 3, aircraft storage hangars not exceeding one storey in height.

ii Group B, Division 4 Occupancies not exceeding two storeys in height.

iii Group E, Division 5 aircraft repair hangars not exceeding one storey in height. Area increases shall not exceed 500 percent for aircraft repair hangars except as provided in Section 7.1.5.2.

7.1.1.6.1.4 Unlimited area: The area of any one-or two-storey building of Groups B and E,

Division 5 occupancies shall not be limited, if the building is provided with an approved automatic sprinkler system throughout, as specified in and entirely surrounded and adjoined by public ways or yards not less than 1830mm in width.

The area of a Group B, Division 4 Occupancy in a one-storey Type 2 and Type 3 one- hour or Type 4 building shall not be limited if the building is entirely surrounded and adjoined public ways or yards not less than 1830mm in width.

7.1.1.6.1.5 Automatic sprinkler systems: The areas specified in Table 7.1.4 and Section 7.1.4.2 may be tripled in one-storey buildings and doubled in buildings of sprinkler system throughout. The area increases permitted in this Section 7.1.5.1 may be compounded with that specified in Section 7.1.5.1.1, 7.1.5.1.2, 7.1.5.1.3. if the sprinkler systems are installed under the following provisions:

a. Section 7.1 4 for an increase in allowable number of storeys.

b. Chapter 12.1 for Group E, Division 1 and 2 Occupancies.

c. Substitution for one-hour fire-resistive construction pursuant to Section 7.1.7.

d. Section 6.21 Atriums.

7.1.1.6.1.6 Maximum height of buildings and increases: The maximum height and number of storeys of every building shall be dependent upon the character of the occupancy and the type of construction and shall not exceed the limits set forth in Table 7.1.6, except as provided in this section and as specified in Section 7.1.2.1 for mixed occupancy buildings.

Exception

i Towers, spires and steeples erected as a part of a building and not used for habitation or storage are limited as to height only by structural design if completely of non-combustible materials, or may extend not to exceed 6.1m above the height limit in Table No.7.1.6 if of combustible materials.

ii The height of one-storey aircraft hangars shall not be limited if the building is provided with automatic sprinkler systems throughout as specified in Section 12.1 and is entirely surrounded by public ways or yards not less in width than one and one-half times the height of the building.

The storey limits set forth in Table 7.1.6 may be increased by one storey if the building is provided with an approved automatic sprinkler system throughout. The increase in the number of storeys for automatic sprinkler systems shall not apply when the automatic sprinkler systems throughout are installed under the following provisions:

a. Section 12.1.13.7 for Group E, Division 1, 2 and 6 Occupancies.

b. Section 7.1.5 for an increase in allowable area.

c. Substitution for one-hour fire-resistive construction pursuant to Section 7.1.7.

d. Section 6.21, Atriums.

See section 4 inclusive for special occupancy provisions.

7.1.1.7 Fire-resistive substitution: Where one-hour fire-resistive construction throughout is required by this Code, an approved automatic sprinkler system, as specified in Section 12.1, may be substituted, provided such system is not otherwise required throughout the building.

Exception: Such substitution shall not waive nor reduce required fire-resistive construction for:

Occupancy separations [Section 7.1.2.4]

ii Exterior wall protection due to proximity of property lines [Section 7.1.3.2]

Area separations [Section 7.1.4.5]

iv Shaft enclosures [Section 6.12]

v Corridors [Section 6.12]

vi Stair enclosures [Section 10.17]

vii Exit passageways [Section 10.11]

viii Type of construction separation [Section 6.2.1]

ix Atriums constructed in accordance with section 6.21

7.1.1.8 Pedestrian walkways

7.1.1.8.1 General: A pedestrian walkway shall be considered a building when determining the roof covering permitted by Section 10.7. Pedestrian walkways connecting separate buildings need not be considered as buildings and need not be considered in the determination of the allowable floor area of the connected buildings when the pedestrian walkway complies with the provisions of this section.

7.1.1.8.2 Construction: Pedestrian walkways shall be constructed of non-combustible materials.

EXCEPTIONS:

i. Pedestrian walkways connecting buildings of Type 3, 4 or 5 construction in accordance with requirements for Heavy Timber construction (see Chapter on materials)

ii. Pedestrian walkways located on grade having both sides open by at least 50 percent and connecting buildings or Type 3, 4 or 5 construction may be constructed with any materials allowed by this Code.

7.1.1.8.3 Openings between pedestrian walkways and buildings: Openings from buildings to pedestrian walkways shall conform to the requirements of Table 7.1.3 and Sections 12.1.8.10, 12.2.9.1 and 7.1.3. In addition, pedestrian walkways connecting buildings shall be either provided with opening protection at connections to buildings in accordance with Section 10.13 or constructed with both sides of the pedestrian walkway at least 50 percent open with the open area distributed so as to prevent the accumulation of smoke and toxic gases.

7.1.1.8.3.1 Width: The unobstructed width of pedestrian walkways shall be not less than 1100mm.

7.1.1.8.3.2 Maximum length: The length of a pedestrian walkway shall not exceed 91.4m.

Exception

i Pedestrian walkways that are fully sprinklered may be 122m in length.

ii Unenclosed walkways at grade.

7.1.1.8.3.3 Multiple pedestrian walkways: The distance between any two pedestrian walkways on the same horizontal plane shall be not less than 12.2m.

7.1.1.8.3.4 Required exits: Pedestrian walkways at other than grade level shall not be used as required exits. Pedestrian walkways at grade level used as required exits shall provide an unobstructed means of egress to a public way and shall have a minimum width in accordance with Section 10.9.2.

7.1.1.8.3.5 Pedestrian walkways over public streets: Pedestrian walkways over public streets shall be subject to the approval of local jurisdictions.

7.1.1.9 Sanitation

7.1.1.9.1 Water closet separation: A room in which a water closet is located shall be separated from food preparation or storage rooms by a tight-fitting door.

7.1.1.9.2 Floors and walls in water closet compartment and showers: In other than dwelling units, toilet room floors shall have a smooth, hard, non-absorbent surface such as Portland cement, concrete tiles or other approved material which extends upward onto the walls at least 127 mm. Walls within water closet compartments and walls within 800mm of the front and sides of urinals shall be similarly finished to a height of 1.2m and, except for structural elements; the materials used in such shall be of a type which is not adversely affected by moisture.

Showers in all occupancies shall be finished as above to a height of not less than 1.8m above

the drain inlet. Materials other than structural elements used in such walls shall be of a type which is not adversely affected by moisture.

In all occupancies, accessories such as grab bars, towel bars, paper dispensers and soap dishes, etc., provided on or within walls, shall be installed and sealed to protect structural elements from moisture.

7.1.1.9.3 Access to toilets and other facilities:

7.1.1.9.3.1 Access to water closets: Each water closet stool shall be located in a clear space not less than 762mm in width and have a clear space in front of the water closet stool of not less than 600mm.

Where toilet facilities are provided on any floor where access by the physically challenged is required by Table 10.10, at the least one such facility for each sex or a separate facility usable by either sex shall comply with the requirement of this Section. Except in dwelling units and guest rooms, such facilities must be available to all occupants and both sexes. All doorways leading to such toilet rooms shall have a clear and unobstructed width of not less than 813mm each such toilet room shall have the following:

A clear space of not less than 1200mm on each side of doors providing access to toilet rooms. This distance shall be measured at right angles to the face of the door when in the closed position. Not more than one door may encroach into the 1200mm space.

Except in dwelling units and guest rooms, a clear space within the toilet room of sufficient size to inscribe a circle with a diameter not less than 1.5m. Doors in any position may encroach into this space by not more than 3000mm.

A clear space not less than 1100mm wide and 1250mm long in front of at least one water closet stool for the use of the physically challenged persons. When such water closet stool is within a compartment, entry to the compartment shall have a clear width of 900mm when located at the end and a clear width of 900mm when located at the side. A door, if approved, shall not encroach into the required space in front of the water closet. Except for door swing, a clear unobstructed access not less than 122cm in width shall be provided to toilet compartments designed for use by the physically challenged persons.

Grab bars near each side or one side and the back of the toilet securely attached 84cm to 850mm to 950mm above and parallel to the floor. Grab bars at the side shall be 1200mm long with the front end positioned 600mm in front of the water closet stool. Grab bars at the back shall be not less than 600mm long for room installations and 950mm long where the water closet is installed in a stall. Grab bars shall have an outside diameter of not less than 35mm nor more than 40mm and shall provide a clearance of 40mm between the grab bar and adjacent surface. Grab bars need not be provided in Group H, Division 1 apartment houses.

When it can be established that the facilities are usable by a person in a wheelchair, dimensions other than those above shall be acceptable.

7.1.1.9.3.2 Access to lavatories, mirrors and towel fixtures: In other than Group H, Division 3, Group G and H, Division 1 apartment houses and Group B, Division 2 and 4 storage occupancies, toilet room facilities shall be as follows:

Except for the projection of bowls and water piping, a clear unobstructed space 800mm in width and 750mm in height and 450mm in depth shall be provided under at least one lavatory.

Where mirrors are provided, at least one shall be installed so that the lowest part of the mirror is within 1000mm from the floor.

Where towel and disposal fixtures are provided, they shall be accessible to the physically challenged persons and at least one shall be within 1000mm from the floor.

7.1.1.9.3.3 Water fountains: Where water fountains are provided, at least one shall have a spout within 850mm from the floor and shall have up-front, hand-operated controls. When

fountains are located in an alcove, the alcove shall be not less than 850mm in width.

7.1.1.9.3.4 Telephones: Where public telephones are provided, at least one shall be installed so that the handset, dial and coin receiver are within 1250mm from the floor. Unobstructed access within 300mm of the telephone shall be provided. Such access shall be not less than 800mm in width.

7.1.1.9.3.5 Compressed gases: The storage and handling of compressed gases shall comply with the National Fire Safety Code.

7.1.1.9.3.6 Premises identification: Approved numbers of addresses shall be provided for all new buildings in such a position as to be plainly visible and legible from the street or road fronting the property.

TABLE NO. 7.1.3 WALL AND OPENING PROTECTION OF OCCUPANCIES BASED ON LOCATION ON PROPERTY

TYPES II ONE-HOUR, II-N AND V CONSTRUCTION:

For exterior wall and opening protection of Types 2 One-hour, 2-N and 5 buildings, see Table below and Sections 7.1.3, 7.3.9 7.1.3, 7.3.9, 6.2.3 and 6.2.6. This Table does not apply to Types 1,2, F-R,3 and 4 construction, see Sections 6.2.2, 6.2.3, 6.2.4 and 6.2.5.

GROUP	DESCRIPTION OF OCCUPANCY	FIRE RESISTANCE EXTERIOR WALLS	OPENINGS IN EXTERIOR WALLS
A	1-Any assembly building with a stage and an occupant load of 1000 or more in the building.	Not applicable (See Sections 7.2.2 and 7.2.3)	
See also Section 7.2.2	2-Any building or portion of a building having an assembly room with an occupant load of less than 1000 and a stage.	2 hours less than 3.0m,1 hour less	Not permitted less than 1.5m Protected less

	2.1-Any building or portion of a building having an assembly room with an occupant load of 300 or more without a stage, including such buildings used for educational purposes and not classed as a Group E or Group B, Division 2 Occupancy.	than 12.m	than 3.0m
	3-Any building or portion of a building having an assembly room with an occupant load of less than 3000 without a stage, including such buildings used for educational purposes and not classed as a Group E or Group B, Division 2 Occupancy.	2 hours less than 1.5m, 1 hour less than 12.0m	Not permitted less than 1.5m Protected less than 3.0m
	4-Stadiums, reviewing stands and amusement park structures not included within other Group A Occupancies.	1 hour less than 3.0m	Protected less than 3.0m
B See also Section 7.3.2	1- Gasoline service stations, garages where no repair work is done except exchange of parts and maintenance requiring no open flame, welding, or use of Class I,II or III-A liquids. 2- Drinking and dining establishments having an occupant load of less than 50, wholesale and retail stores, office buildings, printing plants, municipal police and fire stations, factories and workshops using material not highly flammable or combustible, storage and sales rooms for combustible goods, paint stores without bulk handling. Buildings or portions of buildings having rooms used for educational purposes beyond the Secondary School, with less than 50 occupants in any room.	1 hour less than 6.0m	Not permitted less than 1.5m Protected less than 3.0m
B (continued)	3- Aircraft hangars where no repair work is done except exchange of parts and maintenance requiring no open flame, welding, or the use of Class I or II liquids. Open parking garages (For requirements, See Section 7.3.9) Heliports. 4- Ice plants, power plants, pumping plants, cold storage and creameries. Factories and workshops using non-combustible and non-explosive materials. Storage and sales rooms of non-combustible and nonexplosive materials.	1 hour less than 6.0m 1 hour less than 1.5m	Not permitted less than 1.5m Protected less than 6.0m Not permitted less than 1.5m
C	1-Any building used for educational	2 hours less	Not permitted

See also Section 7.4.2	purposes through the 12th grade by 50 or more persons for more than 12 hours per week or four hours in any one day 2- Any building used for educational purposes through the Secondary School 12th grade by less than 50 persons for more than 12 hours per week or four hours in any one day 3- Any building used for day-care purposes for more than six children.	than 1.5m, 1 hour less than 3.0m	less than 1.5m Protected less than 3.0m
E	1-Storage, handling, use or sale of Classes I, II and III-A liquids; dry cleaning plants using Class I, II or III-A liquids [See also Section 7.5.1 Division 1].	See Section 7.5 and the National Fire Safety Code	
See also Sections 7.5.2 and 7.5.3	2- Storage, handling, use or sale of Classes I, II and III-A liquids; dry cleaning plants using Class I, II or II-A liquids; paint shops and spray-painting rooms and shops [See also section 7.5.1, Division 2] 3- Woodworking establishments, planing mills, box factories, buffing rooms for tire- rebuilding plants and picking rooms; shops; factories; or warehouses where loose combustible fibers or dust are manufactured, processed, generated or stored; and pin-refinishing rooms.	4 hours less than 1.5m, 2 hours less than, 1 hour less than 3.0m, 6.0m	Not permitted less than 1.5m Protected less than 6.0m
	4-Repair garages not classified Group E, Division 2 and 3 Occupancies having an occupant load of not more than 20 may have exterior wall and opening protection as required for Group R, Division 3 Occupancies.	1 hour less than 18.0m	Protected less than 18.0m
E (continued)	6-Semiconductor fabrication facilities and comparable research and development areas when the facilities in which hazardous production materials are used are designed and constructed in accordance with Section 7.5.11 and storage, handling and use of hazardous materials is in accordance with the Fire Code,[See also Section 7.5.1, Division 6].	4 hours less than 1.5m, 2 hours less than 3.0m, 1 hour less than 6.0m	Not Permitted less than 1.5m, protected less than 6.0m
F See also Section 7.6.2	1-Nurseries for the full-time care of children under the age of six (each accommodating more than five (persons) Hospitals, sanitariums, nursing homes with nonambulatory patients and similar buildings (each accommodating more than	2 hours less than 1.5m, 1 hour elsewhere	Not permitted less than 1.5m protected less than 3.0m

	five persons).		
	2- Nursinghomes for ambulatory patients, homes for children six years of age or over (each accommodating more than five persons) 3- Mental hospitals, mental sanitariums, jails, prisons, reformatorws and buildings where personal liberties of inmates are similarly restrained.	1 hour 2 hours less than 1.5m, 1 hour elsewhere	Not permitted less than 3.0m, protected less than 3.0m.
G	1-Private garages, carports, sheds and agricultural buildings (See also Section 7.7.1, Division 1) 2-Fences over 1.8m high, tanks and towers	1 hour less than 0.9m (or may be protected on the exterior with materials approved for 1-hour fire-resistive construction)	Not permitted less than 0.9m Not regulated for fire resistance
H See also Section 7.8.2	1-Hotels and apartment houses, convents and monasteries (each accommodating more than 10 persons) 3-Dwellings and lodging houses	1 hour less than 1.5m 1 hour less than 0.9m	Not permitted less than 1.5m Not permitted less than 0.9m
I	???	???	???
J	???	???	???
K	???	???	???
L	???	???	???

For agricultural buildings, see Schedule Section 7.7

NOTES: 1. See Section 7.1.3 for types of walls affected and requirements covering percentage or openings permitted in exterior walls.

2. For additional restrictions, see chapter under Occupancy and Types of Construction.
3. For walls facing yards and public ways, see Chapter 6.
4. Openings shall be protected by a fire assembly having a three-fourths- hour fire-protection rating.

TABLE NO. 7.1.2

REQUIRED SEPARATION IN BUILDINGS OR MIXED OCCUPANCY (IN HOURS)

	A-1	A-2	A-2.1	A-3	A-4	B-1	B-2	B-3	B-4	C	E-1	E-2	E-3	E-4-5	E-6	F	G	H-1	H-3
A-1		N	N	N	N	4	3	3	3	N	4	4	4	4	4	3	1	1	1
A-2	N		N	N	N	3	1	1	1	N	4	4	4	4	4	3	1	1	1
A-2.1	N	N		N	N	3	1	1	1	N	4	4	4	4	4	3	1	1	1
A-3	N	N	N		N	3	N	1	N	N	4	4	4	4	3	3	1	1	1
A-4	N	N	N	N		3	1	1	1	N	4	4	4	4	4	3	1	1	1
B-1	4	3	3	3	3		1	1	1	3	2	1	1	1	1	4	1	31	1
B-2	3	1	1	N	1	1		1	1	1	2	1	1	1	1	2	1	1	N
B-3	3	1	1	1	1	1	1		1	1	2	1	1	1	1	4	1	1	N
B-4	3	1	1	N	1	1	1	1		1	2	1	1	1	1	4	N	1	N
C	N	N	N	N	N	3	1	1	1		4	4	4	4	3	1	1	1	1
E-1	4	4	4	4	4	2				4		1	1	1	2	4	1	4	4
E-2	4	4	4	4	4	1	1	1	1	4	1		1	1	1	4	1	3	3
E-3	4	4	4	4	4	1	1	1	1	4	1	1		1	1	4	1	3	3

TABLE NO. 7.1.2 — *continued*

TABLE NO. 7.1.2 — *continued*

E-4-5	4	4	4	4	4	1	1	1	1	4	1	1	1		1	4	1	3	3
E-6	4	4	4	3	4	1	1	1	1	3	2	1	1	1		4	3	4	4
F	3	3	3	3	3	4	2	4	4	1	4	4	4	4	4		1	1	1
G	1	1	1	1	1	1	1	1	N	1	1	1	1	1	3	1		1	1
H-1	1	1	1	1	1	31	1	1	1	1	4	3	3	3	4	1	1		N
H-3	1	1	1	1	1	1	N	N	N	1	4	3	3	3	4	1	1	N	

Note: For detailed requirements and exceptions and exceptions, see Section 7.1.2.

1. The three-hour separation may be reduced to two hours where the Group B, Division 1 Occupancy is limited to the storage of passenger motor vehicles having a capacity of not more than nine persons. This shall not apply where provisions of Section 7.3.2.1 apply.
2. For agricultural buildings, see also Schedule section 7.7.

TABLE NO. 7.1.6

MAXIMUM HEIGHT OF BUILDINGS

OCCUPANCY	V		TYPES OF CONSTRUCTION			I	II	III	IV
	F.R	F.R	ONE HOUR	N	ONE HOUR	N	H.T	ONE HOUR	N
	Unlimited	50	50	18	20M	18	20	15	12
	MAXIMUM HEIGHT IN SOURCES								
A-1	Unlimited	4	Not Permitted						
A)2-2.1	Unlimited	4	2	Not Permitted	2	Not Permitted	2	2	Not Permitted
A)3.4.1	Unlimited	12	2	1	2	1	2	2	1
B)1.2.3.1	Unlimited	12	4	2	2	1	2	2	2
B-4	Unlimited	12	4	2	4	2	4	3	2
C	Unlimited	4	2	1	2	1	2	2	1
E-1	Unlimited	2	1	1	1	1	1	1	1
E)2.3.4.5	Unlimited	5	2	1	2	1	2	2	1
E-6	3	3	3	2	3	2	3	3	1
F-1	Unlimited	3	1		1	Not Permitted	1	1	Not Permitted
F-2	Unlimited	3	2	Not Permitted	2	Not Permitted	2	2	Not Permitted
F-3	Unlimited	2			Not Permitted	4			
G-5						See Chapter.5			
H-1	Unlimited	12	4	26	4	26	4	3	26
H-3	Unlimited	3	3	3	3	3	3	3	3

1. For limitations and exceptions, see Section 7.2.2.I.
2. For Open parking garages, see Section 7.3.9.
3. See Section 7.4.2.3.
4. See Section 7.6.2.2.
5. For agricultural buildings, see also Section 7.7 Chapter 11.
6. For limitations and exceptions, see Section 7.8.2.I.

N - No requirements for fire resistance F.R - Fire Resistive

H. T - Heavy Timber

TABLE 7.1.4

BASIC ALLOWABLE FLOOR AREA FOR BUILDINGS ONE STOREY IN HEIGHT (SQUARE METERS)

OCCUPANCY	I		II		III		IV	V	
	F.R	F.R	ONE HOUR	N	ONE HOUR	N	H.T	ONE HOUR	
A-1	Unlimited	2,697							
A)2-2.1	Unlimited	2,697	1,256	Not Permitted	1,256	Not Permitted	1,256	977	Not Permitted
A)3-4.2	Unlimited	2,697	1,256	846	1,256	816	1,256	977	558
B)1-2.33	Unlimited	3,711	1,674	1,116	1,674	1,116	1,674	1,302	744
B.4	Unlimited	5,571	2,511	1,674	2,511	1,674	2,511	1,953	1,116
C	Unlimited	4,207	1,819	1,256	1,879	1,256	1,878	1,460	846
E)1-24	Unlimited	1,153	521	349	521	319	521	409	233
E)3-4.5	Unlimited	2,306	1,012	698	1,012	689	1,012	818	474
E.6	Unlimited	3,711	1,674	1,116	1,674	1,116	1,674	1,302	744
F 1-2	Unlimited	1,403	632	Not Permitt	632	Not Permit	632	484	Not Permitt

			ed		ted			ed
F-3	Unlimited	1,403		Not Permitted 5				
G			See Section 7.1					
H-1	Unlimited	2,697	1,256	816	1,256	816	1,256	977	558
H-3				Unlimited				

1. For multistorey buildings, see Section 7.I.4.2.
2. For limitations and exceptions, see Section 7.2.2.1.
3. For open parking garages, see Section 7.3.9.
4. See Section 7.5.3.
5. See Section 7.6.2.2.
6. For agricultural buildings, see also Chapter 11.
7. For limitations and exceptions, see Section 8.0.2.1.

N - No requirements for fire resistance F.R - Fire Resistive

H.T - Heavy Timber

7.1.2 REQUIREMENTS FOR GROUP A OCCUPANCIES

7.1.2.1 Group A Occupancies defined

7.1.2.2 Group A Occupancies shall be

Division 1: Any assembly building with a stage and an occupant load of 1000 or more in the building.

Division 2: Any building or portion of a building having an assembly room with an occupant load of less than 1000 and a stage.

Division 2.1: Any building or a portion of a building having an assembly room with an occupant load of 300 or more without a stage, including such buildings used for educational purposes and not classed as a Group C or Group B, Division 2 Occupancy.

Division 3: Any building or portion of a building having an assembly room with an occupant load of less than 300 without a stage, including such buildings used for educational purposes and not classed as a Group C or group B, Division 2 occupancy.

Division 4: Stadia, reviewing stands and amusement park structures not included within other Group A Occupancies. Specific and General requirements for grandstands, bleachers and reviewing stands are to be found in Chapter 10. For Occupancy separations, see Table 7.1.2.

7.1.2.3 Construction, height and allowable area:

7.1.2.4 General: Buildings or parts of buildings classed in Group A because of the use or character of the occupancy shall be limited to the types of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Sections 7.1.4, 7.1.5 and 7.1.6

Exceptions

i Grandstands, bleachers or reviewing stands of Type 3 One-hour, Type 4 or Type 5 one-hour construction shall not exceed 12m to the highest level of seat boards; 6m in cases where construction is Type 3-N or Type 4-N and 3.6m in cases where construction is with combustible members in the structural frame and located indoors.

ii Division 4 structures other than Type 3-N and type 5-N grandstands, bleachers and

reviewing stands of open skeleton-frame type without roof, cover or enclosed usable space shall not be limited in area or height.

iii A fire-resistive ceiling for the roof-ceiling assembly in one-storey portions of buildings of Type 2 one-hour, Type 3 one-hour or Type 5 one-hour construction may be omitted, provided the roof framing system is open to the room and does not contain concealed spaces.

7.1.2.5 Special provisions: Stages/Performing platforms shall be constructed in accordance with the provisions of Chapters 24 and 25 on Structures. The gradient of the main floor assembly room shall not exceed the gradient permitted by Section 10.16. Occupancies with an occupant load of 1000 or more shall be of type 1, Type 2-F.R, Type 2 one-hour, Type 3 one-hour or Type 4 construction, except that the roof framing system for one-storey portions of buildings of Type 2 one-hour or Type 3 one-hour construction may be of unprotected construction when such roof framing system is open to the room and does not contain concealed spaces.

Division 3 Occupancies located in a basement or above the first storey shall be of not less than one-hour fire-resistive construction.

Group A Assembly rooms having an occupant load of 1000 or more shall not be located in the basement.

Exception

i Basement of buildings of Type 1 or 2-F.R construction.

ii Division 3 Occupancies with an occupant load of 50 or more which are located over usable space shall be separated from such space by not less than one- hour resistive construction.

iii For attic space partitions and draft stops, (see Section 12.2.16.5 on Timber Construction).

7.1.2.6 Division 4 provisions: Erection and structural maintenance shall conform to the special requirements as well as with other applicable provisions of this Code.

When the space under a Division 4 Occupancy is used for any purpose, including exits, it shall be separated from all parts of such Division 4 Occupancy, including exits by walls, floor and ceiling of not less than one-hour fire-resistive construction.

Exceptions

i Exits under temporary grandstands need not be separated.

ii The underside of continuous steel deck grandstands when erected outdoors need not be fire protected when occupied for public toilets.

The Code Enforcement Officer may cause Division 4 structures to be reinspected at least once every six months.

Grandstands or bleachers may have seatboards, toeboards, bearing or base pads and footboards of combustible materials regardless of construction type.

Seating and exiting requirements for reviewing stands, Folding and telescopic seating, grandstands and bleachers are provided under Section 8.14

7.1.2.7 Location of building on property: Buildings housing Group A Occupancies shall have access to a public street not less than 6.0m in width. The access to the public street shall be a minimum of 6.0m wide right-of-way, unobstructed and maintained only as access to the public street. The main entrance to the building shall be located on a public street or on the access way. The main assembly floor of Division

1 Occupancies shall be located at or near the adjacent ground level. For the fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Chapter 6.

7.1.2.8 Exit facilities

7.1.2.8.1 General: Stairs, exits and enclosures shall be provided as specified in Section 10.

7.1.2.8.2 Amusement structures: Exits and exit signs for Division 4, amusement structures, shall be approved by the Code Enforcement Officer and, where practicable, shall comply with the requirements specified in Section 10.

7.1.2.8.3 Light, ventilation and sanitation: All enclosed portions of Group A Occupancies customarily used by human beings and all dressing rooms shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the total floor area, and natural ventilation by means of openable exterior openings with an area not less than one twentieth of the total floor area, or shall be provided with artificial light and a mechanically operated ventilating system. The mechanically operated ventilating system shall be capable of supplying a minimum of $0.14m^3$ per minute of outside air with a total circulated of not less than $0.42m^3$ per occupant in all portions of the building during such time as the building is occupied. If the velocity of the air at the register exceeds 0.3m per second, the register shall be placed more than 2.4m above the floor directly beneath.

Toilet rooms shall be provided with a fully openable exterior window at least $0.25m^2$ in area; or a vertical duct not less than $0.65m^2$ in area for the first toilet facility, with $0.37m^2$ for each additional facility; or a mechanically operated exhaust systems capable of providing a complete change of air every 15 minutes. Such systems shall be connected directly to the outside, and the point of discharge shall be at least 1.5m from any openable window. There shall be provided in an approved location at least two water lavatories for each two lavatory closets for each sex, and at least one drinking fountain for each floor level.

For other requirements on water closets, see Section 7.1.9 and 7.1.10.

7.1.2.8.4 Shaft enclosures: Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 6.12.

7.1.2.8.5 Sprinkler and standpipe systems: When required by other provisions of this Code, automatic sprinkler systems and standpipes shall be installed as specified in section 12.1.

7.1.2.8.6 Special hazards: Stages/Performing platforms shall be equipped with automatic ventilators as required in Section 8.17.

7.1.2.8.7 Chimneys and heating apparatus shall conform to the requirements of the section on Masonry of this Code and relevant section of this Code.

7.1.2.8.8 Motion picture machine booths shall conform to the requirements of Section 8.15.

Proscenium curtains shall conform to the requirements set forth in U.B.C. Standard No. 6-1.

7.1.2.8.9 Class I, II or III-A liquids shall not be placed or stored in any Group A Occupancy.

7.1.2.8.10 All exterior openings in a boiler room or room containing central heating equipment if located below openings in another storey or if less than 3.0m from other doors or windows of the same building shall be protected by a fire assembly having a one-hour fire protection rating. Such fire assemblies shall be fixed, automatic or self closing. Every room containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a one-hour fire-resistive Occupancy separation.

Exception: Boilers, central heating plants or hot-water supply boilers where the largest piece of fuel equipment does not exceed 400,000 Btu per hour input.

7.1.2.9 Modifications: Gymnasia and similar occupancies may have running tracks constructed of wood or unprotected steel or iron.

In gymnasia or in multipurpose schoolrooms having an area not greater than $297.6m^2$, Ex-25mm tight tongue-and-grooved or 19mm plywood wall covering may be used on the inner side in lieu of fire-resistive plaster.

7.1.3 REQUIREMENTS FOR GROUP B OCCUPANCIES

7.1.3.1 Group B Occupancies defined

Group B Occupancies shall be
Division 1: Gasoline service stations, garages where no repair work is done except exchange of parts and maintenance requiring no open flame, welding or use of Class I,
II or III-A liquids.
Division 2: Drinking and dining establishments having an occupant load of less than 50, wholesale or retail stores, office buildings, printing plants, municipal police and fire stations, factories and workshops using materials not highly flammable or combustible, storage and sales rooms for combustible goods, paint stores without bulk handling (see Chapter 4 for definition of assembly buildings).
Buildings or partitions of buildings having rooms used for educational purposes beyond the Secondary School with less than 50 occupants in any room.
Division 3: Aircraft hangars where no repair work is done except exchange of parts and maintenance requiring no open flame, welding or the use of Class I or II liquids.

Open parking garages.

Heliports.

Division 4: Ice plants, power plants, pumping plants, cold storage and creameries. Factories

and workshops using non-combustible and non-explosive materials. Storage
and sales rooms containing only non-combustible and non-explosive materials that are not packed or crated in or supported by combustible material. For occupancy separations, see Table 7.1.2.

7.1.3.1.1 Construction, height and allowable area:

7.1.3.1.2 General: Buildings or parts of buildings classed in Group B Occupancy because of the use or type of the occupancy shall be limited to the types of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Sections 7.1.4, 7.1.5 and 7.1.6.

Other provisions of this code notwithstanding, a Group B, Division 1 Occupancy located in the basement or first storey of a building housing a Group B, Division 2 or a Group H, Division 1 Occupancy, may be classed as a separate and distinct building for the purpose of area limitation of number of storeys and type of construction, when all of the following conditions are met: The Group B, Division 1 Occupancy is of Type 1 construction.

7.1.3.1.3 There is a three-hour occupancy separation between the Group B, Division 1 Occupancy and all portions of the Group B, Division 2 or Group H, Division 1 Occupancy.

7.1.3.1.4 The basement of first storey is restricted to the storage of passenger vehicles, but may contain laundry rooms and mechanical equipment rooms incidental to the operation of the building.

7.1.3.1.5 The maximum building height in (m) shall not exceed the limits set forth in Table No. 7.1.6 for the least type of construction involved.

7.1.3.1.6 Special Provision: Marine or motor vehicle service stations including canopies and supports over pumps shall be of non-combustible, fire-retardant treated wood or of one-hour fire-resistive construction.

Exceptions

i Roofs of one storey service stations may be of heavy timber construction.

ii Canopies conforming to Section 10 may be erected over pumps.

iii In areas where motor vehicles, boats or airplanes are stored, and in gasoline service stations, floor surfaces shall be of non-combustible, non-absorbent materials. Floor shall drain to an approved oil separator or trap discharging to sewers in accordance

with the Plumbing Code.

iv Floors may be surfaced or waterproofed with asphaltic paving materials in areas where motor vehicles or airplanes are stored or operated.

v Storage area in excess of 93m^2 in connection with the wholesale or retail sales in division 2 Occupancies shall be separated from the public areas by a one- hour fire-resistive occupancy separation as defined in Section 7. Such areas may be increased to 280m^2 when sprinklers, not otherwise required, are installed in the storage area.

vi A one-hour fire-resistive occupancy separation is not required where an approved automatic sprinkler system is installed throughout the building. Area increases also shall be permitted as specified in Section 7.1.5.3.

vii Parking garages shall have an unobstructed headroom clearance of not less than 2.1m above the finish floor to any ceiling, beam, pipe or similar construction, except for wall-mounted shelves, storage surfaces, racks or cabinets. In Division 4 Occupancies, fire protection of the underside of roof framing may be omitted in all types of construction.

viii For attic space partitions and draft stops, see Section 12.2.16.5.

ix For smoke and heat venting, see Section 12.2.32.

7.1.3.1.7 Location on property: For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Part IV.

7.1.3.1.8 Exit facilities: Stairs, exits and smokeproof enclosures shall be provided as specified in Section 7.3.

7.1.3.2 Light, ventilation and sanitation:

7.1.3.2.1 In Group B Occupancy buildings, all enclosed portions customarily occupied by human beings, other than rooms and areas for which requirements are specified elsewhere in this Section, shall be provided with natural light by means of exterior glazed openings with an area equal to one tenth of the total area of such portions, and natural ventilation by means of exterior area openings with an openable area not less than one twentieth of the total floor of such portions, or shall be provided within an artificial light and a mechanically operated ventilating system. The mechanically operated ventilating system shall be capable of supplying a minimum of 0.14m^3 per minute of outside air with a total circulated of not less than 0.42m^3 per occupant in all occupied portions of the building.

7.1.3.2.2 In all buildings or portions thereof where Class 1, 2 or 3-A liquids are used as stipulated in Table 7.5.11 below, exhaust ventilation shall be provided sufficient to produce four air changes per hour. Such exhaust ventilation shall be taken from a point at or near the floor level.

7.1.3.2.3 In all parking garages, other than open parking garages as defined in Section

7.3.9.2, used for storing or handling of automobiles operating under their own power and on all loading platforms in bus terminals, ventilation shall be provided capable of exhausting a minimum of 7.6 litres/m2 of gross floor area.

7.1.3.2.4 The Building Code Enforcement Division/Section/Unit shall approve an alternate ventilation system designed to exhaust a minimum of 6600 litres/m^2 or as may be prescribed from time to time for each operating vehicle. Such system shall be based upon the anticipated instantaneous movement rate of vehicles but not less than

2.5 percent (or one vehicle) of the garage capacity. Automatic Carbon-monoxide (CO) sensing devices may be employed to modulate the ventilation system to maintain a maximum average concentration of CO of 50 ppm during any eight-hour period, with a maximum concentration not greater than 200 ppm for a period not exceeding one hour. Connecting offices, waiting rooms, ticket booths, etc., shall be supplied with conditioned air under positive pressure.

Exceptions

i In gasoline service stations without lubrication pits, storage garages and aircraft hangars, the Code Enforcement Division/Section/Unit shall authorise the omission of such ventilating equipment, where the building is supplied with unobstructed openings to the outer air which are sufficient to provide necessary ventilation.

ii Every building or portion thereof where persons are employed shall be provided with at least one water closet. Separate facilities shall be provided for each sex when the number of employees exceeds four and when both sexes are employed such toilets facilities shall be located either in such building or conveniently in a building adjacent thereto on the same property. Such water closet rooms in connection with food establishments where food is prepared, stored or served shall have a non-absorbent interior finish as specified in Section 7.1.9.2, shall have hand-washing facilities therein or adjacent thereto, and shall be separated from food preparation or storage rooms as specified in Section 7.1.9.1

iii Toilet rooms shall be provided with a fully openable exterior window at least 0.28m^2 in area, or a vertical duct not less than 0.065m^2 in area for the first toilet facility, with 0.035m^2 for each additional facility; or a mechanically operated exhaust system capable of providing a complete change of air every 15 minutes. Such systems shall be connected directly to the outside, and the point of discharge shall be at least 1.5m from any openable window. For other requirements on water closets, see Section 7.1.9.

7.1.3.3 Shaft enclosures:

7.1.3.3.1 Exits shall be enclosed as specified in Chapter 10.

7.1.3.3.2 Elevator shafts, vent shafts and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 6.12.

Exceptions: In Group B, Division 4 Occupancies, Exits shall be enclosed as specified in chapter 10, but other vertical openings need not be enclosed.

7.1.3.4 Sprinkler and standpipe systems: When required by other provisions of this Code, automatic sprinkler systems and standpipes shall be installed as specified in Section 12.

7.1.3.4.1 Special hazards

7.1.3.4.2 Chimneys and heating apparatus shall conform to the requirements in Sections 8, 8.9, 9.1.8.28, 9.2, 10.3, 10.4, 10.5, 12.1 and 12.2 of this Code.

7.1.3.4.3 Storage of Class 1 liquids shall not be allowed in Group B, Division 1, 2 and 3 Occupancies and the handling and use of gasoline, fuel oil and other Class 1, 2 or 3. A-Liquids shall not be permitted in any Group B Occupancy unless such use and handling comply with the ***National Fire Safety Code and existing ASHME and British Standard Codes.***

7.1.3.4.4. Devices generating a glow or flame capable of igniting gasoline vapour shall not be installed or used within 40cm of the floor in any room in which Class I flammable liquids or gas are used or stored.

7.1.3.4.5 Every room containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a one-hour fire- resistive occupancy separation. Boilers, central heating plants or hot-water supply boilers where the largest piece of fuel equipment does not exceed 400,000 Btu per hour input. Buildings erected or converted to hour high-piled combustible stock shall comply with the National Fire Safety Code.

7.1.3.5 Open Parking Garages

7.1.3.5.1 Scope: Except where specific provisions are made in the following subsections, other requirements of this code shall apply.

7.1.3.5.2 Definitions: For the purpose of this section, certain terms are defined as follows:

7.1.3.5.2.1 Open parking garage is a structure of Type 1 or Type 2 construction with the

openings as described in Section 7.3.9.2.3 on two or more sides and which is used exclusively for the parking or storage of private or pleasure-type motor vehicles.
Exception: The ground-level tier may contain an office, waiting and toilet rooms having a total area of not more than 93m^2, and such area need not be separated from the open parking garage.
7.1.3.5.2.2 Mechanical-access open parking garages are open parking garages employing parking machines, lifts, elevators or other mechanical devices for vehicles moving from and to street level and in which public occupancy is prohibited above the street level.
7.1.3.5.2.3 Ramp-access open parking garages are open parking garages employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of vehicles under their own power from and to the street level.
Openness: For natural ventilation purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in exterior walls on a tier must be at least 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural ventilation shall constitute a minimum of 40 percent of the perimeter tier. Interior wall lines and column lines shall be at least 20 percent open with uniformly distributed openings.
7.1.3.5.2.4 Construction: Construction shall be of non-combustible materials. Open parking garages shall meet the design requirements of Section 7.3.9. Adequate curbs and railings shall be provided at every opening.
7.1.3.6 Area and height:
7.1.3.6.1 Area and height of open parking garages shall be limited as set forth in Table 7.3.9.
In structures having a spiral or sloping floor, the horizontal projection of the structure at any cross section shall not exceed the allowable area per parking tier.
In the case of a structure having a continuous spiral floor, each 2.9m height or portion thereof shall be considered as a tier.
7.1.3.6.2 The clear height of a parking tier shall be not less than 2.1m, except that a lesser clear height may be permitted in mechanical-access open parking garages when approved by the Code Enforcement Division/Section/Unit.
7.1.3.6.3 Area and height increases
7.1.3.6.3.1 The area and height of structures with cross ventilation throughout may be increased in accordance with the provisions of this subsection.
7.1.3.6.3.2 Structures with sides open [as defined in Section 7.3.9.2] on three-fourths of the building perimeter may be increased by 25 percent in area and one tier in height.
7.1.3.6.3.3 Structures with sides open [as defined in Section 7.3.9.2] around the entire building perimeter may be increased 50 percent in area and one tier in height.
7.1.3.6.3.4 Open parking garages constructed to heights less than the maximum established by Table 7.3.9 may have individual tier areas exceeding the otherwise permitted, provided the gross tier area of the structure does not exceed that permitted for the higher structure. At least three sides of each such larger tier shall have continuous horizontal openings not less than 760mm in clear height extending for at least 80 percent of the sides, and no part of such larger tier shall be more than 60mm horizontally from such an opening. In addition, each opening shall face a street or yard accessible to a street with a width of at least 720mm for the full length of the opening, and standpipes shall be provided in each such tier.
7.1.3.6.3.5 Structures of Type 2-F.R, Type 2 one-hour or Type 2-N construction, with all sides open, may be unlimited in area when the height does not exceed 23m. For a side to be considered open, the total area of the openings along the side shall be not less than 50 percent of the exterior area of the side at each tier, and such openings shall be equally distributed along the length of the tier. All portions of tiers shall be within 60.1m horizontally

from such openings.

7.1.3.6.3.6 Location and property: When located adjacent to interior property lines, exterior walls shall be of the degree of fire resistance set forth in Table 7.1.3 and such walls shall be without openings.

7.1.3.6.3.7 Stairs and exits: Where persons other than parking attendants are permitted, stairs and exits shall meet the requirements of Section 10, based on an occupant load of 18.0m^2 per occupant. Where no persons other than parking attendants are permitted there shall be not less than two stairs 900mm wide. Lifts may be installed for use of employees only, provided they are completely enclosed by non-combustible materials.

7.1.3.6.3.8 Standpipes: Standpipes shall be installed when required by the provisions of Section 12.1.13.

7.1.3.6.3.9 Sprinkler systems: When required by other provisions of this Code, automatic sprinkler systems and standpipes shall be installed in accordance with the provisions of Section 12.1.13 and 12.1.22

7.1.3.6.3.10 Enclosure of vertical openings: Enclosures shall not be required for vertical openings except as specified in Section 7.3.9.7 for stairs, exits and lifts.

7.1.3.6.3.11 Ventilation: Ventilation, other than the percentage of openings specified in Section 7.3.9.2 shall not be required.

7.1.3.6.3.12 Prohibitions: The following uses and alterations are not permitted:

a. Automobile repair work.
b. Parking of buses, trucks or similar vehicles.
c. Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.

7.1.3.7 Helipads

7.1.3.7.1 General: Helipads may be erected on buildings or other locations if they are constructed in accordance with this section.

7.1.3.7.2 Size: The landing or area for helipads of less than 1575 kilograms shall be a minimum of 6m by 6m in size. The landing area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 4.5m but with no width less than 1.5m.

7.1.3.7.3 Design: Helicopter landing areas and supports therefore on the roof of a building shall be of non-combustible construction. Landing area shall be designed to confine any Class I, II or III-A liquid spillage to the landing area itself and provision shall be made to drain such spillage away from any exit or stairway serving the helicopter landing area or from a structure housing such exit or stairway.

7.1.3.7.4 Exits and stairways: Exits and stairways from helipads shall comply with the provisions of Chapter 10 of this code, except that all landing areas located on buildings or structures shall have two or more exits. For landing platforms or roof areas less than 18m, or less than 186m^2 in area, the second exit may be a fire escape or ladder leading to the floor below.

7.1.3.7.5 Federal aviation approval: Before operating helicopters from helipads, approval must be obtained from the Federal Civil Aviation Authority.

TABLE 7.3.9 OPEN PARKING GARAGES AREA AND HEIGHT MECHANICAL-ACCESS Automatic Fire-Extinguishing System

Types of Constructions	Area Per Tier (square meter)	Ramp-Access	No	Yes
1	Unlimited	Unlimited	Unlimited	Unlimited
II-F, R	11,626m²	12 Tiers	12 Tiers	18 Tiers
II-1-hour	4,650m²	10 Tiers	10 Tiers	15 Tiers
II-N	2,790m²	8 Tiers	8 Tiers	12 Tiers

TABLE 7.3.9.6 OPEN PARKING GARAGES EXTERIOR WALLS

DISTANCE FROM PROPERTY LINE TO BUILDING	WALL CONSTRUCTION
6M	one-hour

7.1.4 REQUIREMENTS FOR GROUP C OCCUPANCIES

7.1.4.1 GROUP C OCCUPANCIES DEFINED Group

C Occupancies shall be

Division 1: Any building used for educational purposes through the Secondary School by 50 or more persons for more than 12 hours per week or four hours in any one day.

Division 2: Any building used for educational purposes through the Secondary School by less than 50 persons for more than 12 hours per week or four hours in any one day.

Division 3: Any building used for day-care purposes for more than six children. For occupancy separations, see Table 7.1.2.

7.1.4.2 Construction, height and allowable area

7.1.4.2.1 General: Buildings or parts of buildings classed in Group C because of the use or character of the occupancy shall be limited to the type of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Section 7.1.4, 7.1.5 and 7.1.6, except that the area may be increased by 50 percent when the maximum frame distance is reduced by 50 percent.

7.1.4.2.2 Atmospheric separation requirements

7.1.4.2.3 Definitions: For the purpose of this Chapter, the following definitions are applicable.

a. Common atmosphere: A common atmosphere exits between rooms, spaces or areas within a building which are not separated by an approved smoke and draft-stop barrier.
b. Separate atmosphere: A separate atmosphere exits between rooms, spaces or areas that are separated by an approved smoke and draft-stop barrier.
c. Smoke and draft barrier: A smoke and draft barrier consists of walls, partitions, floors and openings therein of such construction as will prevent the transmission of smoke or gases through the construction.

7.1.4.2.4 General provisions: The provisions of this subsection shall apply only to the requirements for providing separate atmospheres. Walls, partitions and floors forming all of, or

part of, an atmospheric separation shall be of materials consistent with the requirements for the type of construction, but of construction not less effective than a smoke-or draft-stop barrier. Glass lights of approved wired glass set in steel frames may be installed in such walls or partitions.

7.1.4.2.5 Every door opening therein shall be protected with a fire assembly as required elsewhere in this code, but not less than a self-closing or automatic-closing, tight-fitting smoke barrier and fire assembly having a fire-protection rating of not less than 20 minutes when tested in accordance with U.B.C. Standard No. 43-2. (FIRE TESTS OF DOOR ASSEMBLIES).

7.1.4.2.5.1 Ducts penetrating atmospheric separation walls, partitions or floors shall be equipped with an approved automatic-closing smoke damper when having openings into more than one atmosphere.

7.1.4.2.5.2 All automatic-closing fire assemblies installed in the atmospheric separation shall be activated by approved smoke detectors.

The specific requirements of this section are not intended to prevent the design or use of other system, equipment or techniques, which will effectively prevent the products of

combustion from breaching the atmospheric separation.

7.1.4.2.5.3 Special provisions: Rooms in Division 1 and 2 Occupancies used for kindergarten, class pupils and Division 3 Occupancies shall not be located above the first storey.

Exception

i In buildings equipped with an automatic sprinkler system throughout, rooms used for kindergarten, first and second-class children or for day-care purposes may be located on the second storey, provided there are at least two exits directly to the exterior for the exclusive use of such occupants.

ii Storage and janitor closets shall be of one-hour fire resistive construction.

iii Stages and performing platforms shall be constructed in accordance with Section 7. For attic space partitions and draft stops, see Section 12.2.16.5 and Section 10.22 on Timber.

7.1.4.2.6 Special hazards: Rooms or groups of rooms in which Class I, II or III-A liquids, combustible dust or similar hazardous materials are used, stored, developed or handled shall be separated from other portions of the building by not less than a one- hour fire-resistive occupancy separation. Equipment in rooms or groups of rooms sharing a common atmosphere where flammable liquids, combustible dust or hazardous materials are used, stored, developed or handled shall conform to the requirements of the National Fire Safety Code.

7.1.4.3 Location of building on property: All buildings housing Group C Occupancies shall have access to a public street not less than 6m in width. The access to the public street shall be a minimum 6m wide right-of-way, unobstructed and maintained only as access to the public street. At least one required exit shall be located on the public street or on the access away.

For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Part 4.

7.1.4.3.1 Exit facilities: Stairs, exits and smoke proof enclosures shall be provided as specified in Section 10, and Section 7.5.

7.1.4.4 Light, ventilation and sanitation: All portions of Group C Occupancies shall be provided with light and ventilation, either natural or artificial, as specified in Section 7.2.5.

Water closets shall be provided on the basis of the following ratio of water closets to the number of students:

	Boys	Girls
ElementarySchools	1:100	1:35
Secondary Schools	1:100	1:45

In addition, urinals stalls shall be provided for boys on the basis of 1:30 in elementary and secondary schools. There shall be provided at least two water closets and/or urinals where applicable in one lavatory and at least one drinking fountain on each floor for elementary and secondary schools.

For other requirements on water closets, see Section 7.1.9.

7.1.4.5 Shaft enclosure: Exits shall be enclosed as specified in Chapter 10. Elevator shafts, vent shafts and other vertical openings shall be enclosed, and the enclosure shall be as specified in Section 12.

7.1.4.6 Sprinkler and standpipe systems: Where required, automatic sprinkler systems and standpipes shall be installed as specified in Chapter 30 (FIRE EXTINGUISHING SYSTEMS).

7.1.4.7 Special hazards

7.1.4.7.1 Chimneys and heating apparatus shall conform to the requirements of this Code dealing with Materials and the current Engineering Code of Practice. Motion picture machine room shall conform to the requirements of Section 7.

All exterior openings in a boiler room or rooms containing central heating equipment, if located below openings in another storey or if less than 3.0m from other doors or windows of the same building, shall be protected by a fire assembly having a one hour fire-protection rating. Such fire assemblies shall be fixed, automatic or self-closing. Every room containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a one-hour fire-resistive separation.

Exception

i Boilers, central heating plants or hot-water supply boilers where the largest piece of fuel equipment does not exceed 400,000 Btu per hour input.

ii When the opening for a heater or equipment room is protected by a pair of fire doors, the inactive leaf shall be normally secured in the closed position and shall be openable only by the use of a tool. An astragal shall be provided and the active leaf shall be self-closing.

iii Class I, II or III-A liquids shall not be placed, stored or used in any group C Occupancies, except in approved quantities as necessary in laboratories and approved utility rooms, and such liquids shall be kept in tight or sealed containers when not in actual use and shall be stored within a storage cabinet for Class I, II or III-A liquid approved by the fire department.

7.1.4.8 Fire alarms: Approved fire alarms shall be provided for all Group C Occupancies with an occupant load of more than 50 persons. In every group C Occupancy provided with an automatic sprinkler or detection system, the operation of such system shall automatically activate the school fire alarm system, which shall include an alarm mounted on the exterior of the building.

7.1.5 REQUIREMENTS FOR GROUP E OCCUPANCIES

7.1.5.1 Group E Occupancies Defined

General Group E Occupancies shall be

Division 1: Storage, handling, use or sale of hazardous and highly flammable or explosive materials other than Class I, II or III-A liquids.

Exception: The storage, handling, use or sale of hazardous materials or chemicals that do not exceed the quantities listed in Table 7.5.11 are permitted in other occupancies, provided the storage, handling, use or sale of such hazardous materials or chemicals is in compliance with the National Fire Safety Code.

Division 2: Storage, handling, use or sale of Classes I, II and III-A liquids; dry cleaning plants using Class I, II or III-A liquids, paint stores with bulk handling; paint shops and spray-painting rooms and shops.

EXCEPTION: The storage, handling, use or sale of liquids in quantities that do not exceed those set forth in Table 7.5.11 are permitted in other occupancies, provided the storage, handling, use or sale is in compliance with the provisions of the National Fire Safety Code.

Division 3: Woodworking establishments, planting mills, box factories, buffing rooms for tire-rebuilding plants and picking rooms, shops; factories or warehouses where loose combustible fibres or dust are manufactured, processed, generated or stored; and pin-refinishing rooms.

Division 4: Repair garages not classified as a group B, Division 1.

Division 5: Aircraft repair hangars.

Division 6: Semiconductor fabrication facilities and comparable research and development areas when the facilities in which hazardous production materials are used, are designed and constructed in accordance with Section 7.5.10 and when storage, handling and use of hazardous materials is in accordance with the National Fire Safety Code.

Exception: The specified uses need not be classified as a Group E, Division 6 Occupancy

when the quantities of hazardous materials do not exceed those listed in Table 7.5.11, provided the storage, handling and use are in compliance with the National Fire Safety Code.

7.1.5.1.1 Special provisions: In buildings used for educational purposes, vocational shops, laboratories and similar areas need not be classified as Group E Occupancies provided:

7.1.5.1.1.1 Such areas are separated from classrooms other than the classroom directly related to the use by not less than a one-hour fire-resistive separation.

7.1.5.1.1.2 Such areas are separated from each other by not less than a one-hour fire-resistive occupancy separation unless the uses are determined to be compatible.

7.1.5.1.1.3 The requirements of Sections 7.5.4, 7.5.7, 7.5.9 and the National Fire Safety Code shall be met when applicable.

For occupancy separations, see Table 7.1.2.

When an approved spray booth constructed as specified in the National Fire Safety Code is installed, such booth need not be separated from other Group E or group B Occupancies.

7.1.5.2 Construction, height and allowable area

7.1.5.2.1 General: Buildings or parts of buildings classed in group E because of the use or character of the occupancy shall be limited to the types of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Sections 7.1.4, 7.1.5 and 7.1.6.

7.1.5.2.2 Special provisions: Division 5 Occupancies shall have exterior walls of not less than one-hour fire-resistive construction or shall be surrounded by public ways or yards not less than 18m in width.

Exceptions

i Exterior walls of a non-rated building fronting on public ways or yards having a width of at least 12m may be of unprotected construction.

ii The area increases allowed by Section 7.1.5.1 shall not exceed 500 percent for aircraft repair hangars, except as permitted in Section 7.1.5.2.

iii In areas where motor vehicles, boats or airplanes are stored, repaired or operated and where Class I, II or III-A liquids are stored or used, floor surfaces shall be of non-combustible non-absorbent materials.

iv Floors may be surfaced or waterproofed with asphaltic paving materials where no repair work is done.

For special provisions and hazardous chemicals and magnesium, see also the National Fire Safety Code.

. A Division 4 Occupancy having a floor area not exceeding 240m^2 may have exterior walls of not less than two-hour fire-resistive construction when less than 1.5m from a property line and of not less than one-hour fire-resistive construction when more than 1.5m but less than 6.0m from a property line.

For smoke and heat venting, see Section 12.2.32.

7.1.5.2.3 Special occupancies

7.1.5.2.3.1 Liquid storage rooms: The design and construction of liquid storage rooms in which Class I, II or III-A liquids are stored shall be in accordance with the requirements for a Group E, Division 2 Occupancy and the following:

a. Floors shall be of non-combustible liquid-tight construction designed to prevent liquids from flowing to adjacent rooms by any of the following methods.
   i Recessing the floor at least 100mm lower than the floor of adjacent rooms.
   ii Installation of liquid-tight sills at least 100mm in height. Sills may be omitted at openings when trenches are constructed in accordance with Item (iii) below.
   iii Installation of an open-grade trench which drains to an approved location.

b. Shelving, racks, dunnage scuffboards, floor overlay and similar installations shall be

of non-combustible construction or wood not less than 37.5mm thickness.

7.1.5.2.3.2 Inside liquid rooms: Rooms that do not have an exterior wall may be used for the storage or the storage and use, dispensing or mixing of Class I, II or III-A liquids, provided they do not exceed 48m^2 in area and are separated from other areas by occupancy separations having a fire-resistive rating not less than one hour for rooms up to 14m^2 in area and not less than two-hours where the room is more than 14m^2 in area. Separations from other occupancies shall be not less than required by Table 7.1.2.

7.1.5.2.3.3 Liquid storage warehouses: The design and construction of liquid storage warehouses in which flammable or combustible liquids are stored shall be in accordance with the requirements for a Group E, Division 2 Occupancy and this Section. Liquid storage warehouses shall be used for the storage of flammable or combustible liquids only and shall be separated from all other uses by a four-hour area separation wall.

All liquid storage warehouses shall be provided with adequate drainage. Drainage systems shall be sized and designed to carry off any anticipated spill, plus the minimum calculated fire flow of the sprinkler system to a safe location. If connected to a public drain or sewer system, a clarifier shall be installed.

Floors and equipment in liquid storage warehouses shall comply with the applicable provisions of Subsections 7.5.2.3.1 a and b above.

7.1.5.3 Location of building on property: For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Part 4 of this Code. Buildings containing Group E, Division 1, Occupancies shall be located 18m from all property lines including property lines adjacent to public ways. Group E, Division 2 Occupancies containing hazardous materials in excess of the amounts listed in Table 7.5.11 shall not exceed 139m^2 in area unless there is more than 9.1m from all property lines including property lines adjacent to public ways.

When a building is of mixed occupancy and contains a group E, Division 2 Occupancy, the Group E, Division 2 Occupancy shall be separated from the other occupancy as required in Table 7.1.2. Such Group E, Division 2 Occupancies shall be on the outer perimeter of the building and all walls of the group E, Division 2 Occupancy shall be located a minimum of 9.1m from property line.

Exception: Inside liquid rooms that comply with the limitations in Section 7.5.2.3.

7.1.5.4 Exit facilities: Stairs, exits and smoke proof enclosures shall be provided as specified in Chapter 10 and Section 7.5.

7.1.5.5 Light, ventilation and sanitation

7.1.5.5.1 In group E Occupancy buildings, all enclosed portions customarily occupied by human beings, other than rooms and area for which requirements are specified elsewhere in this section, shall be provided with natural light by means of exterior glazed openings with an area equal to one-tenth of the total floor area of such portions, and natural ventilation by means of exterior openings with an openable area not less than one twentieth of the total floor area of such portions, or shall be provided with artificial light and a mechanically operated ventilating system. The mechanically operated ventilation system shall be capable of supplying a minimum of 0.14m^3 per minute of outside air with a total circulated of not less than 0.42m^3 per minute per occupant in all occupied portions of the building.

7.1.5.5.2 In all buildings or portions thereof where Class I, II or III-A liquids are used, mechanical exhaust ventilation shall be provided sufficient to produce four complete air changes per hour. Such exhaust ventilation shall be taken from a point at or near the floor level.

7.1.5.5.3 In all buildings used for the repair or handling of automobiles operating under their own power, mechanical ventilation shall be provided capable of exhausting a minimum of 6.8m^3/m^2. Additionally, each engine repair stall shall be equipped with an exhaust pipe extension duct, extending to the outside of the building, which, if over 3.0m in length, shall mechanically exhaust 9m^3 per minute. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

Exception

i In public repair garages and aircraft hangars not exceeding an area of 465m^2 the Code Enforcement Division/Section/Unit may authorise the omission of such ventilating equipment where, in his opinion, the building is supplied with unobstructed openings to the outer air which are sufficient to provide the necessary ventilation.

ii Every building or portion thereof where persons are employed, shall be provided with at least one water closet. Separate facilities shall be provided for each sex when the number of employees exceeds four and both sexes are employed. Such toilet facilities shall be located either in such building or conveniently in a building adjacent thereto on the same property.

iii Toilet rooms shall be provided with a fully openable exterior window at least 0. 3m^2 in area; or a vertical duct not less than 0.065m^2 in area for the first toilet facility, with 0.033m^2 for each additional facility; or a mechanically operated exhaust system capable of providing a complete change of air every 15 minutes. Such systems shall be connected directly to the outside, and the point of discharge shall be at least 1.5m from any openable window. For other requirements on water closets, see Sections 7.1.9 and 7.1.10.

7.1.6 Shaft enclosures: Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other vertical openings shall be enclosed, and the enclosure shall be as specified in Section 6.12.

Doors which are a part of an automobile ramp enclosure shall be equipped with automatic closing devices.

7.1.7 Sprinkler and standpipe systems: When required by other provisions of this code, automatic sprinkler systems and standpipes shall be installed as specified in Section 12.1.

7.1.8 SPECIAL HAZARDS

7.1.8.1 Chimneys and heating apparatus shall conform to the requirements of this Code dealing with Materials and the current Engineering Code of Practice.

7.1.8.1.1 Every boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by a two-hour fire-resistive occupancy separation.

7.1.8.1.2 In Division 1 and 2, there shall be no openings in such occupancy separations except for necessary ducts and piping. In any room in a Group E, Division i, ii, or iii Occupancy in which Class I liquids or hazardous materials are stored or used, energy-consuming equipment shall not be used unless equipment has been listed specifically for the hazardous atmosphere that may develop.

7.1.8.1.3 In Division 4 Occupancies, devices which generate a spark or glow capable of igniting gasoline vapours shall not be installed or used within 450mm of the floor.

The use, handling and sale of Classes 1, 2 and 3-A liquids shall be in accordance with the National Fire Safety Code.

7.1.8.1.4 Dry cleaning plants shall comply with the National Fire Safety Code.

Equipment or machinery which generates or emits combustible or explosive dust or fibres shall be provided with an adequate dust-collecting and exhaust system installed in conformance with the applicable section of this Code. The storage and handling of cellulose nitrate plastics other than film shall be in accordance with the National Fire Safety Code. Storage and

handling of combustible fibre in amounts beyond the exemptions of Table 7.5.11 shall be in accordance with the National Fire Safety Code.

7.1.8.1.5 Combustible fibre storage rooms or vaults having a capacity exceeding 14m^3 shall be separated from the remainder of the building by a two-hour fire-resistive occupancy separation.

Buildings erected or converted to house high-piled combustible stock shall comply with the National Fire Safety Code.

7.1.9 Fire alarms: An approved fire alarm system shall be installed in Group E, Division 2 Occupancies used for the manufacturing of organic coatings as specified in the National Fire Safety Code.

7.1.10 Explosion venting

7.1.10.1 Flammable dusts: Rooms or portions of a building wherein flammable dusts are stored, manufactured, processed or used and may be in suspension in the air continuously or intermittently shall conform with the following:

a. Wall and ceiling surfaces shall be smooth. Ledges shall be beveled at 60 degrees to the horizontal to prevent the accumulation of dust.
b. Every dust-producing process shall be provided with a dust-collection system adequate in capacity to prevent hazardous concentrations of dust within the room.
c. Effective venting devices equal in area to at least 0.093m^2 for each 2.4m^3 of volume shall be provided for every flammable dust-connection or storage container having a volume exceeding 7m^3.

7.1.10.1.1 The venting devices shall be of light non-combustible construction and shall vent directly to the exterior of the building. Venting devices shall be located in walls facing yards 9.0m or more in width, or located in roofs.

b. Flammable liquids: Rooms used for dispensing of Class i-B liquids and rooms used for storage or dispensing of Class i-A liquids shall have roofs or walls designed to relieve internal explosion forces.
c. Group E, Division 2 Occupancies involving chemical operations such as oxidation, reduction, polygenisation, hydrogenation, alcoholisation, polymerisation and similar chemical processes shall have roofs or walls designed to relieve explosion forces.

7.1.11 Division 6 occupancies

7.1.11.1 General: In addition to the requirements set forth elsewhere in this Code, Group E, Division 6 Occupancies shall comply with the provisions of this Section and the National Fire Safety Code.

7.1.11.1.1 Fabrication Area

Separation: Fabrication areas, whose size is limited by the quality of HPM permitted by the National Fire Safety Code, shall be separated from each other, from exit corridors, and from other parts of the building by not less than one-hour fire-resistive occupancy separations.

Exceptions

i Doors within such occupancy separation, including doors to corridors, shall be only self-closing fire assemblies having a fire-protection rating of not less than three-fourths hour.
ii Windows between fabrication areas and exit corridors may be in accordance with Section 10.11.
iii Floors: Except for surfacing, floors within fabrication areas shall be of noncombustible construction. Openings through floors of fabrication areas may be unprotected when the interconnected levels are used solely for mechanical equipment directly related to such fabrication area. See also Section 6.12.
When forming a part of an occupancy separation, floors shall be water tight.

iv Ventilation: Mechanical ventilation, which may include recirculated air, shall be provided throughout the fabrication area at the rate of not less than 0. 32m^3/Min/m^2 of floor area. The exhaust air duct system of one fabrication area shall not connect to another duct system outside that fabrication area within the building.

Ventilation systems shall comply with the applicable section of this Code except that the automatic shutoff need not be installed in the circulating airstream and shall initiate a signal at the emergency control station.

Except for exhaust systems, at least one manually operated remote control switch that will shut down the fabrication area ventilation system shall be installed at an approved location outside the fabrication area.

v Transporting hazardous production materials: Hazardous production materials shall be transported to fabrication area through enclosed piping or tubing systems that comply with Section 7.5.11.6 through service corridors or in exit corridors as permitted in the exception to Section 7.5.11.3. The handling or transporting of hazardous production materials within service corridors shall comply with the National Fire Safety Code.

vi Electrical: Electrical equipment and devices within the fabrication area shall comply with the Electrical Code. The requirements for hazardous locations need not be applied when the average air change is at least four times that set forth in Section 7.5.11.3 and when the number of air changes at any location is not less than three times that required by Section 7.5.11.3 and the National Fire Safety Code.

7.1.11.1.2 Exit corridors: Exit corridors shall comply with Section 10.11 and shall be separated from fabrication areas as specified in Section 7.5.11.2 (i) Exit corridor shall not be used for transporting hazardous production materials except as provided in Section 7.5.11.6 (2).

Exceptions: In existing Group E, Division 6 Occupancies when there are alterations or modifications to existing fabrication areas, the Code Enforcement Division/Section/Unit may permit the transportation of hazardous production materials (HPM) in exit corridors subject to the requirements of the National Fire Safety Code and as follows:

i Corridors adjacent to the fabrication area where the alteration work is to be done shall comply with Section 10.11 for a length determined as follows:
   a. The length of the common wall of the corridor and the fabrication area, and,
   b. for the distance along the exit corridor to the point of entry of hazardous Production Materials (HPM) into the exit corridor serving that fabrication area.

ii There shall be an emergency telephone system or a local alarm manual pull station or approved signal device within exit corridors at not more than 45.7m intervals or fraction thereof and at each exit stair doorway. The signal shall be relayed to the emergency control station and a local signaling device shall be provided.

iii Sprinkler protection shall be designed in accordance with U.B.C Standard No. 38-1 for Ordinary Hazard Group 3, except that when one row of sprinklers is used in the corridor protection, the maximum number of sprinklers that need be calculated is 13.

7.1.11.1.3 Service corridors: Service corridors shall be classified as group E, Division 6 Occupancies. Service corridors shall be separate from exit corridors as required by Section 7.5.11.1 Service corridors shall be mechanically ventilated as required by Section 7.5.11.3 or at not less than six air changes per hour, whichever is greater.

The maximum distance of travel from any point in a service corridor to an exterior exit door, horizontal exit, exit passageway, enclosed stairway or door into a fabrication area shall not exceed 23m. Dead ends shall not exceed 1.2m in length. There shall be not less than two

exits, and not more than one half of the required exits shall be into the fabrication area. Doors from service corridors shall swing in the direction of exit travel and shall be self-closing.

7.1.11.1.4 Storage of hazardous production materials (HPM)

7.1.11.1.5 Construction: The storage of hazardous production materials in quantities greater than those listed in Table 7.5.11 shall be in inside rooms complying with Section

7.5.2.3 or shall be in HPM storage rooms not exceeding 558m^2 in area. Such HPM storage rooms shall be separated from all other areas by not less than a two-hour-fire-resistive separation when the area is 28m^2 or more and not less than one-hour fire- resistive construction when the area is less than 28m^2. The provisions of Section 7.1.2 shall apply.

When an HPM storage room is also used for dispensing of Class I or II flammable liquids or flammable gases, the area of the room shall not exceed 93m^2. Except for surfacing, floors of storage rooms shall be of non-combustible liquid-tight construction. Raised grating over floors shall be of non-combustible materials. See Section 7.5.2.3 for sill requirements for liquid storage rooms.

7.1.11.1.6 Location within building: When HPM storage rooms are provided, they shall have at least one exterior wall and such wall be not less than 9m from property lines, including property lines adjacent to public ways. Explosion venting shall be provided when required by Section 7.5.10.1.

7.1.11.1.7 Exits: When two exits are required from HPM storage rooms, one shall be directly to the outside of the building. See Section 7.5.11.2 (i).

7.1.11.1.8 Ventilation: Mechanical exhaust ventilation shall be provided in storage rooms at the rate of not less than 0.32m^3/Minute/m^2 of floor area or six air changes per hour, whichever is greater, for all categories of material.

7.1.11.1.9 Emergency alarm: An alarm pull station or approved signal device shall be installed outside of each interior exit door from HPM storage rooms. Operation of such alarm or signal device shall provide a local alarm and relay a signal to the emergency control station.

7.1.11.1.10 Electrical: HPM storage rooms containing flammable liquids or gases shall be classified as Class I, Division 1 hazardous location. Electrical wiring and equipment within such rooms shall comply with the applicable electrical section of this Code.

7.1.11.2 Piping and tubing

7.1.11.2.1 General: HPM piping and tubing shall comply with this subsection and shall be installed in accordance with nationally recognised standards. Piping and tubing systems shall be metallic unless the material being transported is incompatible with such system. Systems supplying gaseous HPM shall be welded throughout, except for connections, valves and fittings, to the systems which are within a ventilation enclosure. HPM supply piping or tubing in service corridors shall be exposed to view.

7.1.11.2.2 Installation in exit corridors and above other occupancies: Hazardous production materials shall not be located within exit corridors or above areas not classified as Group E, Division 6 Occupancies except as permitted by this subsection.

Hazardous production material piping and tubing may be installed within the space defined by the walls of exit corridors and the floor or roof above or in concealed spaces above other occupancies under the following conditions:

a. Automatic sprinklers shall be installed within the space unless the space is less than 150mm in least dimension.
b. Ventilation at not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.
c. When the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The one-hour enclosure shall not be used as part of the receptor.

d. All HPM supply and tubing and HPM non-metallic waste lines shall be separated from the exit corridor and from any occupancy other than Group E, Division 6 by construction as required for walls or partitions that have a fire- protection rating of not less than one hour. When gypsum wallboard is used, joints on the piping side of the enclosure need not be taped, provided the joints occur over framing members. Access openings into the enclosure shall be protected by approved fire assemblies.

e. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:

i At branch connections into the fabrication area.

ii At entries into exit corridors.

Excess flow valves shall be installed as required by the National Fire Safety Code.

f. Electrical wiring and equipment located in the piping space shall be approved for Class I, Division 2 Hazardous Location.

Exception

i Occasional transverse crossing of the corridors by supply piping which is enclosed within a ferrous pipe or tube for the width of the corridor need not comply with items a through f.

7.1.11.2.3 Identification: Piping, tubing and HPM waste lines shall be identified in accordance with nationally recognized standards to indicate the material being transported.

TABLE 7.5.11 EXEMPT AMOUNTS OF HAZARDOUS MATERIALS LIQUIDS AND CHEMICALS

MATERIAL	MAXIMUM QUANTITIES
1. Flammable liquids	
Class 1-A	114 liters 2
Class 1-B	228 liters 2
Class 1-C	342 liters 2
2. Combustible liquids	
Class II	456 liters 2
Class III-A	950 liters 2
3. Combination flammable liquid	456 liters 2
4. Flammable gases	90m^3 at one atmosphere of pressure at 39oC
5. Liquified flammable gases	228 liters
6. Flammable fibers -loose	3m^3
7. Flammable fibers - baled	30m^3
8. Flammable solids	225 kg
9. Unstable materials	No exemption
10. Corrosive liquids	290 liters
11. Oxidizing material-gases	180m^3
12. Oxidizing material-liquids	190 liters
13. Oxidizing material-solids	225 kg
14. Organic peroxides	4.5 kg
15. Nitromethane (unstable materials)	No exemptions
16. Ammonium nitrate	450 kg
17. Ammonium nitrate compound mixtures	450 kg
containing more than 60% nitrate by weight	
18. Highly toxic material and poisonous gas	No exemptions
19. Smokeless powder	9 kg4
20. Black sporting powder	45 kg5

1. The quantities of alcoholic beverages in retail sales or storage uses are unlimited, provided the liquids are packaged in individual containers not exceeding 4 liters.
   The quantities of medicines, foodstuffs and cosmetic, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solution not being flammable, in retail sales or storage occupancies are unlimited when packaged in individual containers not exceeding 4 liters.

2. Quantities may be increased by 100 percent in areas which are not accessible to the public. In buildings where automatic fire-extinguishing systems are installed, the quantities may be increased by 100 percent in areas accessible to the public.
3. Containing not more than the exempt amounts of Class 1-A, 1-B or 1-C flammable liquids.
4. Quantities of smokeless powder may be increased to a maximum of 2.25kg, provided those amounts exceeding 9kg are stored in an approved Class II magazine as specified in the Uniform Fire Code.
5. Quantities of black sporting powder may be increased to a maximum of 2.25kg, provided such amount is stored in an approved Class II magazine as specified in the National Fire Safety Code.

7.1.12 REQUIREMENTS FOR GROUP F OCCUPANCIES

7.1.12.1 Group F Occupancies defined Group F occupancies

shall be

Division 1: Nurseries of the full-time care of children under the age of six (each accommodating more than five persons). Hospitals, sanitaria, nursing homes with non-ambulatory patients and similar buildings (each accommodating more than five persons).

Division 2: Nursing homes for ambulatory patients, homes for children six years of age or over (each accommodating more than five persons).

Division 3: Mental hospitals, mental sanitaria, jails, prisons, reformatories and building where personal liberties of inmates are similarly restrained.

For occupancy separations, see Table 7.1.2.

EXCEPTION: Group F Occupancies shall not include buildings used only for private residential purposes for a family group.

7.1.12.2 Construction, height and allowable area

7.1.12.2.1 General Buildings or parts of buildings classes in Group F because of the use of character of the occupancy shall be limited to the types of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Sections 7.1.4, 7.1.5 and 7.1.6.

7.1.12.2.2 Special provisions: Division 3 Occupancies shall be housed in buildings of Type I or Type 2-F.R, construction.

Exception

i One-storey buildings of Type 2 one-hour, Type 3 one-hour, or 5 one-hour construction may be permitted, provided the floor area does not exceed 363m^2 between separation walls of two hour fire resistive construction with openings protected by fire assemblies having one and a half-hour fire protection rating.

ii Every storey of group F, Division 1 occupancy accommodating more than five non-ambulatory persons, unless provided with a horizontal exit, shall be divided into not less than two compartment accommodation approximately the same number of non-ambulatory persons in each compartment by a smoke-stop partition meeting the requirements of a one-hour occupancy separation so as to provide an area of refuge within the building. Corridor openings in the smoke-stop partition shall be protected with doors as required in Section 10.11. Other openings shall be limited to ducts which have smoke-detectors-activated fire dampers in the plane of the wall. Rooms occupied by inmates or patients whose personal liberties are restrained shall have non-combustible floor surfaces.

7.1.12.3 Location on property: For fire-resistive protection or exterior walls and openings, as

determined by location on property, see Section 7.1.3 and Part 4 of this Code.

7.1.12.4 Exit facilities: Stairs, exits and smoke proof enclosures shall be provided as specified in Chapter 10.

7.1.12.5 Light, ventilation and sanitation: All portions of Group F Occupancies customarily used by human beings shall be provided with natural light by means of exterior glazed openings with an area equal to one tenth of the total floor area, and natural ventilation by means of exterior openings with an area not less than one twentieth of the total floor area or shall be provided with artificial light area a mechanically operated ventilating system as specified in Section 7.2.5.

For other requirements on water closets, see Section 7.1.9.

7.1.12.6 Shaft enclosures: Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other vertical openings shall be enclosed, and the enclosure shall be as specified in Section 6.12.

7.1.12.7 Sprinkler and standpipe systems: When required by other provisions of this code, automatic sprinkler systems and standpipes shall be installed as specified in Chapter 30.

7.1.12.8 Special Hazards

7.1.12.8.1 Chimneys and heating apparatus shall conform to the requirements of (Refer to the applicable mechanical section of this Code). Motion picture projection rooms shall conform to the requirements of Chapter 8.

7.1.12.8.1.1 Storage of class liquids shall not be allowed in Group F Occupancies and the handing of such liquids shall not be permitted in any Occupancies in Quantities of more than 3.8L unless such handling complies with the National Fire Safety Code.

7.1.12.8.1.2 All exterior openings in a boiler room or room containing central heating equipment if located below openings in another storey, or if less than 3.0m from the other doors or windows of the same building, shall be protected by a fire assembly having a one-hour fire-protection rating. Such fire assemblies shall be fixed, automatic- or self-closing. Every room containing a boiler, central heating plant or hot-water supply shall be separated from the rest of the building by not less than a one-hour fire-resistive occupancy separation.

Exception: Boilers, central heating plants or hot-water supply boilers where the largest piece of fuel equipment does not exceed 400,000 joules-per hour input.

7.1.12.9 Fire alarm: An approved fire alarm system shall be provided for all Group F Occupancies. Audible alarm devices shall be used in all non-patient areas. Visible alarm devices may be used in lieu of audible devices in patient-occupied areas.

7.1.13 REQUIREMENTS FOR GROUP G OCCUPANCIES

7.1.13.1 Group G Occupancies defined

Group G Occupancies shall be

Division 1: Private garages, Carports, sheds and agricultural buildings.

EXCEPTION: Where applicable for agricultural buildings.

Division 2: Fences over 1.8m. high, tanks and towers. For occupancy separation, see Table 7.1.2.

7.1.13.1.1. Construction, height and allowable area

7.1.13.1.2 General: Buildings or parts of buildings classed in Group G, Division 1 because of the use or type of the occupancy shall not exceed 93m^2 in area or one storey in height except as provided in this section. Any building or portion thereof that exceeds the limit specified in this chapter shall be classed in the occupancy group other than Group G, Division 1 that it most nearly resembles.

For a mixed occupancy building, the total area of a private garage used only as a parking garage for private or pleasure-type motor vehicles with no repair or fuelling may be 280m^2, provided the exterior wall and opening protection are as required for the major occupancy of the building. The allowable floor area of the building shall be as permitted for the major occupancy of the building.

Each portion of the building separated as specified in Section 7.1.4 may be considered a separate building. Such increase in area may apply to a single-occupancy building, provided the use of the building is as specified and the exterior wall and opening protection are as required for a Group H, Division 1 occupancy building.

7.1.13.1.3 Special provisions: Garages in connection with Group H, Division 1 Occupancies shall have unobstructed headroom clearance of not less than 2.1m above the finish floor to any ceiling, beam, pipe or similar construction except for wall-mounted shelves, storage surfaces, racks or cabinets.

7.1.13.2 Location on property:For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Part 4 of this Code.

7.1.13.3 Special Hazards

7.1.13.3.1 Chimneys and heating apparatus shall conform to the requirements of Chapters on Materials and the applicable mechanical section of this Code.

Under no circumstances shall a private garage have any opening into a room used for sleeping purposes.

Class 1, 2 or 3-A liquids shall not be stored, handled or used in Group G, Occupancies unless such storage or handling shall comply with the National Fire Safety Code.

7.1.13.4 Garage floor surfaces: In areas were motor vehicles are stored or operated, floor surfaces shall be of non-combustible materials or asphaltic paving materials.

7.1.13.5 Agricultural Buildings: Where applicable for agricultural buildings.

7.1.14 REQUIREMENTS FOR GROUP H OCCUPANCIES

7.1.14.1 Group Occupancies defined Group H Occupancies shall be Division 1: Hotels and apartment houses.

Convents and monasteries (each accommodating more than 10 persons).

Division 2: Not used.

Division 3: Dwellings and lodging houses.

For occupancy separations, see Table No. 7.1.2.

A complete code for construction of detached one-and two-family dwellings is in the Schedule.

7.1.14.1.1 Construction, height and allowable area

7.1.14.1.2 General: Buildings or parts of buildings classed in Group H because of the use or type of the occupancy shall be limited to the types of construction set forth in Tables 7.1.4 and 7.1.6 and shall not exceed, in area or height, the limits specified in Sections 7.1.4, 7.1.5 and 7.1.6.

Special Provisions: Group H, Division 1 Occupancies more than two storey in height or having more than 280m^2 of floor area above the first storey shall be not less than one-hour fire-resistive construction throughout except as provided in Section 6.3.5. Storage or laundry rooms that are within Group H, Division 1 Occupancies that are used in common by tenants shall be separated from the rest of the building by not less than one-hour fire-resistive occupancy separation.

Every block of apartment or house three storeys or more in height or containing more than 15 dwelling units and every hotel three storeys or more in height or containing 20 or more guest rooms shall have an approved fire alarm system as specified in the current Engineering Code

of Practice and required by the National Fire Safety Code.
Exception: An alarm system need not be installed in buildings not over two storeys in height when all individual dwelling units and contiguous attic and crawl spaces are separated from each other and from public or common areas by at least one-hour fire- resistive occupancy separations and each individual dwelling unit has an exit direct to a yard or public way.
For Group H, Division 1 Occupancies with a Group B, Division 1 parking garage in the basement of first floor, see Section 7.3.2.
For attic space partitions and draft stops, see Section 29.16.5.
7.1.14.2 Location on property: For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 7.1.3 and Part 4 of this Code.
7.1.14.2.1 Exits and emergency escapes: Stairs, exits and smoke proof enclosures shall be as specified in Chapter 10.
Every sleeping room below the fourth storey shall have at least openable window or exterior door approved for emergency escape or rescue. The units shall be openable from the inside to provide a full clear opening without the use of separate tools.
All escape or rescue windows from sleeping rooms shall have a minimum net clear opening of 0.5m^2. The minimum net clear opening height shall be 600mm. The minimum net clear opening width shall be 510mm. Where windows are provided as a means of escape or rescue they shall have a finished sill height not more than 1100mm above the floor.
Bars, grills, grates or similar devices may be installed on an emergency escape or rescue windows or doors, provided:

a. Such devices are equipped with approved release mechanisms which are openable from the inside without the use of a key or special knowledge or effort, and
b. The building is equipped with smoke detectors installed in accordance with Section 12.1.19.

7.1.14.3 Light, ventilation and sanitation

7.1.14.3.1 Light and ventilation

7.1.14.3.1.1 All guest rooms, dormitories and habitable rooms within a dwelling unit shall be equipped with natural light by means of exterior glazed openings with an area not less than one tenth of the floor area of such rooms with a minimum of one square meter.
7.1.14.3.1.2 All bathrooms, water closet compartments, laundry rooms and similar rooms shall be provided with natural ventilation by means of openable exterior openings with an area not less than one twentieth of the floor area of such rooms with a minimum of 0.14m^2.
7.1.14.3.1.3 All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural ventilation by means of openable exterior openings with an area of not less than one twentieth of the floor area of such rooms with a minimum of 0.46m^2.
7.1.14.3.1.4 In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in all guest rooms, dormitories, habitable rooms and in public corridors. One fifth of the air supply shall be taken from the outside.
7.1.14.3.1.5 In bathrooms, water closet compartments, laundry rooms and similar rooms a mechanical ventilation system connected directly to the outside, capable of providing five air changes per hour, shall be provided.
7.1.14.3.1.6 For the purpose of determining light and ventilation requirements, any room may be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one tenth of the floor area of the interior room or 2.3m^2, whichever is greater.

7.1.14.3.1.7 Required exterior openings for natural light and ventilation shall open directly onto a street or public alley or a yard or court located on the same plot as the building.

Exception: Required windows may open into a roofed porch where the porch;

i Abuts a street, yard or court; and

ii has a ceiling height of not less than 2.1m;

iii has the longer side at least 65 percent open and unobstructed.

7.1.14.3.1.8 Sanitation: Every building shall be provided with at least one water closet. Every hotel or subdivision thereof where both sexes are accommodated shall contain at least two separate toilet facilities which are conspicuously identified for male or female use, each of which contains at least one water closet.

Exceptions

i Hotel guest rooms may have one unidentified toilet facility.

ii Additional water closets shall be provided on each floor for each sex at the rate of one for every additional 10 guests, or fractional part thereof, in excess of 10.

iii Every dwelling unit shall be provided with a kitchen equipment with a kitchen sink.

iv Every dwelling unit and every lodging house shall be provided with a bathroom equipped with facilities consisting of a water closet, lavatory and either a bathtub or shower. Each sink, lavatory and either a bathtub or shower shall be equipped with hot and cold running water necessary for its normal operation. For other requirements on water closets, see Section 7.1.9.

7.1.14.4 Yards and courts

7.1.14.4.1 Scope: This section shall apply to yards and courts having required windows opening therein.

7.1.14.4.1.1 Yards: Every yard shall be not less than 3.0m in width for one-storey and two-storey buildings. For buildings more than two storeys in height, the minimum width of the yard shall be increased at a width height ratio of 1 to 4 for each additional storey. For buildings exceeding 14 storeys in height, the required width of yard shall be computed on the basis of 14 storeys in height.

7.1.14.4.1.2 Courts: Every court shall be not less than 3.0m in width. Court having windows opening on opposite sides shall be not less than 3.0m in width. Courts bounded on three or more sides by the walls of the building shall be not less than 3m in length unless bounded on one end by a public way or yard. For buildings more than two storeys in height, the court shall be increased at a width to height ratio of 1.4 for each additional storey. For buildings exceeding 14 stories in height, the required dimensions shall be computed on the basis of 14 stories.

Adequate access shall be provided to the lowest level of all courts for cleaning purposes. Every court more than two stories in height shall be provided with a horizontal air intake at the lowest level not less than $2m^2$ in area and leading to the exterior of the building unless abutting a yard or public way. The construction of the air intake shall be as required for the court walls of the building, but in no case shall be less than one-hour fire-resistive.

7.1.14.5 Room dimensions

7.1.14.5.1 Ceiling heights: Habitable space shall have a ceiling height of not less than 2.3m except as otherwise permitted in this section. Halls bathrooms and toilet compartments may have a ceiling height of not less than 2.1m measured to the lowest projection from the ceiling. Where exposed beam ceiling members are spaced at 1.2 or more on centre, ceiling height shall be measured to the lowest level of the deck supported by these members, provided that the lowest level of the members is not less than 2.1m above the floor. If any room in a building has a sloping ceiling the prescribed ceiling height for the room is required in only one-half the area thereof. No portion of the room measuring less than 1.5m from the finished floor to the

finished ceiling shall be included in any computation of the minimum area thereof. If any room has a dropped ceiling, the prescribed ceiling height is required in two thirds the area thereof, but in no case shall the height of the sloping ceiling be less than 2.1m.

7.1.14.5.2 Floor area: Every dwelling unit shall have at least one room which shall have not less than 12.0m^2 of floor area. Other habitable rooms except kitchens shall have an area of not less than 6.5m^2. Efficiency dwelling units shall comply with the requirements of Section 7.8.8.

7.1.14.5.3 Width of habitable rooms other than a kitchen shall be not less than 3.0m any dimension.

7.1.14.6 Efficiency dwelling units: An efficiency dwelling unit shall conform to the requirements of this Code except as herein provided.

7.1.14.6.1 The unit shall have a living space of not less than 20m^2 of superficial floor area. An additional 9.3m^2 of superficial floor area shall be provided for each occupant of such unit in excess of two.

7.1.14.6.2 The unit shall be provided with a separate closet.

7.1.14.6.3 The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 76cm in front. Light and ventilation conforming to this code shall be provided.

7.1.14.6.4 The unit shall be provided with a separate bathroom containing a water closet, wash-hand-basin and bathtub or shower.

7.1.14.7 Shaft enclosure: Exits shall be enclosed as specified in Section 7.3. Elevator shafts, vent shafts, dumbwaiter shafts, clothes chutes and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 6.12.

7.1.14.7.1 Fire warning and sprinkler systems

7.1.14.7.2 Fire-warning systems

7.1.14.7.3 Every dwelling unit and every guest room in a hotel or lodging house used for sleeping purposes shall be provided with smoke detectors conforming to U.B.C Standard No. 43-6 or equivalent standards. In dwelling units, detectors shall be mounted on the ceiling or wall at a point centrally located in the corridor or area giving access to rooms used for sleeping purposes. In an efficiency dwelling unit, hotel sleeping room and in hotel suites, the detector shall be centrally located on the ceiling of the main room or hotel sleeping room. Where sleeping rooms are on a upper level, the detector shall be placed at the centre of the ceiling directly above the stairway.

7.1.14.7.4 All detectors shall be located in accordance with approved manufacturer's instructions. When actuated, the detector shall provide an alarm in the dwelling unit or guest room.

When the valuation of an addition or repair to a Group H, Division 3 occupancy exceeds N=100,000.00 or when one or more sleeping rooms are added or created in existing Group H, Division 3 Occupancies, the entire building shall be provided with smoke detectors located as required for new Group H, Division 3 Occupancies.

7.1.14.7.5 In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke detectors may be battery operated when installed in existing buildings, or in buildings without commercial power, or in buildings which undergo alterations, repairs or additions regulated by the second paragraph of this Section.

A smoke detector shall be installed in the basement of dwelling units. Such detectors shall be connected to a sounding device or other detector to provide an alarm which will be audible in the sleeping area.

7.1.14.7.6 Sprinkler and standpipe systems: When required by other provisions of this code,

automatic sprinkler systems and standpipes shall be installed as specified in Chapter 30.

7.1.14.7.7 Special hazards: Chimneys and heating apparatus shall conform to the requirements of Chapters on materials and the current Engineering Code of Practice.

The storage and handling of gasoline, fuel oil or other flammable liquids in Division 1 Occupancies shall be in accordance with the National Fire Safety Code.

In Division 1 Occupancies, doors leading into rooms in which Class I flammable liquids are stored or used shall be protected by a fire assembly having a one-hour fire- protection rating. Such fire assembly shall be self-closing and shall be posted with a sign on each side of the door in 25mm block letters stating. FIRE DOOR-KEEP CLOSED.

Every room containing a boiler, central heating plant or hot-water supply boiler in Division 1 Occupancies shall be separated from the rest of the building by not less than a one-hour fire-resistive occupancy separation.

Exception: A separation shall not be required for such rooms with equipment serving only one dwelling unit.

7.1.14.8 Access to buildings and facilities: Buildings containing more than 20 dwelling units or 20 guest rooms shall be accessible to the physically handicapped by a level entry, ramp or elevator. The number of dwelling units or guest rooms accessible to the physically handicapped shall be not less than the following:

21 through 99 -one unit.

100 and over -one unit plus one for each additional 100 units or fraction thereof.

To determine the total number of accessible units, more than one structure on a building site shall be considered as one building. Habitable rooms, bathrooms, toilet compartments, halls and utility rooms in units that are required to be accessible to the physically challenged shall be accessible by level floors, ramps or lifts, and doorways to such rooms shall have a clear unobstructed width of not less than 900mm.

Toilet facilities in accessible units shall comply with Section 7.1.10.1.

7.2 SPECIAL BUILDING DESIGN REQUIREMENTS

7.2.1 General: In addition to the general requirements of this Code governing the location, construction and equipment of all buildings and structures, and the fire resistance ratings, height and area limitations of Tables 6.1 and 11.2 the provisions of this Part shall control all buildings and structures designed for special uses and occupancies as herein provided.

Chemical plants, packing plants, grain elevators, refineries, flour mills and other similar structures shall be constructed in accordance with the recognised practices and requirements of the specific industry. The Code Enforcement Officer shall permit such variations from the requirements of this code as will secure reasonable and economical construction with the necessary fire, life and property safeguards. In granting such variations, due regard shall be given to the isolation of the structure, the fire hazard and the exposure to surrounding property.

7.2.1.1 Special high hazards: When necessary to resist a higher degree of fire severity than specified herein, for high concentrations of combustible contents and for buildings of high hazard uses which exceed five storeys or 20m in height, the Code Enforcement Officer shall require higher fire resistance ratings than the requirements of Table 6.1 governing the fire resistance ratings of types of construction and protection of structural elements.

7.2.1.2 Means of egress: The means of egress for buildings of special uses and occupancies shall conform to the requirements of Chapter 10, except as is modified by more restrictive provisions of this Part for specific uses.

7.2.1.3 Heating and venting: The requirements herein prescribed for the installation of heating and venting appliances and equipment shall be construed as supplemental to the provisions of Chapters 9 and 27 and the applicable mechanical section of this Code.

7.2.1.4 Equipment rooms: Heating and ventilating equipment in occupancies involving fire hazards from flammable vapours, dust, combustible fibres or other highly combustible substances shall be installed and protected against fire and explosion hazards in accordance with the applicable mechanical section of this code. Rooms containing such equipment shall be segregated by construction of not less than 2 hours fire resistance rating except as otherwise required for specific uses, without openings in the enclosure walls and with means of direct ingress and egress from the exterior, or such equipment shall be located in accessory structures segregated from the main building.

7.2.1.5 Segregation of storage spaces: All rooms and spaces used for the storage of volatile and flammable materials shall be separately enclosed and segregated with fire resistance rated construction as herein required for specific uses and occupancies.

7.2.1.6 Restricted locations: Except as otherwise specifically provided for herein, buildings of Use Group E shall not be located within 60m of the nearest wall of a building classified in Use Group A, C or F.

7.2.1.7 Inspections: All buildings and structures involving the use and handling of flammable or explosive materials and other hazardous uses and occupancies and buildings of Use Group C shall be inspected in accordance with the National Fire Safety
Code listed in the Schedule.

7.2.1.8 Coordination of inspections: The Code Enforcement Officer, Fire Safety Officer, Health Officer, and other administrative agencies of the jurisdiction to whom the authority is delegated to inspect buildings and structures in respect to the maintenance of safe conditions of use and occupancy shall immediately notify the respective official of any violation of the provisions of this Code or the Fire Prevention Code listed in the Schedule and health rules and regulations.

7.2.2 COVERED MALL BUILDINGS:

7.2.2.1 Scope: The provisions of this section shall apply to buildings or structures defined herein as covered mall buildings not exceeding three floor levels in height at any one point. Except as specially required by this section, covered mall buildings shall meet all applicable provisions of this code.

7.2.2.2 Exceptions: When approved by the code enforcement officer, the following uses are not required to comply with the provisions of this section.

a. Terminals for transportation facilities.

b. Foyers and lobbies in buildings of Use Groups H-1, H-2 or B.

c. Buildings which comply totally with all other applicable provisions of this Code.

7.2.2.3 Definitions: Terms used in this section shall have the following meanings:

a. Anchor store: An exterior perimeter department store or major merchandising or magnet centre having direct access to a mall and having its required exits independent of the mall.

b. Gross leasable area: The gross leasable area is the total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the centre lines of joint partitions to be outside of the tenant walls.

c. Mall: A mall is a roofed-over common pedestrian area serving more than one tenant located within a mall building.

d. Mall building, covered: A building enclosing a number of tenants and occupancies such as retail stores, drinking and dining establishments, entertainment and amusement facilities, offices and other similar uses wherein two or more tenants have a main entrance into one or more malls. Anchor stores shall not be considered as part of the covered mall building.

7.2.2.4 Lease plan: The permit holder shall provide both the building and fire departments with a lease plan showing the locations of each occupancy and it means of egress after the certificate of occupancy has been issued. Such plans shall be kept current. Modifications or changes in occupancy or use shall not be made from that shown on the lease plan without prior approval.

7.2.2.5 Tenant separations: Each tenant space shall be separated from other tenant spaces by a wall having a fire resistance rating of not less than 1 hour. The separation wall shall extend from the floor to the underside of the ceiling. Except as required by other provisions of this Code, the ceiling need not be a fire resistive assembly. A separation is not required in attic spaces above tenant separation walls nor is a tenant separation wall required between any tenant space and a mall, except for occupancy separations required elsewhere in this Code.

a. Anchor store openings: Openings between an anchor store and the pedestrian area of a mall need not be protected.

7.2.2.6 Egress: Each individual occupancy within the covered mall building shall be provided with a means of egress in accordance with other provisions of this code. Measurements shall be made to the entrance to the mall.

a. Travel distance: The maximum length of exit access travel from any point within the mall to an approved exit along the natural and unobstructed path of travel shall not exceed 60m.
b. Anchor store exits: Anchor stores shall provide the required number of exits and units of exit width directly to the exterior. The occupant load of anchor stores opening into the mall shall not be included in determining exit requirements for the mall.
c. Dead ends: The dead end of a mall shall not exceed twice its width.
d. Design occupant load: In determining required exit facilities of the mall, the number of occupants for whom exit facilities are to be provided shall be based on gross leasable area of the covered mall building (excluding anchor stores) and shall be based on Table 8.2.
e. Exit access width: The minimum width of exit access passageways and corridors from a mall shall be 1.8m.
f. Exit distribution: The required units of exit width and exits shall be distributed equally throughout the mall.
g. Storage prohibited: Storage is prohibited in exit corridors which are also used for serving to the tenants. Such corridors shall be provided with conspicuous signs so stating.

TABLE 7.2.1

FLOOR AREA ALLOWANCE PER OCCUPANT FOR COVERED MALLS

SQUARE METER PER PERSON	GROSS LEASABLE AREA M^2
2.80	under 14,000m^2
3.72	14,000-33,000
4.65	over 33,000

7.2.2.7 Mall width: The minimum width of the mall shall be 6.0m. There shall be a minimum of 3m clear exit width to a height of 2.4m between any projection of a tenant space bordering the mall and the nearest kiosk, vending machine, bench, display opening, or other obstruction to egress travel.

The mall width shall be sufficient to accommodate the occupant load emptying into the immediately adjacent mall as determined by Section 8.2.4.4 for all occupancies except Use

Group A and C which shall be determined by Section 10.7.

7.2.2.8 Structural elements: Covered mall buildings shall be of Types 1, 2 or 4 construction. Covered mall buildings three storeys or less in height are exempt from the area limitations of Table 11.2.7.

a. Floor/ceiling assemblies: Floor/ceiling assemblies and their supporting columns and beams within multi-level covered malls shall be of 1-hour fire resistance rated non-combustible construction or of Type 4 construction meeting the requirements of Section 6.25.
b. Structural elements, anchor stores: An anchor store three storeys or less in height shall be of Type 1, 2 or 4 construction and is exempt from the area limitations of Table 11.2, provided that a smoke control system conforming to Section 12.1.20.12 is installed in the anchor store.

For the purposes of the design and operation of the fire emergency ventilation system, the anchor store shall be considered a tenant space zone.

7.2.2.9 Roof covering: Roof coverings for covered mall buildings shall be Class A, B or C as required by (Section on roofing materials.).

7.2.2.10 Use Group A-1 and A-2 occupancies: Use Group A-1 and A-2 occupancies shall be located in the covered mall building so that their main entrance is immediately adjacent to principal entrance to the mall and shall have not less than one-half of their required exits opening directly to the exterior of the covered mall building.

7.2.2.11 Fire suppression: The covered mall and all buildings connected thereto shall be provided throughout with an approved automatic fire suppression system. The system shall be installed in such a manner that when any portion of the system serving tenant spaces is shut down, the portion of the system serving the mall will remain operational.

7.2.2.12 Supervision: All sprinkler control valves shall be electrically supervised and connected to either the fire department or to an approved supervisory service.

7.2.2.13 Standpipe: There shall be a fire department standpipe outlet connected to a supply capable of delivering 1,135 liters per minute ($0.022m^3$) located within the mall at each entrance to an exit passageway, corridor or enclosed stairway and at exterior exits.

7.2.2.14 Smoke control: The mall and adjacent tenant spaces shall be equipped with a smoke control system conforming to Section 12.1.20.12.

7.2.2.15 Fire department access to equipment: Controls for air conditioning systems, sprinkler risers and valves, or other fire detection, suppression or control elements shall be accessible to and properly identified for use by the fire department.

7.2.2.16 Plastic panels and plastic signs: Within every storey or level and from side wall to side wall of each tenant space, approved plastic panels and signs shall be limited as specified in Section 8.2.15 through 8.2.18.

7.2.2.17 Area: The panels and signs shall not exceed 20 percent of the wall area facing the mall.

7.2.2.18 Height and width: The panels and signs shall not exceed a height of 900mm, except if the panel or sign is vertical, the height shall not exceed 2.4m and the width shall not exceed 900mm.

7.2.2.19 Location: The panels and signs shall be located at a minimum distance of 450mm from adjacent tenants.

7.2.2.20 Encasement: All edges and the backs shall be fully encased in metal.

7.2.2.21 Kiosks: Kiosks and similar structures (temporary or permanent) shall meet the requirements of Section 8.2.20 through 8.2.23.

7.2.2.22 Construction: Combustible kiosks or other structures shall not be located within the covered mall unless constructed of fire-retardant treated wood throughout conforming to

Section 12.2.5.

7.2.2.23 Fire suppression: Kiosks or similar structures that are covered or have roofs and are located within the covered mall shall be protected by an approved automatic fire suppression system.

7.2.2.24 Horizontal separation: The minimum horizontal separation between kiosks and other structures within the covered mall shall be 6.0m.

7.2.2.25 Maximum area: Kiosks or similar structures shall have a maximum area of $30m^2$.

7.2.2.26 Parking structures: An attached garage for the storage of passenger vehicles or an open parking structure shall be considered as separate building where it is separated from the covered mall building by a fire separation wall having a fire- resistance rating of not less than 2 hours or shall be considered as part of the covered mall building.

7.2.3 HIGH-RISE BUILDINGS

7.2.3.1 Applicability: The provisions of this section shall apply to all buildings of Use Group B, H-1 and H-2 when such buildings have floors used for human occupancy located more than 15m above the lowest level of fire department vehicles access, except that the provisions of this section shall not apply to airport traffic control towers conforming to the requirements of Section 8.18.

7.2.3.1.1 Maintenance and inspection: All fire protection systems shall be maintained in an operative condition at all times and shall be periodically inspected and tested in accordance with the fire prevention code listed in Schedule A. Maintenance inspections shall be made quarterly and logged in a journal kept available for inspection.

7.2.3.1.2 Options: All buildings and structures shall be provided with either an approved automatic fire suppression system according to Section 8.3.3.1, or safe areas of refuge (compartmentation) according to Section 8.3.3.2.

7.2.3.1.3 Automatic fire suppression system: When provided as required herein, the automatic fire suppression system shall be installed throughout the building. The system shall be designed using the parameters set forth in Chapter 30 and the requirements of Sections 8.3.3.1 a-c.

a. Shutoff valves and waterflow devices: Shutoff valves and a water flow- device shall be provided for each floor.
b. Valve supervision: Valves shall be supervised by a continuously manned control station or central station.
c. Secondary water supply: In addition to the main water supply, in Seismic Zones 2 and 3, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus 454 liters per minute ($0.0063m^3/s$) additional for the total standpipe system shall be provide. This supply shall have a duration of 30 minutes, but need not exceed 45,400 liters ($38m^3$).
d. Automatic fire suppression system alternatives: When a complete automatic fire suppression system is installed throughout, modifications to this code are permitted as described in Section 8.3.3.1e (i-vii)
e. (i) Type of construction: The minimum type of construction required by this Code shall be modified as indicated in Table 8.3.
   (ii) Fire resistance rating of walls and doors: The fire resistance rating of exit access corridors, vertical separation of tenant spaces and dwelling unit separations shall be in accordance with Sections 10.11.7 and 10.11.8.
   (iii) Shaft enclosures: The required fire resistance rating of vertical shafts other than stairway enclosures and elevator hoistway enclosures shall be reduced to 1-hour fire resistance rating when sprinklers are installed within the shafts at

alternate floor.

TABLE 7.2.2.3 TYPES OF CONSTRUCTION MODIFICATION PERMITTED FOR HIGH-RISE BUILDINGS

Types of Construction set forth in Table 6.1	Modified type of construction permitted hereunder
1A	1B
1B	2A
2A	2B

(iv) Standpipe system: The 38mm hose line, nozzle, rack and cabinet are not required in accordance with Section 12.1.13.26.

(v) Travel distance: The exit access travel distance limitations set forth in Table 10.8 shall be increased to 90 meters.

(vi) Smoke proof enclosures: Smokeproof enclosures as set forth in Section 8.3.5.1 are not required, but required stairways greater than 23m in height shall be pressurised to a minimum of 38mm of water column (37.33 Pa) and a maximum of 9mm of water column (87.10 Pa) in the shaft relative to the building with all stairway doors closed. The stairway pressurisation system shall be activated by all devices which are required to activate the voice alarm system in Section 6.2.5.1.

(vii) Fire dampers: Fire dampers, other than those needed to maintain the fire resistance rating of the floor/ceiling assembly, are not required. Where fire dampers will interfere with the operation of the smoke control system, approved alternative protective devices shall be utilised.

7.2.3.1.4 Areas of refuge (compartmentation): Areas of refuge conforming to Sections 8.3.3.2 (a to e) shall be provided when an automatic fire suppression system is not provided in buildings up to 12 storeys or 45 meters in height (see Section 12.1.3.7).

a. Division of floor areas: Every storey shall be divided into two or more areas of approximately the same size without a single area exceeding 1,400m^2. The wall and doors between the areas of refuge shall be constructed as required for a horizontal exit in Section 10.15.

b. Stairways and lifts: Each area of refuge compartment shall contain a minimum of one enclosed exit stairway and each compartment shall have access to a lift which shall serve one or more compartments. When lifts are directly accessible and serve more than one compartment, the elevator lobby shall be separated from the compartments by not less than 2-hour fire resistance rated construction with tight-fitting fire doors complying with Section 12.2.18.

c. Wall constructions: Walls used for compartmenting a building shall have a fire resistance rating of not less than 2 hours. Duct penetrations of this wall shall not be permitted. Ferrous or copper piping and conduit shall only penetrate or pass through the wall if the openings around such piping and conduit are sealed with impervious non-combustible materials sufficiently tight to prevent the transfer of smoke or combustion gases from one side of the wall to the other and are so maintained. The fire door serving as the horizontal exit between compartments shall be so installed, fitted and gasketed that it will provide a substantial barrier to the passage of smoke

and shall comply with Section 10.15.2.

d. Floor/ceiling construction: The fire resistive floor or the floor/ceiling construction shall extend to and be tight against the exterior wall so that the fire resistive integrity between storeys is maintained. Penetrations or other installations which will impair the fire resistive integrity of the floor or floor/ceiling assembly shall not be permitted (see Section 12.2.4.1).

e. Manual fire alarm system: A manual fire alarm system (pull boxes) shall be provided.

7.2.3.1.5 Smoke detection system: A smoke detector suitable for the intended use shall be installed in accordance with Sections 8.3.4.1 through 8.3.4.3.

7.2.3.1.6 Room locations: A smoke detector shall be installed in every mechanical equipment, electrical transformer, telephone equipment, lift machine or similar room unless such rooms are protected with an automatic fire suppression system.

7.2.3.1.7 Duct locations: A smoke detector shall be installed in each connection to a vertical duct or riser serving two or more storeys from return air ducts or plenums of heating, ventilating and air conditioning systems. In buildings of Use Group H, an approved smoke detector shall be installed as required above or shall be installed in each return air riser carrying not more than 2.36m^3/s and serving not more than ten air inlet openings.

7.2.3.1.8 Operation: The actuation of any detector required by this shall operate the voice alarm system and shall place into operation all equipment necessary to prevent the re-circulation of smoke.

7.2.3.2 Alarm and communication systems: Alarm and communication systems shall be provided. The alarm and communication systems shall be so designed and installed that damage to any terminal unit or speaker will not render more than one zone of the system inoperative.

One or more communication systems shall be designed to serve the voice alarm, public address and fire department communication system as indicated in Section 8.3.5.1 through 8.3.5.3.

7.2.3.2.1 Voice alarm system: The operation of any smoke detector, sprinkler, water flow device or manual fire alarm station shall automatically activate a voice alarm system.

Activation of the system shall automatically sound an alert signal to the desired areas. The voice alarm system shall provide a predetermined message on a selective basis to the area where the alarm originated and shall provide information and give direction to the occupants. The alarm shall be designed to be heard clearly by all occupants within the building or designated portions thereof as is required for the public address system.

The central control station shall contain controls for the voice alarm system having the capability to manually initiate a selective or general voice alarm.

The system shall be continuously electrically supervised against component failure of the audiopath, including amplifiers, speaker wiring, switches and electrical contacts and shall detect opens, shorts and grounds which might impair the function of the system.

7.2.3.2.2 Public address system: A public address communication system designed to be clearly heard by all occupants of the building shall operate from the central control station.

It shall be established on a selective or general basis to the following terminal areas: lifts, lift lobbies, corridors, exit stairways, rooms and tenant spaces exceeding 90m^2 in area, ds system: A public address communication system designed to be clearly heard by all occupants of the building shall operate from the central control station.

It shall be established on a selective or general basis to the following terminal areas: lifts, lift lobbies, corridors, exit stairways, rooms and tenant spaces exceeding 90m^2 in area, dwelling units in Use Group H-2 and guest rooms or suites in Use Group H-1

7.2.3.2.3 Fire department communication system: A two-way fire department communication

system shall be provided for fire department use. It shall operate between the central control station and every lift, lift lobby and entry to an enclosed exit stairway.

7.2.3.3 Central control station: A central control station for fire department operations shall be provided in a location approved by the fire department. It shall contain the voice alarm and public address system panels, the fire department communications panel; fire detection and alarm system annunciator panels; an annunciator which visually indicates the floor location of lifts and whether they are operational; status indicators and controls for air handling systems; controls for unlocking all stairway doors simultaneously; sprinkler valve and water flow detector display panels; emergency power, light and system controls; and status indicators and a telephone for fire department use with controlled access to the public telephone system.

7.2.3.4 Smoke control: A smoke control system conforming to Section 12.1.20.6 shall be installed.

7.2.3.5 Lifts: Lift operation and installation shall be in accordance with Chapter 27.

Lift service shall be provided for fire department emergency access to all floors.The said lift cab shall be of such size to accommodate an ambulance cot 600mm by 2000mm in its horizontal open position. Except for the main entrance level, all elevators shall open into a lobby separated from the remainder of the building by 1-hour fire resistance rated construction. Exit stairways, chutes, janitor closets, tenant spaces in Use group H and service rooms shall not open into the lift lobby and shall be provided with other means of exit access that does not require passage through the lift lobby.

7.2.3.5.1 Exception: Lift lobbies are not required when a smoke control system is installed in accordance with Section 30.20.11.

7.2.3.6 Standby power, light and emergency systems: Standby power, light and emergency systems shall comply with the requirements of Section 8.3.9.1 through
8.3.9.6.

7.2.3.7 Standby power: A standby power system conforming to Section 9.2.8 shall be provided. If the standby system is a generator set inside a building, it shall be located in a separate room of 2-hour fire resistance rated construction. System supervision with manual start features shall be provided at the central control station.

7.2.3.8 Fuel supply: An on-premises fuel supply sufficient for not less than 2-hours full demand operation of the system shall be provided

7.2.3.8.1 Exception: Where the system is supplied with pipeline natural gas and is approved.

7.2.3.8.2 Capacity: The standby system shall have a capacity and rating that would supply all equipment required to be operational at the same time. The generating capacity need not be sized to operate all the connected electrical equipment simultaneously.

7.2.3.8.3 Connected facilities: All power, lighting, signal and communication facilities specified in Sections 8.3.4, 8.3.5, 8.3.6, 8.3.7, 8.3.8 and 8.3.9 as applicable, and electrically-powered fire pumps required to maintain pressure, shall be transferable to the standby source. Services shall be provided for access to all floors by at least one elevator when standby power is connected.

7.2.3.9 Exception: Smoke control systems in accordance with Section 29.13.

7.2.3.10 Separate circuits and fixtures: Separate lighting circuits and fixtures shall be required to provide sufficient light with an intensity of not less than (10.76 lux) measured at floor level in all egress corridors, stairways, smoke proof enclosures, lift cars and lobbies and other areas which are clearly a part of the escape route.

7.2.3.11 Other circuits: All circuits supplying lighting for the central control station and mechanical equipment rooms shall be transferable to the standby source.

7.2.3.12 Emergency systems: Exit signs, exit illumination as required by Section 10.25, and lift car lighting, are classified as emergency systems and shall operate within

10 seconds of failure of the normal power supply.
7.2.3.13 Exits: Exits shall comply with other requirements of this Code and Sections 8.3.10.1 and 8.3.10.2.

7.2.3.13.1 Door operation: All stairway doors which are to be locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central station.

7.2.3.13.2 Stairway communication system: A telephone or other two-way communications system connected to an approved emergency service which operates continuously shall be provided at not less than every fifth floor in each required stairway where other provisions of this code permit the doors to be locked.

7.2.3.14 Seismic consideration: Anchorage of lift drive and suspension systems, emergency power and lighting facilities, fire pumps and all other fire protection equipment and systems shall be designated in accordance with the section on structural loading.

7.2.4 HAZARDOUS PRODUCTION MATERIALS USE FACILITIES

7.2.4.1 Scope: The provisions of these sections shall apply to buildings and structures using hazardous production materials (HPM), such as in semi-conductor fabrication facilities and areas of comparable research and development. Except as specifically required by this section, such buildings shall comply with the applicable requirements of this code. The specific code provisions of Sections 5.7, 11.3.3 and Tables 10.9 and 29.3 applicable to high hazard use shall not apply unless stated herein.

7.2.4.1.1 Fabrication area, general: A fabrication area is one in which there are processes involving hazardous production materials, and includes ancillary rooms or areas such as dressing rooms and offices that are supplemental to the area processes.

7.2.4.1.2 Allowable heights, storeys and area: The allowable height, number of storeys and basic areas permitted for buildings and structures used for facilities using HPM shall not exceed the limits specified in Table 8.4.1.2 The provisions of Section 11.5 shall not apply. The area limitations are for one or two-storey buildings facing on one street or public space not less than 9m wide. The increases permitted in Sections 11.3.2 and 11.3.3 shall apply.

TABLE 8.4.1.2

HEIGHT, NUMBER OF STOREYS AND AREA LIMITATION FOR HPM USE FACILITIES

TYPE OF CONSTRUCTION	NUMBER OF STOREYS	HEIGHT (m)	AREA IN SQUARE METERS PER FLOOR
1A and 1B	**3**	**17.0m**	**Unlimited**
2A	**3**	**17.0m**	**3181.00**
2B	**3**	**17.0m**	**2093.0**
2C		**12.0m**	**1340.0**
3A	**3**	**15m**	**1842.0**
3B	**3**	**12.0m**	**1340.0**
4	**3**	**17.0m**	**2010.00**
5A	**3**	**12m**	**1423.0**
	3	**10m**	**670.0 ‖**

Note a: 1 foot = 304.8mm 1 square foot = 0.093m^2

7.2.4.1.3 Fabrication area size: The size of a fabrication area shall be determined by the density of the HPM in that space. The density of HPM shall not exceed that specified in Table 8.4.1.3b. The total quantity of HPM permitted shall be based on the densities in Table 8.4.1.3b, or the quantities in Table 8.4.1.3a, whichever is the larger amount.

TABLE 8.4.1.3a

PERMITTED QUANTITIES OF HPM IN A SINGLE FABRICATION AREA

MATERIAL	MAXIMUM QUANTITY
Flammable liquids	
Class 1-A	0.34m³
Class 1-B	0.68m³
Class 1-C	1.02m³
Combination flammable liquids containing not more than the exempt amounts of Class 1-A, 1-B or 1-C flammable liquids	1.36m³
Combustible liquids	1.36m³
Class II	2.84m³
Class III-A	2.52m³
Flammable gases	atmosphere of pressure at 21oc
Liquified flammable gases	0.68m³
Flammable solids	680kg
Corrosive liquids	0.63m³
Oxidizing material-gases	504m³
Oxidizing material-liquids	0.57m³
Oxidizing material-solids	680kg
Organic peroxides	13.62kg
Included in the aggregate for highly toxic material and poisonous gas	

TABLE 8.4.1.3b PERMITTED QUANTITIES OF HMP IN A SINGLE HPM USE FACILITY - DENSITY BASIS

STATE	UNITS	FLAMMABLE	OXIDIZER	CORROSIVE
Solid	**kg/m²**	**0.005**	**0.015**	**0.015**
Liquid	**m3/m²**	**0.002**	**0.001**	**0.004**
Gas	**m3/m²**	**0.376**	**0.376**	**0.903**

Note a: HPM within piping shall not be included in the calculated quantities.

Note b: The maximum permitted quantities of flammable and combustible liquids shall not exceed the following quantities:

Class (1-A) + (1-B) + (1-C) (Combinating flammable liquids) 0010

Class II 0001

Class III-A 0004

Note c: Highly toxic materials and poisonous gases shall be limited by the maximum quantities

specified in Table 8.4.1.3a.

7.2.4.1.4 Egress: There shall be not less than two means of egress provided for by any fabrication area or any HPM use facility subdivision thereof larger than 20m^2. The maximum length of exit access travel in HPM use facilities shall be 30 meters.

7.2.4.1.5 Separation: Fabrication areas shall be separated from each other, from egress corridors and from other parts of the building by not less than 1-hour fire resistance rated assemblies in compliance with Section 29.4, with fire doors complying with Section 12.2.18. Floors part of the required separation shall be liquid-tight.

7.2.4.1.6 Floors: Floors within fabrication areas shall be of non-combustible construction. Unprotected openings through floors of fabrication areas are permitted when the interconnected levels are used solely for mechanical equipment directly related to such fabrication areas. Mechanical, duct and piping penetrations within a fabrication area shall not extend through more than two floors. Penetrations shall be effectively draft-stopped at the floor level. The fabrication area, including the areas through which ductwork and piping extend, shall be considered a single conditioned space or fire area.

7.2.4.2 Ventilation, general: Ventilation systems shall comply with the applicable mechanical section of this code listed in the Schedule except as otherwise provided herein. Ventilation including recirculated air shall be provided throughout the fabrication area at the rate of not less than 5000$cm^3/s/m^2$ of floor area.

a. Interconnection: the exhaust system of one fabrication area shall not connect to another exhaust system outside that fabrication area within the building. The return air system from one fabrication area shall not connect to any other system.
b. Smoke detector: Smoke detectors shall be installed in the recirculating air- stream and shall initiate a signal at the emergency control station.
c. Shutoff switches: Automatic shut-off are not required to be installed on air- moving equipment. A manually-operated remote switch to shut off the fabrication area supply or recirculation air system, or both, shall be provided at an approved location outside the fabrication area.
d. Gas detection: When HPM gas is used or dispensed and the physiological warning properties for the gas are at a higher level than the accepted permissible exposure limit for the gas, a continuous gas-monitoring system shall be provided to detect the presence of a short-term hazard condition. When dispensing occurs with the possibility of generating flammable gases or vapours in quantities exceeding 20 percent of the lower explosive limit, a continuous gas- monitoring system shall be provided. The monitoring system shall be connected to the emergency control station.

7.2.4.3 Transporting HPM: HPM shall be transported to fabrication areas through enclosed piping or tubing systems that comply with Section 8.4.5, through service passages, or in egress corridors as permitted in the exception to Section 8.4.2.

7.2.4.4 Electrical: Electrical equipment and devices within the fabrication area shall comply with approved standards. The requirements for hazardous locations need not be applied when the average rate of air change is at least 20300$cm^3/s/m^2$ of floor area and when the rate of air change at any location is not less than 15200$cm^3/s/m^2$.

7.2.4.5 Egress corridors: Egress corridors shall comply with Section 10.11.6 and shall be separated from fabrication areas as specified in Section 8.4.1.5. Egress corridors shall not be used for transporting HPM except as provided in Section 8.4.5.2.

7.2.4.5.1 Exception: In existing HPM use facilities, when there are alterations on modification to existing fabrication areas, the transportation of HPM in egress corridors shall be permitted when all the following requirements are met:

i Corridors adjacent to the fabrication area under alteration shall comply with Table 6.1,

item 7, for a length determined as follows:

a. the length of the common wall of the corridor and that fabrication area; and
b. for the distance along the egress corridor to the point of entry of HPM into the egress corridor serving that fabrication area.

ii There shall not be openings between an egress corridor and an HPM storage cabinet in a fabrication area other than those in compliance with all of the following:

a. 1-hour fire doors are installed between the egress corridor and the cabinet;
b. the cabinet is enclosed with a 1-hour fire resistance rated assembly between it and the corridor;
c. the cabinet shall be internally sprinklered.

7.2.4.6 Service passages: Service passages shall be considered as HPM use facilities. Service passages shall be separated from egress corridors as required by Section 8.4.1.5.

7.2.4.6.1 Ventilation: Service passages shall be ventilated as required by Section 8.4.1.7.

7.2.4.6.2 Egress: There shall be not less than two means of egress from a service passage. Not more than one-half of the required means of egress shall be into the fabrication area. Doors from service passages shall be self-closing and swing in the direction of egress travel.

7.2.4.6.3 Travel distance: The maximum distance of travel from any point in a service passage to an exit or door into a fabrication area shall not exceed 22m. Dead ends shall not exceed 1.2m in length.

7.2.4.6.4 Alarms: Alarms shall be provided in accordance with Section 8.4.4.5.

7.2.4.7 Storage of HPM, general: Rooms used for the storage of HPM in quantities greater than the set forth in Table 5.7.2b, except for that permitted within a fabrication area, shall comply with the relevant standards (see NFiPA 30), provided that the area of an HPM cutoff room shall not exceed 558m^2. The storage area for any liquid HPM shall be provided with drains.

7.2.4.7.1 Location within building: When HPM cutoff rooms are provided, they shall be not less than 9 meters from plot lines.

7.2.4.7.2 HPM drainage systems: Drainage systems shall be provided to direct liquid leakage and fire protection water to a safe location away from the building, any important valve or adjoining property. HPM flammable liquid drains shall be separated from other HPM liquid drains. Other HPM liquids in drains that are not compatible shall be separated from each other, provided that they are permitted to be combined when they have been rendered acceptable for discharge by an approved means into the public sewers.

7.2.4.7.3 Egress: There shall be two means of egress from a separate inside HPM storage room when the room exceeds 18.6m^2 in area. When two means of egress are required from HPM cutoff rooms, one shall be directly to the outside of the building. All storage room egress doors shall be self-closing and swing in the direction of egress travel.

7.2.4.7.4 Ventilation: Exhaust ventilation shall be provided in accordance with Section 8.4.1.7 for all categories of HPM.

7.2.4.7.5 Emergency alarm: An emergency telephone system or local manual alarm pull station shall be installed outside of each interior egress door from HPM cutoff rooms. The signal shall be relayed to the emergency control station and a local signalling device provided.

7.2.4.7.6 Electrical: HPM cutoff rooms containing flammable liquids or gases shall be classified appropriately under hazardous locations in the relevant standards (see NFiPA 70).

7.2.4.7.7 Gas detection: Gas detection shall be provided in accordance with Section 8.4.1.7d. 8.4.5.

7.2.4.7.8 Piping and tubing: HPM piping and tubing shall comply with this section and shall be

installed in accordance with the relevant standards.

7.2.4.7.8.1 General: Piping and tubing system shall be metallic unless the material being transported is incompatible with such system. Systems supplying gaseous HPM, having a health hazard of 3 or 4 as ranked by NFiPA 704 listed in Schedule A, shall be welded throughout, except for connections, valves and fittings which are within an exhausted enclosure. HPM piping or tubing in service passages shall be exposed to view.

7.2.4.7.8.2 Installation in egress corridors or above other use groups: HPM shall not be located within egress corridors or above areas not containing HPM use facilities except as permitted by this section. HPM piping and tubing shall be permitted within the space defined by the walls of egress corridors and the floor or roof above, or in concealed spaces above other use groups under the following conditions:

a. Automatic sprinklers shall be installed within the space unless the space is less than 15cm in least dimension.
b. Ventilation at not less than 6 air changes per hour shall be provided. The space shall not be used to convey air from any other area.
c. All HPM supply piping and tubing and HPM non-metallic waste lines shall be separate from the egress corridor and from any use group other than an HPM use facility by construction having a fire resistance rating of not less than 1 hour as permitted for walls or partitions. When gypsum wallboard is used, joints on the piping side of the enclosure need not be taped, provided the joints occur over framing members.
d. When the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The 1-hour enclosure required by item c herein shall not be used as part of the receptor.
e. Readily accessible manual or automatic remotely-activated fail-safe emergency shutoff valves shall be installed on piping and tubing, other than waste lines, at the following locations:
    i At branch connections into the fabrication area;
    ii At entries into egress corridors.
f. Where HPM supply gas is carried in pressurised piping, a fail-safe system for excess flow control shall shut off flow due to a rupture in the piping.
g. Electrical wiring and equipment located in the piping space shall be approved for Class I Division 2 hazardous locations in accordance with NFiPA 70 listed in the Schedule.
h. Gas detection shall be provided per Section 8.4.1.7(d).

Exceptions to items g. through h.: Transverse crossings of the corridors by supply piping coaxially enclosed within a ferrous pipe or tube for the width of the corridor. An enclosing pipe or tube open to an HPM use facility is permitted.

7.2.4.7.8.3 Identification: Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A13.1 listed in the Schedule.

7.2.5 MEMBRANE STRUCTURES

7.2.5.1 General: The provisions of this Section shall apply to air-supported, air-inflated, membrane-covered cable and membrane-covered frame structures, collectively known as membrane structures, erected for a period of 90 days or longer. Those erected for a shorter period of time shall comply with applicable provisions of the fire prevention code listed in the Schedule and Section 8.28. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants and similar facilities not used for human occupancy are required to meet only the requirements of Section 8.5.2.2 and Section 8.5.5 of this Section.

7.2.5.1.1 Construction requirements: Construction of membrane structures shall comply with Section 8.5.2.1 through to 8.5.2.5.
7.2.5.1.2 Type of construction: All non-combustible membrane structures shall be classified as Type 2C construction. Non-combustible frame-or cable-supported structures covered by an approved membrane in accordance with Section 8.5.2.2 shall be classified as Type 2C construction. Heavy timber frame-supported structures covered by an approved membrane in accordance with Section 8.5.2.2 shall be classified as Type 3B construction. A non-combustible membrane structure used exclusively as a roof and located more than 6 meters above any floor, balcony or gallery is deemed to comply with the roof construction for Type 1 and Type 2 construction, provided that such a structure complies with the requirements of this Section. All other membrane structures shall be classified as Type 5B construction.
7.2.5.1.3 Membrane material: Membranes shall be either non-combustible as defined by Section 12.2.4.6, or flame-resistance conforming to NFiPA 701 listed in the Schedule.
7.2.5.1.4 Exception: Plastic less than 500um thickness used in green houses when occupancy by the general public is not permitted and for aquaculture pond covers are not required to be flame-resistant.
7.2.5.1.5 Applicability of other provisions: Except as otherwise specifically required by this section, membrane structures shall meet all applicable provisions of this code. The membrane shall meet roof covering requirements of the section on roofing materials.
7.2.5.1.6 Allowable floor areas: The area of a membrane structure shall not exceed the limits set forth in Table 11.2.7 except as provided in Section 11.3.
7.2.5.1.7 Maximum height: Membrane structures shall not exceed one storey nor shall they exceed the height limits in metres set forth in Table 11.2.7.
7.2.5.1.8 Exception: Non-combustible membrane structures serving as roof construction only.
7.2.5.2 Inflation systems: Air-supported and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Section 8.5.3.1 and 8.5.3.2.
7.2.5.2.1 Equipment requirements: The inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. The system shall be so designed as to prevent over pressurisation of the system.
In addition to the primary inflation system, in buildings exceeding 140m^2 in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically if there is a loss of internal pressure or if the primary blower system becomes in-operative.
Blowers equipment shall meet the following requirements:

a. Blowers shall be powered by continuous rated motors at the maximum power required for any flow condition as required by the structural design.
b. Blowers shall be provided with inlet screen, belt guards and other protective devices as required by the code enforcement officer to provide protection from injury.
c. Blowers shall be housed within a weather-protecting structure.
d. Blowers shall be equipped with backdraft check dampers to minimise air loss when in-operative.
e. Blower inlets shall be located to provide protection from air contamination. Location of inlets shall be approved by the Code Enforcement Officer.

7.2.5.2.2 Standby power: Whenever an auxiliary inflation system is required, an approved standby power generating system shall be provided. The system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical services and for automatic transfer and operation of all the required electrical functions at full

power within 60 seconds of such normal service failure. Standby power shall be capable of operating independently for a minimum of 4 hours.

7.2.5.2.3 Support provisions: A system capable of supporting the membrane in the event of deflation shall be provided in all air-supported and air-inflated structures having an occupant load of more than 50 or when covering a swimming pool regardless of occupant load. The support system shall be capable of maintaining membrane structures used as a roof for Type 1 or Type 2 construction not less than 6 meters above floor or seating areas. The support system shall be capable of maintaining all other membranes at least 2.4 meters above the floor, seating area or surface of the water.

7.2.5.2.4 Engineering design: All membrane structures shall be structurally designed in accordance with criteria approved by the Code Enforcement Officer and developed by a registered engineer or architect.

7.2.6 Mezzanines

7.2.6.1 General: A mezzanine or mezzanines in compliance with this Section shall be considered a portion of the floor below. Such mezzanines shall not contribute to the number of storeys or height as regulated by Section 11.2.6.

7.2.6.2 Area limit: The aggregate area of a mezzanine or mezzanines within a storey shall not exceed one-third of the area of that storey.

7.2.6.2.1 Exception: The aggregate area of mezzanines in buildings and structures of Type 1 or 2 construction for special industrial uses according to Section 11.2.2 shall not exceed two-thirds of the area of that storey.

7.2.6.3 Egress: Each occupant of a mezzanine with an occupant load of more than 50 or in which the travel distance to an exit exceeds 20 meters shall have access to at least two independent means of egress.

7.2.7 OPEN WELLS

7.2.7.1 General: The term “Open well” shall mean a floor opening, series of floor openings or an atrium connecting two or more storeys which does not meet requirements for a covered shaft with respect to enclosure. Open wells are to be classified as either atriums (Section 8.7.2) or floor openings (Section 8.7.3) and shall be permitted in all buildings in other than Use Group E when provided with the protection herein required.

Exception: The provisions of this section shall not apply to the following:

i Stairways permitted to be unenclosed in accordance with Section 10.17.23.

ii In other than Use Group F openings which serve only one adjacent floor, are not connected with an exit access corridor, not connected with openings serving other floors and are not concealed within the building construction.

7.2.7.1.1 Fire suppression: An approved, electrically supervised automatic fire suppression system shall be installed throughout all floor area connected by the open well in accordance with the provisions of Chapter 30, except those floor areas separated from the open well by fire separation assemblies conforming to Table 6.1 and for floor openings meeting the exceptions in Section 8.7.3.

7.2.7.1.2 Use: The floor of the open well shall not be used for other than low fire hazard uses and only approved materials and decorations shall be used in the open well space.

7.2.7.1.3 Exception: The use of the open well floor area for any approved purpose shall not be restricted when the individual space is provided with an approved automatic fire suppression system.

7.2.7.1.4 Atriums: Atriums shall be constructed in accordance with Sections 8.7.2.1 through 8.7.2.4.

7.2.7.1.5 Smoke control: A smoke control system complying with Section 30.20.17 shall be installed in all atriums that connect more than two storeys.

7.2.7.1.6 Enclosure of atriums: Atrium spaces shall be separated from adjacent spaces by a

1-hour fire separation wall as required for corridors.

7.2.7.1.7 Exceptions:

i In residential occupancies, protected openings are not required when the floor area of each guest room or dwelling unit does not exceed 93m^3 and each room or unit has an approved means of egress not entering the atrium.

ii Adjacent spaces shall be separated from the atrium by fire windows or by a tempered, wired or laminated glass wall subject to the following:

a. The glass shall be protected by a specially designed automatic fire sprinkler system. The sprinkler system shall completely wet the entire surface of the glass wall when actuated. When there are walking surface on both sides of the glass, both sides of the glass shall be so protected.

b. The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking the glass before the sprinkler system operates.

c. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the sprinkler heads and the glass.

iii The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium; however, these spaces shall be included in the atrium volume for the design of the smoke control system (see Section 12.1.20.17).

7.2.7.1.8 Alarm: In all buildings with an atrium, a fire alarm system shall be required. The alarm shall be initiated by either the fire suppression system or the activation of two or more smoke detectors in the atrium. Such buildings of Use Group A, C or G shall be provided with voice alarms complying with the requirements of Section 8.3.5.1.

7.2.7.1.9 Travel Distance: In other than the lowest level of the atrium, when the required means of egress is through the atrium space, the exit access travel distance shall not exceed 45 meters.

7.2.7.2 Floor Openings: Floor openings including unenclosed supplemental stairways or escalators conforming to section 9.1 shall be permitted when protected on every floor pierced by the opening in accordance with Sections 8.7.3.1 and 8.7.3.2.

EXCEPTION: In buildings having an approved automatic fire suppression system throughout, escalator openings which are protected by a draft curtain and a closed sprinkler water curtain conforming to the relevant standards (see NFiPA B).

7.2.7.2.1 Smoke Control: A smoke control system conforming to Section 12.1.20.23 shall be installed.

7.2.7.2.2 Draftstop: An approved draftstop shall be installed at each storey of the floor opening. The draftstop shall enclose the perimeter of the opening and shall extend from the ceiling downward at least 450mm on all sides. Automatic sprinklers shall be provided around the perimeter of the opening and within 600mm of the draftstop. The distance between the sprinklers shall not exceed 1.8 meters centre to centre.

7.2.8 OPEN PARKING STRUCTURES

7.2.8.1 General: Open passenger vehicle parking or storage of passenger motor vehicles, wherein two or more sides of such structures are not less than 50% open on each floor or level for 5% of the distance from the floor to the ceiling, and wherein provision for the repairing of such vehicles is not made and include the two general types indicated in Section 8.8.1.1 and 8.8.1.2. Open parking structures are not classified as public garages.

7.2.8.1.1 Ramp-type parking structures: Ramp-type parking structures are those employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of passenger automobiles under their own power to and from the street level.

7.2.8.1.2 Mechanical parking structures: Mechanical-type parking structures are those employing specially designed parking machines, elevator, lifts, conveyors, moving cranes, dollies or other devices for moving passenger automobiles to and from the street level.

7.2.8.1.3 General construction requirements: Passenger vehicles structures shall be constructed of non-combustible materials throughout, including structural framing, floors, roofs and walls. Any enclosed rooms or spaces on the premises shall comply with the applicable requirements of this Code.

7.2.8.2 Basement: Basements which are not classified as open parking structures in accordance with Section 8.8.1, but are used for parking vehicles shall be sprinklered in accordance with the provisions of Section 12.1.3 and shall be ventilated in accordance with applicable mechanical section of this code listed in the Schedule.

7.2.8.3 Fueling dispensing: Areas where fuel is dispensed shall conform to the requirements of Section 8.10.5.

7.2.8.4 Heights and areas: Heights and areas of open parking structures shall not exceed the limits specified in Table 7.3.9, except that when at least 50 percent open on all sides and when the horizontal distance from any point on any level to an exterior wall opening on a street, alley courtyard or any other permanent open space does not exceed 60 meters, the maximum height of open parking structures of Type 2B and 2C construction shall be 20 meters and the area shall not be limited.

TABLE 8.8 HEIGHT AND AREA LIMITATION FOR OPEN PARKING STRUCTURES

TYPE OF CONSTRUCTION	HEIGHT (METERS)	AREA IN M^2
1A and 1B	Unlimited	Unlimited
2A	12 Storeys 36 m	Unlimited
2B	10 Storeys 30m	4,650
2C	8 Storeys 25.5m	4,650
2B and 2Ca	2 Storeys 7.5m	Unlimited

Note a: For exceptions to height and area limitations, see Section 8.8.5. The allowable areas of structures wherein more than 25 percent of the perimeter has frontage on street or other open space leading to a street, each of which is not less than 9 meters wide, shall be increased as provided in Section 11.3.2. When an automatic sprinkler system is installed in accordance with Section 1004.0 in Types 2B and 2C construction, the area shall be unlimited. The above limits of height permit parking on the roof.

7.2.8.5 Protective Guardrail: All wells, shafts and other open, exposed spaces throughout, except ground floor, shall be enclosed and protected with continuous walls or protective guardrail constructed in accordance with Section 10.28, except that in those structures wherein vehicles are hoisted to the desired level and placed in the parking space entirely by approved mechanical means, the continuous wall or protective guardrail is not required on the side of the parking levels adjacent to the space occupied by the hoisting and placing equipment.

7.2.8.6 Wheel guards: Wheel guards made of non-combustible material shall be placed wherever required.

7.2.8.7 Means of egress: For means of egress requirements, see Section 8.9.3.

7.2.9 PRIVATE GARAGES

7.2.9.1 Attached garages: Private garages located beneath rooms in buildings of Use Groups

H1, H2, H3 or F1 shall have walls, partitions, floors and ceilings seperating the garage space from the adjacent interior spaces constructed of not less than 1-hour fire resistance rating. Attached private garages shall be completely separated from the adjacent interior spaces and the attic area by means of 12mm gypsum board or equivalent applied to the garage side. The sills of the door openings between the garage and the adjacent interior spaces shall be raised not less than 100mm above the garage floor. The door opening protectives shall be 42mm solid core wood doors or approved equivalent.

7.2.9.1.1 Separation by breezeway: Where a garage separated by a breezeway not less than 3 meters in length from the building of Use Group H-3 is of Type 5B construction, the junction of the garage and breezeway shall be firestopped to comply with Section 12.2.23.

7.2.9.1.2 Other conditions: All private garages not falling within the purview of Sections 8.8.1 or 8.8.1.1 attached to or located beneath a building shall comply with the requirements of Section 8.10 for public garages.

7.2.9.1.3 Means of egress: Where living quarters are located above a private garage, required means of egress facilities shall be separated from the garage area with 1-hour fire resistance rated construction.

7.2.10 PUBLIC GARAGES

7.2.10.1 General: Public garages shall comply with the applicable requirements of this Section. The portions of such buildings and structures in which paint spraying is done shall comply with the requirements of Section 8.24.

7.2.10.2 Construction: All group 1 building garages hereafter erected shall be classified as Use Group 1-1 and all Group 2 public garages shall be classified as Use Group 1-2 and both shall conform to the height and area limitations of Table 11.2.7 except as herein specifically provided.

7.2.10.3 Special height limitations: Public garage buildings shall comply with the height and area limitations of Table 11.2.7 for the classification of the use as specified in Section 8.10.2. The height limitations shall be increased one additional storey when the building is equipped with an approved automatic fire suppression system.

7.2.10.4 Basement: The first floor construction of public garages of all classifications and public hangers with basements shall be constructed of not less than 2-hour fire resistance rating and shall be water- and vapour-proof. Where openings are provided in the floor, they shall be protected by a curb or ramp not less than 150mm high above the floor to avoid the accumulation of explosive liquids of vapours and prevent spilling to the lower floor. There shall be not less than two means of egress from such areas.

7.2.10.5 Roof storage of motor vehicles: When the roof of a building is used for parking or storage of motor vehicles, it shall be provided with a parapet wall or a guardrail constructed in accordance with Section 10.28 and a wheel guard not less than 150mm in height, located so as to prevent any vehicle from striking the parapet wall or guardrail.

7.2.10.6 Floor construction and drainage: Floors of public garages and air-plane hangars shall be graded to drain through oil separators or traps to avoid accumulation of explosive vapours in building drains or sewers as provided in the applicable plumbing section of this Code listed in the Schedule. The floor finish shall be of concrete or other approved non-combustible material.

EXCEPTION: Floor drains are not required for detached public garages for the storage of four or less commercial motor vehicles without provision for repairing or servicing such vehicles nor the dispensing of gasoline, oil, or similar products.

7.2.10.7 Fuel dispensing areas: Fuel dispensing areas shall be located on the level nearest grade. Public garages with fuel dispensing areas shall be completely separated from any other use, both horizontally and vertically, by fire separation walls and floor/ceiling assemblies having a minimum fire-resistance rating of 2-hours. The floors of the fuel dispensing areas

shall be graded to a floor drainage system such that any fuel spill or leak is contained in that area. The drainage system shall conform to the requirements of the applicable plumbing section of this code listed in the Schedule. The fuel dispensing area shall be protected with an approved automatic fire suppression system in accordance with Section 12.1.1.2.

7.2.10.8 Fuel dispensing systems: All fuel and storage dispensing systems shall conform to the requirements of the applicable mechanical section of this code listed in the Schedule.

7.2.10.9 Ventilation: All public garages shall be ventilated in accordance with the applicable mechanical section of this Code listed in the Schedule. Fuel dispensing areas shall be mechanically ventilated.

7.2.10.9.1 Special hazards: Any process conducted in conjunction with public garages involving volatile flammable solvents shall be segregated or located in a detached building or structure, except as provided in Section 8.21 for the storage and handling of gasoline and other volatile flammables. The quantity of flammable liquids stored or handled in public garages other than in underground storage and in the tanks of motor vehicles shall not be more than $0.019m^3$ in approved safety cans.

7.2.11 Use Group F-2

7.2.11.1 General: All buildings thereof of Use Group F-2 shall comply with the provisions of this Section and all other applicable provisions of this Code.

7.2.11.2 Specific use areas: The specific use areas listed in Table 8.11.2 shall be separated from other areas of buildings of use Group F-2 in accordance with the requirements of Table 8.11.2.

7.2.11.3 Separation walls: Where the separation use areas are not required to have a fire-resistance rating by Table 8.11.2, the separation walls shall be constructed of materials consistent with the building type of construction and be capable of resisting the passage by smoke. The separation of walls extends from floors to the underside of a floor/ceiling assembly or to the floor/roof deck above. All doors shall be self-closing or automatic closing upon detection of smoke, Door in walls required to be fire-resistance rated shall have a minimum of fire-resistance rating of 3/4 hour and shall comply with Section 12.2.18

TABLE 7.11.2 SPECIFIC USE AREAS WITHIN AN F-2 USE

ROOM OR AREA	SEPARATION/PROTECTION
Boiler and heater rooms	2 hours of 1 hour and automatic fire suppression
Employee locker rooms	1 hour: or automatic fire suppression with separation walls
Gift/retail shops	1 hour: or automatic fire suppression with separation walls
Handicraft shops	1 hour: or automatic fire suppression with separation walls
Kitchens	1 hour: or automatic fire suppression with separation walls
Laboratories which employ hazardous materials but such materials are in quantities less than that which would cause classification as Use Group E	1 hour: or automatic fire suppression with separation walls

TABLE 7.11.2 Continued SPECIFIC USE AREAS WITHIN AN F-2 USE

Laundries greater than 9.3m^2	1 hour and automatic fire suppression
Paint shops employing hazardous substances and materials in quantities less than that which would cause classification as Use Group E	2 hours: or 1 hour and automatic fire suppression
Physical plant maintenance shop	2 hours: or 1 hour and automatic fire suppression
Solid linen room	1 hour and automatic fire suppression
Storage rooms more than 4.65m^2 in area but not more than 9.3m^2 in area storing combustible material	1 hour or automatic fire suppression with separation walls
Storage rooms more than 9.3m^2 storing combustible rooms	1 hour and automatic fire suppression
Trash collection rooms	1 hour and automatic fire suppression

7.2.11.4 Corridors: All corridors in buildings of Use Group F-2 shall be continuous to the exits and separated from all other use areas except waiting areas, nurses, stations, and mental health treatment areas conforming to Sections 8.11.4.1 through 8.11.4.4.

7.2.11.4.1 Waiting areas on patient sleeping floors: Waiting areas on patient sleeping floors shall not be open to the corridor, except where:

a. the area does not exceed 24m^2, and
b. the area is located to permit direct supervision by facility staff;
c. the area is equipped with an approved electrically supervised smoke detection system;
d. not more than one such waiting area is permitted in any one smoke compartment;
e. the walls and ceilings of the space are constructed as required for corridors.

7.2.11.4.2 Waiting areas in sprinklered buildings: In buildings equipped throughout with an approved automatic fire suppression system, spaces constructed as required for corridors shall not be open to a corridor, except where:

a. The spaces are not used for patient sleeping rooms, treatment rooms or hazardous areas as defined in Section 8.11.2.
b. Each space is located to permit supervision by the facility staff.
c. The space and corridors which the space opens onto in the same smoke compartment are protected by an approved electrically supervised automatic smoke detection system.
d. The space is arranged so as not to obstruct access to required exits.

7.2.11.4.3 Nurses' stations: Space for doctor's and nurses' charting communications and related clerical areas shall not be open to the corridor, except where the space is constructed as required for corridors.

7.2.11.4.4 Mental health treatment areas: Areas wherein only mental health patients who are capable of self-preservation are housed, group meeting or multi-purpose therapeutic spaces, other than specific use areas as defined in Section 6.10.2, under continuous supervision by facility staff, shall not be open to the corridor, except where:

a. Each area does not exceed 140m^2

b. the area is located to permit supervision by the facility staff;
c. the area is arranged so as not to obstruct any access to required exits;
d. the area is equipped with an approved electrically supervised automatic smoke detection system;
e. not more than one such space is permitted in any one smoke compartment;
f. the walls and ceiling of the space are constructed as required for corridors.

7.2.11.5 Corridor walls: Corridor walls shall have a 1-hour fire-resistance rating extending from the floor to the underside of the floor or roof deck above. In buildings equipped throughout with an approved automatic fire suppression system, the corridor wall fire resistance rating is not required provided the corridor walls form a barrier to limit the transfer of smoke. The walls shall extend from the floor to the underside of the floor or roof deck above or to the underside of the fire-resistance rated floor/ceiling or roof/ceiling assembly above when the ceiling membrane is constructed to limit the transfer of smoke.

7.2.11.5.1 Corridor doors: All doors shall conform to Section 12.2.18. Doors to patient sleeping rooms shall be automatic-closing by smoke detection. All other doors shall be self-closing or automatic closing by smoke detection. In buildings equipped throughout with an approved automatic fire suppression system, corridor doors other than those in a wall required to be rated by Section 8.11.2 or for the enclosure of a vertical opening shall not have a required fire resistance rating, but shall provide an effective barrier to limit the transfer of smoke. In buildings equipped throughout with an approved automatic fire suppression system, all doors except those to sleeping rooms shall be self-closing or automatic closing by smoke detection.

7.2.11.5.2 Locking devices: Locking devices which restrict access to the patient room from the corridor, which are openable only by staff from the corridor side, shall not restrict egress from the patient room except for mental health patient rooms.

7.2.11.6 Smoke barrier: Each floor of a building of Use Group F-2 shall have at least one smoke barrier creating not less than two compartments per floor with a maximum compartment length and width of 45 meters. The smoke barrier shall be in accordance with Section 12.2.13.

7.2.11.6.1 Refuge area: At least 2.8m^2 per occupant shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge of dining areas and other low hazard areas on each side of each smoke barrier. On floors not housing bed or litter patients at least 0.56m^2 per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining compartments.

7.2.11.6.2 Independent egress: A means of egress shall be provided from each compartment created by smoke barriers without returning through the compartment from which egress originated.

7.2.11.7 Smoke/heat detectors: An automatic fire alarm system conforming to Section 12.1.19 shall be provided in patient sleeping rooms, corridors and common spaces open to the corridor as permitted by Section 8.11.3. Heat detectors shall be provided in unsprinklered specific use areas listed in Section 8.11.2 and shall sound a local alarm at a constantly attended location.

7.2.11.7.1 Rooms: Patient sleeping rooms shall be provided with a smoke detector permanently connected to house current and complying with the relevant standards (see UL 217 or UL 268). Such detectors shall provide a visual display on the corridor side of each patient room and shall provide an audible and visual alarm at the nursing station attending that room. Where such detectors and related devices are not combined with the nursing call system, the total system shall be electrically supervised.

7.2.11.7.2 Exception: Smoke detectors are not required in patient rooms equipped with

automatic door-closing devices with integral smoke detectors on the room sides installed in accordance with their listing, provided the integral detectors perform the required alerting function.

7.2.11.7.3 Corridors: An approved automatic smoke detection system shall be installed in all corridors in buildings of Use Group F-2 which are not equipped throughout with an approved automatic fire suppression system. The automatic smoke detection system required by this section shall be electrically inter-connected to the fire alarm system.

7.2.12 USE GROUP - F-3

7.2.12.1 General: All buildings or portions thereof of Use Group F-3 shall comply with the provisions of this section and all other applicable provisions of this Code (see Section 5.2.7.4).

7.2.12.1.1 Definitions: Terms used in this section shall have the following meaning:

Residential housing area: Includes sleeping areas and any contiguous day room, group activity space or other common spaces for customary access of residents.

Sallyport (security vestibule): A compartment provided with two or more doors where the intended purpose is to prevent the continuous and unobstructed passage by allowing the release of only one door at a time.

7.2.12.1.2 Mixed occupancies: Portions of buildings of Use Group F-3 which are classified as a different occupancy group shall meet the applicable requirements of this code for such occupancies. Where security operations necessitate the locking of required means of egress, provisions shall be made for the release of occupants during all times of use.

7.2.12.1.3 Means of egress: Except as modified or provided for in this Section, the provisions of Chapter 10 shall apply.

7.2.12.1.4 Door width: Doors to resident sleeping rooms shall have a clear width of not less than 900mm.

7.2.12.1.5 Sliding doors: When doors in a means of egress are of the horizontal sliding type, the force to slide the door to its fully open position shall not exceed 222 Newtons with a perpendicular force against the door of 222 Newtons.

7.2.12.1.6 Horizontal exits: Horizontal exits shall not be substituted for other exits unless the maximum exit travel distance specified in Table 10.8 is not exceeded. Horizontal exits shall be permitted to comprise 100 percent of the exits required. At least 0.56m^2 of accessible space per occupant shall be provided on each side of the horizontal exit for the total number of people in adjoining compartments. Every fire compartment for which credit is allowed in connection with a horizontal exit shall not be

required to have a stairway or door leading directly outside, provided the adjoining fire compartments have stairways or doors leading directly outside.

7.2.12.1.7 Spiral stairs: Spiral stairs meeting the requirements of Section 10.17.18 are permitted for access to and between staff locations.

7.2.12.1.8 Exit discharge: Exits are permitted to discharge into a fenced or walled courtyard, provided that not more than two walls of the courtyard are the building walls from which exit ie being made. Enclosed yards or courts shall be of sufficient size to accommodate all occupants, a minimum of 15.0m from the building with a net area of 1.4m^2 per person.

7.2.12.1.9 Sallyports: Sallyports shall be permitted in a means of egress where there are provisions for continuous and unobstructed passage through the sallyport during an emergency condition.

7.2.12.2 Locks: Doors from an area of refuge to the exterior are permitted to be locked with a key lock in lieu of locking methods described in Section 8.12.5.1. The locks shall be openable from the outside.

7.2.12.2.1 Remote release: All remote release in a means of egress shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors.

Exception: Provisions for remote unlocking are not required provided not more than ten locks are necessary to be unlocked in order to move all occupants from one smoke compartment to an area of refuge as promptly as required for remote unlocking.
The opening of all necessary doors shall be accomplished with not more than two separate keys.
7.2.12.2.2 Power operated doors and locks: All power operated sliding doors or power operated locks for swinging doors shall be openable by a manual release mechanism at the door, and either emergency power or a remote mechanical operating release shall be provided.
7.2.12.2.3 Redundant operation: Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant release control.
7.2.12.2.4 Relock capability: Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.
7.2.12.2.5 Vertical openings: Vertical openings shall be enclosed in accordance with section 12.2.17.1.
7.2.12.2.6 Exception: Two communicating floor levels are permitted without enclosure protection between the two levels, provided all the following conditions are met:

i The entire normally occupied area, including all communicating floor levels, is sufficiently open and unobstructed that a fire or other dangerous condition in any part will be immediately obvious to the occupants or supervisory personnel in the area.
ii Egress capacity is simultaneously sufficient for all the occupants of all communicating levels and areas, all communicating levels in the same fire area being considered as a single floor area for purposes of determination of required egress capacity.
iii Each floor level, considered separately, has at least one-half of its individual required egress capacity accessible by exit access leading directly out of that level without traversing another communicating floor level.

7.2.12.3 Specific use areas: The specific use areas listed in Table 8.12.7 shall be separated from other areas of buildings of Use Group 1 - 3 in accordance with the requirements of Table 8.12.7.

TABLE 7.12.7 SPECIFIC USE AREAS WITHIN AN F-3 USE

ROOM OR AREA	SEPARATION/PROTECTION
Boiler and heater rooms	2 hours: or 1 hour automatic fire suppression
Employee locker rooms	1 hour: or automatic fire suppression with separation walls
Handicraft shops	1 hour: or automatic fire suppression with separation walls
Kitchens	1 hour: or automatic fire suppression with separation walls
Laundries greater than 9.5m^2	1 hour: or automatic fire suppression
Paint shops employing hazardous substances and materials in quantities less than that which would cause classification as Use Group E	2 hours: or 1 hour and automatic fire suppression

Physical plant maintenance shop	2 hours: or 1 hour and automatic fire suppression
Storage rooms more than 5m^2 in area but not more than 9.5m^2 in area storing combustible material	1 hour: or automatic fire suppression with separation walls
Storage rooms more than 5m storing combustible material	1 hour and automatic fire suppression
Trash collection rooms	1 hour and automatic fire suppression
Padded cells	1 hour and automatic fire suppression

7.2.12.3.1 Separation walls: Where the separation walls around specific use areas are not required by Table 8.12.7 to have a fire resistance rating, the separation walls shall be constructed of materials consistent with the building type of construction and be capable of resisting the passage of smoke. The separation walls extend from the floor to the underside of a fire resistance rated floor/roof assembly or to the floor/roof deck above. All doors shall be self-closing or automatic-closing upon detection of smoke.

7.2.12.3.2 Smoke barrier: All buildings of Use Group F-3 shall have smoke barriers as follows:

a. To divide every storey used by residents for sleeping, or any other storey having an occupant load of 50 or more persons, into at least two compartment;

b. to limit the housing of a maximum of 200 residents in any smoke compartment.

c. To limit the travel distance to a door in a smoke barrier:

i From any room door required as exit access to 30 meters;

ii from any point in a room to 45 meters.

At least 0.60m^2 per occupant shall be provided on each side of the smoke barrier for the total number of occupants in adjoining compartments.

7.2.12.3.3 Refuge area: At least 0.60m^2 per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining compartments.

7.2.12.3.4 Independent egress: A means of egress shall be provided from each compartment created by smoke barriers without returning through the compartment from which exiting originates.

7.2.12.3.5 Sub-division of resident housing areas: Any individual cell, dormitory, or other space where residents are housed shall be separated from all other spaces by substantial construction of non-combustible materials in accordance with Table 6.11.9.

7.2.12.3.6 Fire resistance rated doors: Doors in openings in partitions required to be fire resistive by Table 8.12.9 in other than required enclosures of exits or hazardous areas shall be substantial doors, of construction that will resist fire for at least 20 minutes. Wired glass vision panels are permitted. Latches and door closers are not required on cell doors.

7.2.12.3.7 Smoke-tight doors: Doors in openings in partitions required to be smoke- tight by Table 8.12.9 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closers are not required on cell doors.

TABLE 7.12.9

SUBDIVISION OF RESIDENT HOUSING AREAS

7.2.13 USE CONDITION Section 5.2.7.4

	IIb		IIIb		IVb		V	
Feature	NS	ASz	NS	AS	NS	AS	NS	AS
Room to room separation	NR	NR	NR	NR	ST	NR	FR /	ST
Room face to corridor space separation	ST	NR	ST	NR	ST	NR	FR	ST
Room face to common space separation	NR	NR						
Common space to corridor separation	FR	NR	FR NR	FR	NR	ST	FR	ST
Total openings in solid room faced	774.20 cm^2			774.20 cm^2				774.20 cm^2

AS - Protected automatic sprinklers

ST - Smoke-tight

NS - Not protected by automatic sprinklers

FR - Fire resistance rated - 1 hour

NR - No requirement

FR(/) - Fire resistance rated -1/2 hour

Note a: "Total opening in solid room face" includes all openings (undercuts, food passes, grilles etc.), the total of which will not exceed 774.20cm^2. All openings shall be 90cm or less above the floor.

Note b: Under use condition II, III or IV, a space housing not more than 16 persons and subdivided by open construction (any combination of grating doors and grating walls of solid walls) shall be considered as one room or as separate rooms. The perimeter walls of such space shall be of smoke- tight construction. Smoke detection shall be provided in such space under use IV, common walls between sleeping areas within the space shall be smoke-tight and grating doors and fronts are permitted.

Note c: This is the travel distance through the common space to the exit access corridor.

7.2.13.1 Windowless buildings: For the purposes of this section, a windowless building or portion of a building is one with non-openable windows, windows not readily breakable, or without windows. Windowless buildings shall be provided with vent openings, smoke shafts, or an engineered smoke control system to provide ventilation (mechanical or natural) for each windowless smoke compartment.

7.2.14 BLEACHERS, GRANDSTANDS AND FOLDING OR TELESCOPIC SEATING

7.2.14.1 General: Bleachers, grandstands and folding or telescopic seating shall be constructed as required by this code and in accordance with the relevant standards listed in the Schedule. (see NFiPA 102)

7.2.14.1.1 Handrails: Means of egress stairways shall be provided with a handrail on at least one side and shall conform to Section 10.29. The handrail shall be broken as necessary to provide for entrance to the seating platforms.

7.2.14.1.2 Spaces underneath seats: Spaces underneath grandstand seats shall be kept free of all combustible and flammable materials and shall not be occupied or used for other than exits; except that when enclosed in not less than 1-hour fire- resistance rated construction, the code enforcement officer shall approve the use of such spaces for other purposes provided that the safety of the public is not endangered.

7.2.15 Motion picture projection rooms, screening rooms and sound stages

7.2.15.1 General: The provisions of this section shall apply to rooms in which ribbon- type cellulose acetate or other safety film is used in conjunction with electric arc, xenon or other light source projection equipment which develops hazardous gases, dust or radiation. Where cellulose nitrate film is used or stored, such rooms shall comply with the relevant standards. (see NFiPA 40).

Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction. There shall be posted on the outside of each projection room door and within the projection room itself a conspicuous sign with 25mm block letters stating: SAFETY FILM ONLY PERMITTED IN THIS ROOM.

7.2.15.1.1 Construction of projection rooms: Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings need not be protected.

The room shall have a floor area of not less than 7.5m^2 for a single machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 750mm x 750mm on each side and at the rear thereof, but only one such space shall be required between two adjacent projections.

The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 2.3 meters. The aggregate of openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium. All openings shall be provided with glass or other approved materials, so as to completely close the opening.

7.2.15.1.2 Projection booth and equipment ventilation: Projection booths and equipment shall be ventilated in accordance with the mechanical code listed in the Schedule.

7.2.15.1.3 Lighting control: Provision shall be made for control of the auditorium lighting and the emergency lighting systems of theatres from inside of the room and from at least one other convenient point in the building are required in Section 824.3.1.

7.2.15.1.4 Miscellaneous equipment: Each projection room shall be provided with rewind and film storage facilities.

7.2.15.1.5 Screening rooms: Screening rooms shall provide a seating capacity of not more

than 30 persons, with not less than two approved means of egress complying with Chapter 10. Such rooms shall be enclosed in 1-hour fire separation walls with fire doors complying with Section 12.2.18 All seats shall be permanently fixed in position and the arrangements shall comply with the requirements of Section 10.27.

7.2.15.2 Sound stage construction: All buildings designed or used as sound stages for motion picture or television film productions shall be protected with an approved two-source automatic sprinkler system complying with the provisions of Chapter 30; except that where approved, suppression of rooms designed for housing electrical equipment is not required when such rooms are constructed of Type 1 construction.

7.2.15.3 Film laboratories: Film laboratories shall not be operated in other than buildings and structure of Type 1A construction, equipped throughout with an approved automatic sprinkler system.

7.2.15.4 Film exchanges: All film exchanges and depots shall be housed in buildings and structures of Type 1A construction equipped throughout with an approved automatic sprinkler system. All flammable film other than that in process of receipt, delivery or distribution shall be stored in vaults complying with the requirements of Section 8.15.9.1.

7.2.15.5 Vaults: Flammable film quantities of more than 454kg and not more than 4540 kg shall be stored be in vaults enclosed in floors, walls and ceilings of not less than 4-hour fire-resistance rating with 3-hour fire doors complying with Section 12.2.18. The interior storage volume of the vault shall be not more than 42m^3. The vault shall be drained and provided with scuppers.

7.2.16 ROOFTOP HELIPADS

7.2.16.1 General: This governs the design and construction of rooftop facilities intended to accommodate the landing of helicopters. The use of a roof for landing shall be subject to the approval of the Civil Aviation Authority.

7.2.16.1.1 Structural loads: The roof and all pertinent building components shall be designed for the dead loads, impact loads and vibration imparted to the structure due to helicopter landing, including the single skid point landing.

7.2.16.1.2 Referenced standard: All rooftop helipads shall comply with the relevant standards listed in the Schedule (see NFiPA 418).

7.2.17 STAGES AND PLATFORMS

7.2.17.1 Applicability: The provisions of this Section shall apply to all parts of buildings and structures which contain stages or platforms and similar appurtenances as here defined.

7.2.17.1.1 Stages: A stage is a partially enclosed portion of a building which is designed or used for the presentation of plays, demonstrations or other entertainment. A stage shall be further classified as either a legitimate stage, regular stage or thrust stage.

a. Legitimate stage: A stage wherein curtains, drops, leg drops, scenery, lighting devices or other stage effects are retractable horizontally or suspended overhead.
b. Regular stage: A stage wherein curtains, fixed leg drops, valances, scenery and other stage effects are hung and are not retractable.
c. Thrust stage: A platform extending beyond the proscenium arch and into the audience.

7.2.17.1.2 Stage floor construction: Openings through all stage floors shall be equipped with tight-fitting, solid wood trap doors not less than x50mm thickness with approved safety locks or other materials of equal physical and fire endurance properties.

a. Legitimate stages: Legitimate stages shall be constructed as required for the type of construction, but not less than Type 1B construction except that the portion of the legitimate stage extending back from and 1.8m beyond the full width of the proscenium opening on each side shall be permitted to be constructed of non-

combustible or heavy timber construction covered with a wood floor or not less than x50mm thickness. Except for the finished floor, combusting construction shall not extend beyond the plane of the proscenium opening.

b. Regular and thrust stages: Regular stages and thrust stages shall be constructed of materials as required for floors for the type of construction of the building in which they are located.

7.2.17.1.3 Stage rigging loft: The rigging loft, also referred to as a loft or fly, is the space over the stage where scenery and equipment can be out of view. The fly gallery is the narrow raised platform at the side of the legitimate stage from which the lines for flying scenery are manipulated. The gridiron the machinery for arrangement of beams over a legitimate stage supporting the machinery for flying scenery and hanging battens from which lighting is hung. The pin rail is the beam at one side of a legitimate stage through which wooden or metal pins are driven and to which lines from the flies are fastened. The rigging loft, fly galleries, gridiron and pin rails shall be constructed of approved non-combustible materials.

7.2.17.1.4 Footlights and stage electrical equipment: Footlights and border lights shall be installed in troughs constructed of non-combustible materials. The switchboard shall be so located as to be readily accessible at all times and the storage or placing of stage equipment against it shall be prohibited.

7.2.17.1.5 Exterior stage doors: Where protection of openings is required, exit discharge door openings to the outer air shall be protected with fire doors complying with Section 29.18. All exterior openings which are located on the stage for means of egress or loading and unloading purposes, and which are likely to be open during occupancy of the theatre, shall be constructed with vestibules to prevent air drafts into the auditorium.

7.2.17.1.6 Proscenium wall: Legitimate stages shall be completely separated from the seating area by a proscenium wall of not less than 2-hour fire-resistance rating extending continuously from foundation to at least 1.2 meters above the roof. There shall be no other openings in the wall separating a legitimate stage from the auditorium except the main proscenium opening; two doorways at the stage level, one on each side thereof; and one doorway to the musician's pit from the space below the stage floor. Each such doorway shall not exceed 4m^2 in area and shall be protected with fire doors complying with Section 29.18.

a. Trim, finish and decorative hangings: All moldings and decorations around the proscenium opening shall be constructed entirely of non-combustible materials.

7.2.17.1.7 Proscenium curtain: The proscenium opening shall be provided with an approved curtain of non-combustible of fire retardant material so designed and installed that it will protect against passage of flame and smoke for 5 minutes. The curtain shall be operated by an automatic heat activated device to descend instantly and safety and to completely close the proscenium opening at a rate of temperature rise of 15 to 20 degrees F. per minute (0.14 degrees C.to 0.19 degrees C. per second); and by an auxiliary operating device to permit prompt and immediate manual closing of the proscenium opening.

7.2.17.1.8 Scenery: All combustible materials used in sets and scenery shall be rendered flame resistant to comply with Section 12.2.

7.2.17.1.9 Stage ventilation: Metal or other approved non-combustible ventilators, equipped with movable shutters or sash shall be provided over stages larger than 46m^2 in floor area, constructed to open automatically by approved heat activated devices, with an aggregate clear area of opening not less than 5 percent of the area of the stage, except as otherwise provided in Section 8.17.2.9 Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be provided as required for skylights in Section (refer sections on materials -Glazing).

7.2.17.1.10 Super-imposed theatres: An addition or extension shall not be erected over the

stage section of a theatre, nor shall a second theatre be erected above another. Where approved, the prohibition against super-imposed theatres and construction above the stage shall not apply when approved access is provided for fire fighting with direct means of ventilation to the outer air from the stage portion.

7.2.17.1.11 Platforms: A platform is that raised area within a building used for the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lectures and speakers, boxing and wrestling rings; theatre-in-the- round; and similar purposes wherein there are no overhead hanging curtains, drops, scenery or stage effects other than lighting. A temporary platform is one installed for use for not more than 30 days.

7.2.17.1.12 Materials: In buildings required to be of Type 1 or Type 2 construction, where the platforms are not more than 750mm above the main floor level the minimum type of construction for a permanent platform shall be Type 2C. For all types of construction, where the platforms are not more than 750mm above the main floor level, not larger in area than 10 percent of the room floor area and not more than 20m^2 in area, the minimum type of construction, where the platforms are not more than 750mm above the main floor level, not larger than one-third of the room floor area and not more than 280m^2 in area of the minimum type of construction for a permanent platform shall be Type 4 or the platform shall be constructed of approved materials as required for floors for the required type of construction of the building in which it is located. Temporary platforms shall be constructed of any approved materials.

7.2.17.1.13 Space beneath: The space between the floor and a temporary platform above shall not be used for any purpose other than electrical wiring to platform equipment. Where the space between the floor and a permanent platform above is used for any purpose other than electrical wiring or plumbing, the platform shall provide a 1-hour fire resistance rating.

7.2.17.2 Dressing and appurtenant rooms: Dressing and appurtenant rooms shall comply with Section 8.17.4.1 through 8.17.4.3.

7.2.17.2.1 Construction: Dressing rooms, scene docks property rooms, workshops and storerooms and all compartments appurtenant to the stage shall be separated from each other and from the stage and all other parts of the building by walls of not less than 1-hour fire resistance rating with approved opening protectives. Such rooms shall not be placed immediately over or under the operating stage area.

7.2.17.3 EXCEPTION: Separation from the stage is not required for stages having a floor area of 46m^2 or less.

7.2.17.3.1 Opening Protectives: Openings other than to trunk rooms and the necessary doorways at stage level shall not connect such rooms with the stage, and such openings shall be protected with fire doors complying with Section 12.2.18.

7.2.17.3.2 Dressing room and stage exits: Each tier of dressing rooms shall be provided with at least two means of egress. Egress stairways from dressing and storage rooms are not required to be enclosed when located in the stage area behind the proscenium wall. At least one approved means of egress shall be provided from each side of the stage, each side of the space under the stage, each fly gallery and the gridiron. A steel ladder shall be provided from the gridiron to a scuttle in the stage roof.

7.2.18 AIRPORT TRAFFIC CONTROL TOWERS

7.2.18.1 General: The provisions of this section shall apply to airport traffic control towers not exceeding 140m^2 per floor used only for air traffic control, electrical and mechanical equipment rooms, radar and electronics rooms, office spaces incidental to tower operation and lounges for employees including rest-rooms.

7.2.18.2 Type of construction: Air traffic control towers shall be constructed to conform with

the height and area limitation of Table 8.18.2.

TABLE 8.18.2 HEIGHT AND AREA LIMITATION FOR AIRPORT TRAFFIC CONTROL TOWERS

Type of Construction	Height (Meters)	Maximum area in Square Meters
1 A, 1B	Unlimited	140
2A	72m	140
2B	30m	140

7.2.18.3 Egress: A minimum of one exit stairway shall be permitted for airport traffic control towers of any height provided the occupant load per floor does not exceed 15. The stair shall conform to the requirements of Section 10.17 and 10.19. The stair shall be separated from elevators by a minimum distance of one-half the diagonal of the area served.

7.2.18.3 EXCEPTION: Smokeproof enclosures as set forth in Section 10.19 are not required when required stairways are pressurized to a minimum of 37.33 Pa and a maximum of 87.10 Pa in the shaft relative to the building with all stairway doors closed.

7.2.18.4 Automatic fire alarm systems: Airport traffic control towers shall be provided with an automatic fire alarm system complying with Section 12.1.19.

7.2.18.5 Standby power, light and emergency systems: A standby power system conforming to Section 26.8 shall be provided in airport traffic control towers over 20 meters in height. Services shall be provided to smokeproof enclosure mechanical equipment and lighting, lift operational equipment, and automatic fire alarm systems.

7.2.19 COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE

7.2.19.1 General: The provisions of this section shall apply to all buildings in which materials producing flammable dusts and particles which are readily ignitable and subject to explosion hazards are stored or handled, including among others, grain bleachers and lifts, malt houses, flour, feed or starch mills, wood flour manufacturing and manufacture and storage of pulverized aluminum, coal, cocoa, magnesium, spices, sugar or similar material producing dust. The provisions of NFiPA 61A, 61B, 61C, 61D, 65, 85F, 651, 653, 654, 655, 664 and the fire prevention code listed in Schedule, except as herein specifically required, shall be deemed to conform to the requirements of this Code.

7.2.19.2 Buildings: All such buildings and other occupied structures shall be of Type 1, Type 2 or of laminated timber or timber sizes qualified for Type 4 construction, within the height and area limits of Table 501 for Use Group E except that when erected of Type 1 or Type 2 construction, the height and area of grain elevators and similar structures shall be unlimited, and when of Type 4 construction, the maximum height shall be 20 meters and except further that, in isolated areas, the maximum height of Type 4 structures shall be increased to 25 meters.

7.2.19.2.1 Grinding rooms: Every room or space for grinding or other operations producing flammable dust shall be enclosed with floors and walls of not less than 2- hour fire resistance rating when the area is not more than 280m^2 and of not less than 4- hour fire resistance rating when the area is greater than 280m^2.

7.2.19.2.2 Conveyors: All conveyors, chutes, piping and similar equipment passing through the enclosures of such rooms or spaces shall be constructed dirt-and vapor- tight, and of approved non-combustible materials complying with Section 9.1.29.

7.2.19.3 Explosion relief: Means for explosion relief shall be provided as specified in Section 8.20, or such spaces shall be equipped with the equivalent mechanical ventilation complying with the applicable mechanical section of this code listed in the Schedule.

7.2.19.4 Grain elevators: Grain elevators, malt houses and buildings for similar uses shall not be located within 9 meters of interior lot lines or structures on the same lot, except when erected along a railroad right of way.

7.2.19.5 Coal pockets: Coal pockets located less than 9 meters from interior plot lines or structures on the same plot shall be constructed of not less than Type 2A construction. Where more than 9 meters from interior plot lines, or erected along a railroad right of way, the minimum type of construction of such structures shall be Type
4, provided they are not more than 20 meters in height.

7.2.20 EXPLOSION HAZARDS

7.2.20.1 Explosion relief: Every structure, room or space occupied for uses involving explosion hazards shall be equipped and vented with explosion relief systems and devices arranged for automatic release under predetermined increase in pressure as herein provided for specific uses.

7.2.20.2 Venting devices: Venting devices to relieve the pressure resulting from explosive air-vapour mixtures shall consist of windows, skylights, vent flues or releasing roof or wall panels which discharge directly to the open air or to a public place or other unoccupied space not less than 6 meters in width on the same plot. Such releasing device shall be so located that the discharge end shall be not be less than 3 meters vertically and 6 meters horizontally from window openings or means of egress facilities in the same or adjoining buildings or structures. The exhaust shall always be in the direction of least exposure and never into the interior of the building.

7.2.20.3 Area of vents: The aggregate clear vent relief area shall be regulated by the type of construction of the building and shall be not less than prescribed below:

a. Heavy reinforced concrete frame, 0.093m^3 for 2.24m^3 of volume.
b. Light structural steel frame and ordinary construction. 0.093m^2 for 1.82m^3 of volume.
c. Light wood frame construction 0.093m^2 for 1.40m^3 of volume.

The combined area of open windows, pivoted sash or wall panels arranged to open under internal pressure shall not be less than 10 percent of the area of the enclosure walls, with not less than 50 percent of the opening arranged for automatic release.

7.2.20.4 Construction of vents: All explosion relief devices shall be of an approved type constructed of lightweight, non-combustible and corrosion resistive materials, and the discharge end shall be protected with approved screens of not more than 20mm mesh, arranged to blow out under relatively low pressures.

7.2.21 FLAMMABLE AND COMBUSTIBLE LIQUIDS

7.2.21.1 Main storage: Main storage systems of flammable and combustible liquids shall be constructed and installed in accordance with the relevant standards (see NFiPA 30) and the National Fire Safety Code listed in the Schedule.

7.2.21.2 Construction of enclosures: Process rooms shall be separated from other uses and occupancies by walls, floors and ceilings of not less than 2-hour fire resistance rating with 1 /-hour fire doors complying with Section 12.2.18. The interior door openings shall be provided with non-combustible sills not less than 15cm high and the room shall be vented as required in Section 8.20.1. Floors shall be waterproofed and drained to comply with Section (refer sections on Foundations and Roof Walls)

7.2.21.3 Enclosure openings: Openings shall not be permitted in the enclosure walls within 3 meters of adjoining property lines or with a fire separation distance of less than 3 meters from any building or structure not part of the installation.
7.2.21.4 Dry cleaning plants: The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the mechanical code, the plumbing code and other relevant standards used in the Schedule (see NFiPA 32).
7.2.22 LIQUEFIED PETROLEUM GAS FACILITIES
7.2.22.1 General: The design and construction of propane, butane, propylene, butylene and other liquefied petroleum gas distribution facilities shall conform to the applicable provisions of this section. The storage and handling of liquefied petroleum gas systems shall conform to the fire safety code listed in the Schedule. The design and installation of piping, equipment and systems which utilise liquefied petroleum gas shall be in accordance with the applicable mechanical section of this code. Liquefied petroleum gas facilities shall be ventilated in accordance with the mechanical applicable section of the code and section 8.22.1.1.
7.2.22.2 LPG distribution facilities: Liquefied petroleum gas distribution facilities shall be provided with air inlets and outlets arranged so that air movement across the floor of the facility will be as uniform as possible. The lowest level of such openings shall not be more than 150mm above the floor.
7.2.22.3 Construction: Liquefied petroleum gas distribution facilities shall be constructed in accordance with Section 8.22.3 for separation buildings, Section 8.22.4 for attached buildings or Section 8.22.5 for rooms within buildings.
7.2.22.4 Separate buildings: When located in separate buildings, such buildings shall be used exclusively for that purpose or for other purposes having similar hazards. Such buildings shall be limited to one storey in height.
7.2.22.5 Floors: The floor shall not be located below ground level and any spaces beneath the floor shall be solidly filled or shall be left unenclosed.
7.2.22.6 Materials: Walls, floors, ceilings, columns and roofs shall be constructed of non-combustible materials. Exterior walls, ceilings and roofs shall be constructed of light weight material designed for explosion venting or, if of heavy construction on such as solid brick masonry, concrete block or reinforced concrete construction, explosion venting windows or panels in walls or roofs shall be provided having an explosion venting area of at least $0.093m^2$ for each $1.40m^3$ of the enclosed volume.
7.2.22.7 Attached buildings: Where liquefied petroleum gas facilities are located in an attached structure, the attached perimeter shall not exceed 50 percent of the perimeter of the space enclosed and the facility shall comply with Sections 8.22.3.
7.2.22.8 Where the attached perimeter exceeds 50 percent, such facilities shall comply with Section 8.22.5.
7.2.22.9 Walls: Common walls at points at which structures are attached shall have a fire resistance rating of not less than 1 hour and shall not have openings. Common walls for attached structures used only for storage of LP-gas are permitted to have doors complying with Section 12.2.18. Such walls shall be designed to withstand a static pressure of at least $488.2kg/m^2$, except where the building to which the structure is attached is occupied by operations or processes having a similar hazard.
7.2.22.10 Rooms within buildings: When liquefied petroleum gas facilities are located in rooms within buildings, such rooms shall be located in the first storey and shall have at least one exterior wall with sufficient exposed area to permit explosion venting as provided in Section 8.22.5.1. The building in which the room is located shall not have a basement or unventilated crawl space and the room shall comply with Section 8.22.5.1 and 8.22.5.2.
7.2.22.11 Materials: Walls, floors, ceilings, and roofs of such rooms shall be constructed of

non-combustible materials. Exterior walls and ceilings shall be either of light weight material designed for explosion venting, or, if of heavy construction such as solid brick masonry concrete block or reinforced concrete construction shall be provided with explosion venting area of at least 0.093m^2 for each 1.40m^3 of enclosed volume.

7.2.22.12 Common construction: Walls and floor ceiling assemblies common to the room and to the building within which it is located shall have a fire resistance rating of not less than 1-hour with no openings. Common walls for rooms used only for storage of LP-gas are permitted to have doorways which shall be equipped with one-hour opening protectives. Such walls and ceiling shall be designed to withstand a static pressure of at least 488.2kg/m^2, where approved, these provisions shall not apply when the building within which the room is located is occupied by operations or processes having a similar hazard.

7.2.23 MOBILE UNITS

7.2.23.1 General: Mobile units, as defined in Part 2 shall be designed, constructed and maintained to be transported from one location to another and not mounted on a permanent foundation. A mobile unit placed on a permanent foundation or on foundation piers shall be designed and constructed to comply with all of the requirements of this Code for on-site and prefabricated construction.

7.2.23.2 Construction: Residential mobile units shall be of an approved design and constructed in accordance with the applicable ordinances and statutes. All other mobile units shall be designed and constructed in accordance with the requirements of this Code. All mobile units on a permanent foundation shall be evaluated, inspected and labeled in-plant in accordance with Section 3.6.

7.2.23.3 Location: Mobile units shall be located in spaces approved for such use. The provision of this code shall not be construed to repeal, modify or constitute an alternative to any lawful zoning regulations. In case of conflict between this code or any other ordinance or statute, the most rigid requirements shall apply.

7.2.23.4 Anchorage and tie-down: Every parking space for mobile units shall be provided with devices for anchoring the unit to prevent overturning or uplift. The owner of the parking space shall anchor or cause to be anchored all mobile units located on the parking space. Where concrete platforms are provided for the parking of the units, anchorage shall be provided by eyelets embedded in the concrete with adequate anchor plates or hooks, or other suitable means. The anchorage shall be adequate to withstand wind forces and uplift as required in Part 2 for buildings and structures, based upon the size and weight of the units.

7.2.24 PAINT SPRAYING AND SPRAY BOOTHS

7.2.24.1 General: The provisions of this Section shall apply to the construction, installation and use of buildings and structures or parts thereof for the spraying of flammable paints, varnishes and lacquers or other flammable materials, mixtures or compounds used for painting, varnishing, staining or similar purposes. All such construction and equipment shall comply with the relevant standards listed in the Schedule (see NFiPA 33 34).

7.2.24.2 Location of spraying processes: Such processes shall be conducted in a spraying space, spray booth, spray room or shall be isolated in a detached building or as otherwise approved by the code enforcement officer in accordance with the National Fire Safety Code and other relevant standards listed in the Schedule (see NFiPA 70).

7.2.24.3 Spray spaces: All spray spaces shall be ventilated with an exhaust system to prevent the accumulation of flammable mist or vapours in accordance with the applicable mechanical section of this Code. When such spaces are not separately enclosed, non-combustible spray curtains shall be provided to restrict the spread of flammable vapours.

7.2.24.4 Spray booths: All spray booths shall be constructed of non-combustible materials and equipped with mechanical ventilating systems in accordance with the applicable

mechanical section of this Code.

7.2.24.5 Spray rooms: All spray rooms shall be enclosed in partitions of not less than 1-hour fire resistance rating. Floors shall be waterproofed and drained in an approved manner.

7.2.24.6 Spray storage rooms: Spraying materials in quantities of not more than 0.076m^3 shall be stored in approved cabinets ventilated at top and bottom. When in quantities of more than 0.076m^3 and not more than 0.38m^3 the spraying materials shall be stored in approved double walled non-combustible cabinets vented directly to the outer air. All spraying materials in quantities of more than 0.38m^3 shall be stored in an enclosure of not less than 2-hour fire resistance rating or in a separate exterior storage building. Such storage shall not be in quantities of more than 0.95m^3 except when stored in storage buildings; and except further that not more than 0.095m^3 of spraying material shall be stored in buildings in which pyroxylin products are manufactured or stored.

7.2.24.7 Fire protection: Sprinkler heads shall be provided in all spray, dip and immersing spaces and storage rooms, and shall be installed in accordance with Chapter 30. Where buildings containing spray areas are not equipped with an approved automatic sprinkler system, the sprinklers in booths and other spray areas and storage rooms are permitted to be supplied from the building water supply when approved and conforming to Section 12.1.6.

7.2.25 RADIO AND TELEVISION TOWERS

7.2.25.1 General: Subject to the structural provisions of (refer Section on Structural Loads) for wind loads and the requirements of Section 29.29 governing the fire resistance ratings of buildings for the support of roof structures, all radio and television towers shall be designed and constructed as herein provided.

7.2.25.2 Location and access: The towers shall be so located and equipped with step bolts and ladders to be readily accessible for inspection purposes. Guy wires or other accessories shall not cross or encroach upon any street or other public space, or over any electric power lines, or encroach upon any other privately owned property without written consent of the owner.

7.2.25.3 Construction: All towers shall be constructed of approved corrosion-resistive non-combustible material. The minimum type of construction of isolated radio towers not more than 30 meters in height shall be Type 4.

7.2.25.4 Loads: The structure shall be designed to resist wind loads in accordance with ANSI A58.

7.2.25.4.1 Dead load: Towers shall be designed for the dead load plus other incidental loads.

7.2.25.4.2 Uplift: Adequate foundations and anchorage shall be provided to resist two times the calculated wind uplift.

7.2.25.5 Grounding: All towers shall be permanently and effectively grounded.

7.2.26 RADIO AND TELEVISION ANTENNAE

7.2.26.1 Permits not required: A building permit is not required for roof installation of antennae structures not more than 3.6 meters in height for private radio or television reception. Such a structure, however, shall not be erected so as to injure the roof covering, and when removed from the roof, the roof covering shall be repaired to maintain weather-and water-tightness. The installation of any antennae structure mounted on the roof of a building shall not be erected nearer to the plot line than the total height of the antennae structure above the roof, nor shall such structure be erected near electric power lines or encroach upon any street or other public space.

7.2.26.2 Permits required: Approval shall be secured for all roof mounted antennae structures more than 3.6 meters in height above the roof. The application shall be accompanied by detailed drawings of the structure and methods of anchorage. All connections to the roof structure must be properly flashed to maintain water-tightness. The design and materials of

construction shall comply with the requirements of Section 8.25.3 for character, quality and minimum dimension.

7.2.27 SWIMMING POOLS

7.2.27.1 General: Pools used for swimming or bathing shall be in conformity with the requirements of this section, provided, however these regulations shall not be applicable to any such pool less than 600mm deep or having a surface area less than 24m^2 except when such pools are permanently equipped with a water recirculating system or involve structural materials. For purposes of this Code, pools are classified as private swimming pools or public swimming pools, as defined in Section 8.27.2. Materials and constructions used in swimming pools shall comply with the applicable requirements of this Code.

7.2.27.2 Classification of pools: Any constructed pool which is used, or intended to be used, as a swimming pool in connection with a building of Use Group H-3 and available only to the family of the household and private guests shall be classified as a private swimming pool. Any swimming pool other than a private swimming pool shall be classified as a public swimming pool.

7.2.27.3 Plans and permits: A swimming pool or appurtenances thereto shall not be constructed, installed, enlarge or altered until plans have been submitted and a permit has been obtained from the Code Enforcement Officer. The approval of all city, local government and state authorities having jurisdiction over swimming pools shall be obtained before applying to the code enforcement officer for a permit. Certified copies of these approvals shall be filed as part of the supporting data for the application for the permit.

7.2.27.3.1 Plans: Plans shall accurately show dimensions and construction of the pool and appurtenances and properly established distances to plot lines, buildings, walks and fences, as well as details of the water supply system, drainage and water disposal systems, and all appurtenances pertaining to the swimming pool. Detail plans of structures, vertical elevations, and through the pool showing depth shall be included.

7.2.27.3.2 Locations: Private swimming pools shall not encroach on any front or side yard required by this code, or the governing zoning law, except by specific rules of the jurisdiction in which is located. A wall of a swimming pool shall not be located less than 1.8 meters from any rear or side property line or 3 meters from any street property line, except by specific rules of the jurisdiction in which it is located.

7.2.27.3.3 Structural design: The pool structure shall be engineered and designed to withstand the expected forces to which it will be subjected.

7.2.27.3.4 Wall slopes: To a depth up to 800mm from the top, the wall slope shall not be more than one unit horizontal in five units vertical (1.5).

7.2.27.3.5 Floor slopes: The slope of the floor on the shallow side of the transition point shall not exceed one unit vertical to seven units horizontal (1:7). For public pools greater than 110m^2, the slope of the floor on the shallow side of transition point shall not exceed one unit vertical to ten units horizontal (1:10). The transition point between shallow and deep water shall not be more than 1.5 meters deep.

7.2.27.3.6 Surface cleaning: All swimming pools shall be provided with a recirculating skimming device or overflow gutters to remove scum and foreign matter from the surface of the water. Where skimmers are used for private pools, there shall be at least one skimming device for each 90m^2 of surface area or fraction thereof. For public pools where water skimmers are used, there shall be at least one skimming device for each 55.0m^2 of surface area or fraction thereof. Where overflow gutters are used, they shall not be less than 750mm deep, pitched to a slope of one unit vertical to 48 units horizontal (1:48) toward drains, and constructed so they are safe, cleanable and that matter entering the gutters will not be washed out by a sudden surge of entering water.

7.2.27.3.7 Walkways: All public swimming pools shall have walkways not less than 5.2 meters in width extending entirely around the pool. Where curbs or sidewalks are used around any swimming pool, they shall have a slip-resistant surface for a width of not less than 300mm at the edge of the pool, and shall be so arranged to prevent return of surface water to the pool.
7.2.27.3.8 Steps and ladders: At least one means of egress shall be provided from private pools. Public pools shall provide ladders or other means of egress at both side of the diving section and at least one means of egress at the shallow section; or at least one means of egress in the deep section and the shallow section if diving boards are not provided. Treads of steps and ladders shall have slip-resistant surfaces and handrails on both sides, except that handrails are not required when there are not more than four steps or when they extend the full width of the side or end of the pool.
7.2.27.3.9 Water supply: All swimming pools shall be provided with a potable water supply, free of cross connections with the pool or its equipment.
7.2.27.3.10 Water treatment: Public swimming pools shall be designed and installed so that there is a pool water turnover at least once every 8 hours. Filters shall not filter water at a rate in excess of $0.0020m^3/s.m^2$ of surface area. The treatment system shall be so designed and installed to provide in the water, at all times when the pool is in use, excess chlorine of not less than 0.4 parts per million (ppm) or more than 0.6 ppm, or excess chloramine between 0.7 and 1.0 ppm, or disinfection shall be provided by other approved means. Acidity/alkalinity of the pool water shall not be below 7.0ph or more than 7.5ph. All recirculating systems shall be provided with an approved hair and lint strainer installed in the system ahead of the pump.
Private swimming pools shall be designed and installed so that there is a pool water turnover at least once every 18 hours. Filters shall not filter water at a rate in excess of
0. $0034m^3/S/m^2$ of surface area. The pool owner shall be instructed in proper care and maintenance of the pool by the supplier or builder, including the use of high test calcium hypochlorite (dry chlorine) or sodium hypochlorite (liquid chlorine) or equally effective germicide and algicide, and the importance of proper pH (alkalinity and acidity) control.
7.2.27.3.11 Drainage systems: The swimming pool and equipment shall be equipped to be completely emptied of water and the discharged water shall be disposed of in an approved manner that will not create a nuisance to adjoining property.
7.2.27.3.12 Appurtenant structures: All appurtenant structures, installations, and equipment, such as showers, dressing rooms, equipment houses or other buildings and structures, including plumbing, heating, and air conditioning, amongst others appurtenant to a swimming pool, shall comply with all applicable requirements of this Code and the zoning law.
7.2.27.3.13 Accessories: All swimming pool accessories shall be designed, constructed, and installed so as not to be a safety hazard. Installations or structures for diving purposes shall be properly anchored to insure stability.
7.2.27.3.14 Equipment installations: Pumps, filters, and other mechanical and electrical equipment for public swimming pools shall be enclosed in such a manner as to be accessible only to authorized persons and not to bathers. Construction and drainage shall be such as to avoid the entrance and accumulation of water in the vicinity of electrical equipment.
7.2.27.3.15 Swimming pool safety devices: Every person owning land on which there is situated a swimming pool, which contains 60cm or more of water in depth at any point, shall erect and maintain thereon an adequate enclosure either surrounding the property or pool area, sufficient to make such body of water inaccessible to small children. Such enclosure, including gates therein, shall be not less than 1.2 meters above the underlying ground. All gates shall be self-closing and self-latching with latches placed 1.2 meters above the underlying ground and otherwise made inaccessible from the outside to small children.
A natural barrier, hedge, pool cover or other protective device approved by the governing body

shall be an acceptable enclosure so long as the degree of protection afforded by the substituted devices or structures is not less than the protection afforded by the enclosure, gate and latch described herein.

7.2.27.3.16 Diving boards: Minimum water depths and distances for diving hoppers for pools, based on board height above water, shall comply with Table 8.27 for public pools and Table 8.27a for private pools.

Diving boards higher than 3 meters shall conform to relevant standards.

The maximum slope permitted between point D2 and the transition point shall not exceed one unit vertical to three units horizontal (1:3) in public pools and one unit vertical to one unit horizontal (1:1) in private pools. D1 is the point directly under the end of the diving boards. D2 is the point at which the floor begins to slope upwards to the transition point. (see Figure 8.27, below).

TABLE 8.27

MINIMUM WATER DEPTHS AND DISTANCE BASED ON BOARD HEIGHT FOR PUBLIC POOLS

Board height	Minimum depth at D1 directly under end of Board	Distance between D1 and D2	Minimum depth at D2
6.7cm	2.1m	2.4m	2.55m
7.5cm	2.25m	2.7m	2.7m
10.0cm	2.55m	3.0m	3.0m
30.0cm	3.3m	3.15m	3.6m

TABLE 8.27a

MINIMUM WATER DEPTHS AND DISTANCE BASED ON BOARD HEIGHT FOR PRIVATE POOLS

Board height	Minimum depth at D1 directly under end of Board	Distance between D1 and D2	Minimum depth at D2
5.0cm	1.8m	2.1m	2.25m
6.7cm	2.05m	2.25m	2.4m
7.5cm	2.23m	2.4m	2.4m
10.0cm	2.55m	2.7m	2.7m

TYPICAL POSITION OF TIP OF BOARD RELATIVE TO PT.A

Pt.A	Pt.B	Water Line	Pt.C	Pt.D
D1 Min.	D2 Min.		5 Mx.	
D1	D2		Transition Point	

7.2.28 TEMPORARY STRUCTURES

7.2.28.1 General: The provisions of this section shall apply to tents, membrane structures and other structures, erected for a period of less than 180 days. Those erected for a longer period of time shall comply with Section 8.5 or all applicable sections of this code when Section 8.5 is not applicable.

7.2.28.2 Permit required: All temporary structures including tents or membrane structures covering an area in excess of 12m^2 including all connecting areas or spaces with a common means of egress or entrance, and used or intended to be used for gathering together of ten or more persons shall not be erected, operated or maintained for any purpose without obtaining a permit from the code enforcement officer. Tents used exclusively for recreational camping the location of egress facilities, seating capacity, construction and all mechanical and electrical equipment.

7.2.28.3 Location: All temporary structures shall be located in accordance with the requirements of Table 29.8 based on the fire resistance rating of the exterior walls for the proposed type of construction.

7.2.28.4 Construction: Tents and air-supported structures shall be constructed as required by this code and the relevant standards listed in the Schedule (see NFiPA 102).

7.2.28.5 Membrane material: All tents shall be constructed of flame resistive materials or materials treated to render the material flame resistant in a manner approved by the code enforcement officer. The membrane material shall be either non-combustible as defined in Section 29.4.6 or flame resistant.

7.2.28.6 Certification: An affidavit or affirmation shall be submitted to the code enforcement officer and a copy retained on the premises on which the tent or air- supported structure is located attesting to the following in formation relative to the flame resistance of the fabric.

a. It shall also include the names and addresses of the owners of the tent or air-supported structure.

7.2.28.7 Inflation pressure: Operating pressure shall be maintained at the design pressure specified by the manufacture to assure structural stability and to avoid excessive distortion during high wind.

7.2.28.8 Door operation: Under high wind over 80km/h, the use of doors in air- supported structures shall be controlled to avoid excessive air loss. Doors shall not be left open under any conditions.

7.2.28.9 Means of egress: All temporary structures including tents and membrane structures shall conform to the means of egress requirements of Chapter 10 and shall have a maximum length of exit access travel of 30 meters.

7.3 MEANS OF EGRESS

7.3.1 GENERAL

7.3.1.1 Scope: The provisions of this Part shall control the design, construction and arrangement of building elements required to provide a reasonably safe means of egress from all buildings and structures hereafter erected, and from all buildings hereafter altered to a new occupant load, or manner of use, or inherent fire hazard.

Existing buildings and uses shall be controlled by the provisions of Section 10.5 in conformity with subsisting Development Control Regulations

7.3.1.2 Modification of egress requirements: Where strict compliance with the provisions of this Code is not practical, the Code Enforcement Division/Section/Unit shall approve alternative means of egress which will accomplish the same purpose, by the procedure established in Part I for modification of this Code, or by adoption of approved rules. Existing buildings shall not be occupied during repairs or alterations unless all existing means of egress

and any existing fire protection are continuously maintained, or in lieu thereof, other measures are taken which will provide equivalent safety.

7.3.1.3 Minimum requirements: It shall be unlawful to alter any building or structure in any manner that will reduce the number of exits or the capacity of exits below the requirements of this code for new buildings of the proposed use and occupancy.

7.3.2 PLANS AND SPECIFICATIONS

7.3.2.1 Arrangement of egress: The plans shall show in sufficient, detail, the location, construction, size and character of all exits together with the arrangement of aisles, corridors, passageways and hallways leading thereto in compliance with the provisions of this Code.

7.3.2.2 Number of occupants: In other than buildings of Use Groups H-2, H-3 and F-1, the plans and the application for a permit shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces when required by the Building Code Enforcement Division/Section/Unit. When not otherwise specified, the minimum number of occupants to be accommodated by the exits shall be determined by the occupant load prescribed in Section 10.7. The specified occupant load of the building shall be limited to that number.

7.3.3 BUILDING DESIGN REQUIREMENTS

7.3.3.1 New buildings: Every building and structure and part thereof hereafter erected shall have the prescribed number of exits of one or more of the approved types defined in this part. Exits, in combination with the exit access and exit discharge, shall provide safe and continuous means of egress to a street or to an open space with direct access to a street.

7.3.3.2 Mixed use groups: Where a building is occupied for two or more uses, the means of egress requirements shall apply to each portion of the building based on the use of that space.

7.3.3.3 Multiple tenants: When more than one tenant occupies any one floor of a building or structure, each tenant shall be provided with direct access to approved exits.

7.4 PROHIBITED USE

7.4.1 General: Exits and exit access corridors shall not be used as supply or return air ducts or plenums.

7.4.2 Exception: The restriction on the use of the space between the corridor ceiling and the floor or roof structure above as a return air plenum shall not apply when the corridor is not required to be of fire resistance rated construction or is separated from the plenum by fire resistance rated construction or is located within a dwelling unit.

7.5 EXISTING BUILDINGS

7.5.1 Owner responsibility: The owner or lessee of every existing building and structure shall be responsible for the safety of all persons in, or occupying such premises with respect to the adequacy of means of egress therefrom.

7.5.2 Unsafe means of egress: In any existing building or structure not provided with exit facilities as herein prescribed for new buildings and in which the exits are deemed inadequate for safety by the code enforcement officer, additional provisions shall be made for safe means of egress as the code enforcement officer shall order.

7.5.3 Appeal from exit order: Within seven days after the service of the exit order by the code enforcement officer the owner shall have the right to file a written appeal there from, and the code enforcement officer shall appoint a board of survey as required in Section 2.6 to make a final determination.

7.6 MAINTENANCE OF EXITS

7.6.1 Obstructions: It shall be unlawful to obstruct, or reduce in any manner, the clear width of any doorway, hallway, passageway or other means of egress required by the provisions of this

code.

7.6.2 Maintenance: All exterior stairways and fire escapes shall be kept free of slippery materials. Exterior stairways and fire escapes shall be painted in an approved manner before and after erection; and shall be scraped and painted as often as necessary to maintain them in safe condition.

7.7 OCCUPANT LOAD

7.7.1 Design occupant load: In determining required facilities, the number of occupants for whom exit facilities shall be provided shall be established by the largest number computed in accordance with each of Sections 10.7.2 through 10.7.3.1

7.7.2 Actual number: This is the number of occupants for whom each occupied space, floor, or building is designed.

7.7.3 Number by Table 10.7: The number of occupants of any space as computed in Section 10.7.2 or 10.7.3 plus the number of occupants similarly computed for all spaces that discharge through the space in order to gain access to an exit.

7.7.3.1 Number by combination: The number of occupants of any space as computed in Section 10.7.2 or 10.7.3 plus the number of occupants similarly computed for all spaces that discharge through the space in order to gain access to an exit

7.7.4 Increased occupant load: The occupant load permitted in any building or portion thereof is permitted to be increased from that number established for the given use by Table 10.7 when all other requirements of this Code are also met based on such modified number. Where required by the Building Code Enforcement Division/Section/Unit, an approved aisle, seating, or fixed equipment diagram to substantiate any increase in occupant load shall be submitted and displayed.

7.7.5 Maximum occupant load: The occupant load of any space or portion thereof shall not exceed one occupant per 10.3m^2 of occupiable floor space.

7.7.6 Fixed seats: The occupant load for an assembly or educational area having fixed seats shall be determined by the number of fixed seats installed. The capacity of fixed seats without dividing arms shall equal one person per 460mm. For booths, the

capacity shall be one person per 610mm.

7.7.7 Mezzanine levels: The occupant load of a mezzanine level discharging through a floor below shall be added to that floor's occupant load, and the capacity of the exits shall be designed for the total occupant load thus established.

7.7.8 Roofs: Roof areas occupied as roof gardens or for assembly, educational, storage or other purposes shall be provided with exit facilities to accommodate the required occupant load, but there shall not be less than two approved means of egress from roof areas of Use Groups A and C.

TABLE 10.7

MAXIMUM FLOOR AREA ALLOWANCE PER OCCUPANT

USE GROUPS	FLOOR AREA IN SQUARE METER PER OCCUPANT
Assembly with fixed seats	See Section 10.7.6
Assembly without fixed seats	
Concentrated (chairs only - not fixed)	0.65 net
Standing space	0.28 net
Unconcentrated (tables and chairs)	1.40 net
Business areas	0.65 net
Court rooms - other than fixed seating area	9.30 net
Educational	3.72 net
Classroom area	1.86 net
Shops and other vocational room areas	4.65 net
Industrial areas	9.30 gross
Institutional areas	22.32 gross
Inpatient treatment areas	9.30 gross
Outpatient areas	11.16 gross
Sleeping areas	11.16
Library:	
Reading room	4.65 net
Stack area	9.30 gross
Mercantile, basement and grade floor areas	0.56 gross
Areas on other floors	1.12 gross
Storage, stock, shipping areas	27.90 gross

Parking garages	18.60 gross
Residential	18.60 gross
Storage areas, mechanical equipment room	27.90 gross

7.8 TYPES AND LOCATION OF MEANS OF EGRESS

7.8.1 General: All approved means of egress, including doorways, passageways, corridors, interior stairways, exterior stairways, escalators, smokeproof enclosures, ramps, horizontal exits, bridges, balconies, fire escapes and combinations thereof shall be arranged and constructed as provided in this Code.

7.8.2 Arrangement: All required exits shall be so located as to be discernable and accessible with unobstructed access thereto.

7.8.3 Egress through adjoining spaces: Egress from a room or space shall not open into an adjoining or intervening room or area, except where such adjoining room or area is accessory to the area served, is not a high hazard use and provides a direct means of egress to an exit. A maximum of one exit access shall be permitted to pass through a kitchen, storeroom, restroom, closet or similar space provided that it is not the only means of access to an exit. An exit access shall not pass through a room subject to locking.

TABLE 10.8 LENGTH OF EXIT ACCESS TRAVEL [M]

USE GROUPS	WITHOUT FIRE SUPPRESSION SYSTEM	WITH FIRE SUPPRESSION SYSTEM
A, B, C, D1	-	-
, G, H, I-1	60m	75
D-2, J-2	90m	120
E	-	22.5
F2, F3	45	60

Notes: See the following sections for modifications to travel distance requirements

Section 8.2.4.1: For the exit access travel distance limitation in covered malls.

Section 8.3.3.1 e (v): For the exit access travel distance limitation in high-rise buildings under the automatic fire suppression system alternatives.

Section 8.4.1.4: For the exit access travel distance limitation in HPM use facilities.

Section 8.7.2.4: For the exit access travel distance limitation through an atrium space.

Section 8.28.9: For the exit access travel distance limitation in temporary structures.

Section 10.8.15: For increased limitation in Use Group D and J.

Section 10.8.16: For increased limitation in Use Group A-5.

Section 10.10.3: For buildings with one exit.

7.8.4 Assembly buildings: All buildings used for assembly purposes shall front on at least one street on which the main entrance and exit discharge shall be located. Where there is a single main entrance, the entrance shall be capable of serving as the main exit and shall provide an egress capacity for at least one-half of the total occupant load. In addition to having access to a main exit, each level of a building of Use Group A shall be provided with additional exits

which shall provide an egress capacity for at lest two- thirds of the total occupant load served by that level.

7.8.5 Foyers and waiting spaces: The term “foyer” shall mean an enclosed space surrounding or in the rear of the auditorium of a theatre or other place of assembly which is completely separated from the auditorium and is used as an assembly or waiting space for the occupants. In Use Group A-1, a foyer, waiting space, or lobby shall be provided with a net floor area, exclusive of stairs or landings, of not less than

0. 14m^2 for each occupant having access thereto. The use of foyers and lobbies and other available spaces for harboring occupants until seats become available shall not encroach upon the clear floor area herein prescribed or upon the required clear width of front exits.

7.8.6 Egress: When the foyer is not directly connected to the public street through the main lobby, an unobstructed corridor or passage shall be provided which leads to, and equals the required minimum width of, main entrances and exits. A mirror shall not be placed so as to give the appearance of a doorway, exit or passageway.

7.8.7 Gradient: The rear foyer shall be at the same level as the back of the auditorium and the means of egress leading therefrom shall not have a steeper gradient than one unit vertical in eight units horizontal (1:8).

7.8.8 Construction: The partitions separating the foyer from the auditorium and other adjoining rooms and spaces of a theatre shall be constructed of not less than 2-hour fire resistance rating. Where opening protectives are constructed of non-combustible materials, fire resistance rating of the opening protectives is not required.

7.8.9 Exit discharge: All exits shall discharge directly at a public way or at a yard, court or open space of the required width and size to provide all occupants with a safe access to a public way.

7.8.10 Level of exit discharge protection: In all buildings having habitable or occupiable stories or basements below grade, the floor/ceiling assemblies and supports below the level of exit discharge shall provide a fire resistance rating of not less than 1 hour.

Exceptions

i Buildings of Use Group H-3.

ii Buildings of Type 1 construction.

ii When such floor/ceiling assemblies and supports are constructed of Type 4 construction.

iv When the floor areas below the level of exit discharge are equipped throughout with an approved automatic fire suppression system.

7.8.11 Remote location: Whenever more than one exit is required from any room, space or floor of a building, they shall be placed as remote from each other as practicable, and shall be arranged and constructed to provide direct access in separate possibility that both would be blocked by any one fire or other emergency condition.

7.8.12 Remoteness: Where two exits or two exit access doors are required, they shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served. Where exit enclosures are provided as a portion of the required means of egress and are interconnected by a corridor conforming to the requirements for corridor construction, the exit separation distance shall be measured along the line of travel within the corridor. In all other cases, the separation distance shall be measured in a straight line between exits or exit access doors.

7.8.12.1 Exception: In buildings equipped throughout with an approved automatic fire suppression system, the minimum separation distance shall be one-fourth the length of the maximum overall diagonal dimension.

7.8.13 Three or more: When three or more exits or exit access doors are required, at least

two exits or exit access doors shall be separated as provided in Section 10.8.12.

7.8.14 Length of travel: Except as modified by provisions of Section 10.10.3 for buildings with one exit, all exits shall be so located that the maximum length of exit access travel, measured from the most remote point to an approved exit along the natural and unobstructed line of travel, shall not exceed the distances given in Table 10.8. In single exit buildings covered by Section 10.10.3 where the area is subdivided into rooms or compartments, and the egress travel in the room or compartment is not greater than 15.24m or 30.48m in buildings equipped throughout with an approved automatic fire suppression system, the exit access travel distance shall be measured from the exit access entrance to the nearest exit.

7.8.15 Roof vent increase: In buildings of Use Group D or J one storey in height, equipped with automatic heat and smoke roof vents complying with Section 12.2.32 and equipped throughout with an approved automatic fire suppression system, the exit access travel distance limitation in Table 10.8.14 shall be increased to 122m.

7.8.16 Use Group A-5: Buildings and structures of Use Group A-5, where all portions of the means of egress are essentially open to the outside, shall have an exit access travel distance of not more than 122m, except that such buildings and structures of Type 1 or 2 construction shall not have an exit access travel distance limit.

7.8.17 Elevators: Elevators shall not be accepted as a required element of the means of egress.

7.9 CAPACITY OF EGRESS COMPONENTS

7.9.1 General: The capacity of means of egress for a floor, balcony, tier or other occupied space shall be sufficient for the occupant load thereof.

7.9.2 Minimum width: The width of each means of egress component shall not be less than the width computed in accordance with Table 10.9 for the required capacity of the component, but not less than the minimum width as prescribed by this code for each such component.

TABLE 10.9

EGRESS WIDTH PER OCCUPANT

WITHOUT FIRE SUPPRESSION SYSTEM (MILLIMETER PER PERSON)		WITH FIRE SUPPRESSION SYSTEM (MILLIMETER PER PERSON)		
USE GROUP	STAIRWAYS	DOORS, RAMPSS AND CORRIDORS	STAIRWAYS	DOORS, RAMPS AND CORRIDORS
A, B, C, D	-	-	-	-
G, H, I	7.62	5.08	5.08	3.81
E	-	-	7.62	5.08
F1	10.16	5.08	5.08	5.08
F2	25.40	17.78	15.24	12.70
F3	7.62	5.08	7.62	5.08

7.9.3 Exit design per floor: Where exits serve more than one floor, only the occupant load of each floor considered individually shall be used in computing the required capacity of the exits at that floor, provided that the exit capacity shall not decrease in the direction of egress travel.

7.9.4 Egress convergence: When means of egress from floors above and below converge at an intermediate floor, the capacity of the means of egress from the point of convergence shall not be less than the sum of the two.

7.10 NUMBER OF EXITS

7.10.1 General: The following general requirements apply to buildings of all use groups. Where more restrictive requirements are provided in this Code, such requirements shall take precedence over the general provisions of this Section.

7.10.2 Minimum number: Every floor area shall be provided the minimum number of approved independent exits as required by Table 10.10.2 based on the occupant load, except as modified in Section 10.9.3.

TABLE 10.10.2 MINIMUM NUMBER OF EXITS FOR OCCUPANT LOAD

Occupant Load	Minimum Number of exits
500 or less	2
501 - 1,000	3
over 1,000	4

7.10.3 Building with one exit: Only one exit shall be required in buildings of Use Group H-3 and in buildings of the use groups and characteristics specified in Table 10.10.3; and in stories at the level of exit discharge having an occupant load not exceeding 50 persons and an exit access travel distance not exceeding 22.86m in buildings of any use group; in airport traffic control towers which comply with Section 8.18.

TABLE 10.10.3 BUILDINGS WITH ONE EXIT

USE GROUP	MAX.HEIGHT ABOVE GRADE	MAX. SIZE b	MAX.EXIT ACCESS TRAVEL DISTRANCE	MIN.RESIST-ANCE RATING OF EXIT ENCLOSURES	MIN.FIRE-RESISTANCE RATING OF OPENING PROTECTION
H-1	2 Storeys	4 dwelling units per floor	15.24m	1 hour	1 hour
B and 1 I-2a	2 Storeys	325.5m2	22.86m	1 hour	1 hour

Note a: For the required number of exits for open parking structures, see Section 10.10.5.

7.10.4 Emergency escape: Every sleeping room below the fourth storey buildings of Use Groups H and F-1 shall have at least one operable window or exterior door approved for emergency egress or rescue. The units shall be operable from the inside without the use of separate tools. Where windows are provided as a means of egress or rescue, the windows shall have a sill height not more than 1.1m above the floor. All egress or rescue windows from sleeping rooms must have a minimum net clear openings of 0.55m^2. The minimum net clear opening height dimension shall be 610 mm. The minimum net clear opening width dimension

shall be 508 mm.

* Bars, grilles or screens placed over emergency escape windows shall be releasable or removable from the inside without the use of a key, tool or excessive force.

7.10.4.1 Exception

1. The minimum net clear opening for grade floor windows shall be 5m^2.
2. In buildings where the sleeping room is provided with a door to a corridor having access to two remote exits in opposite directions, an outside window or an exterior door for emergency escape from each such sleeping room is not required.
3. Buildings equipped throughout with a complete automatic fire suppression system.

TABLE NO. 10.10 MINIMUM EGRESS AND ACCESS REQUIREMENTS

USE 1	Minimum of exits other than elevators are required where	Occupant load factor	Access by means of a ramp or an

	number of occupants at least	2 (sq.m)	elevator must be provided for the physically handicapped as indicated
1. Aircraft hangars (no repair)	10	46.5	Yes
2. Auction rooms	30	0.63	Yes
3. Assembly areas, concentrated use (without fixed seats) auditoriums Bowling alleys (assembly areas) Churches and Chapel Dance floors Lobby accessory occupancy Lodge rooms Reviewing stands Stadiums	50	0.65	Yes4 5
4. Assembly areas, less- concentrated use Conference rooms Dining rooms Drinking establishments Exhibit rooms Gymnasiums Lounges Stages	50	1.40	Yes 4 6
5. Children's homes and homes for the aged	6	7.45	Yes7
6. Classrooms	50	1.85	Yes8
7. Dormitories	10	4.65	Yes7
8. Dwellings	10	27.90	No
9. Garages, parking	30	18.60	Yes9
10. Hospitals and Sanitariums- Nursing Homes	6	7.45	Yes
11. Hostels and apartments	10	18.60	Yes10
12. Kitchen-Commercial	30	18.60	No
13. Library reading room	50	4.65	Yes4
14. Locker rooms	30	4.65	Yes
15. Malls (see Chapter 8)	-	-	-
16. Manufacturing areas	30	18.60	Yes7

17. Mechanical equipment room	30	27.90	No
18. Nurseries for children (day-care)	7	3.25	Yes
19. Offices	30	9.3	Yes7
20. School shops and Vocational rooms	50	4.65	Yes
21. Skating rinks	50	4.65 on the skating area; 1.40 on the deck	Yes4
22. Storage and stock Rooms	30	27.90	No
23. Stores-retail sales rooms Basement Ground floor Upper floors	11 50 10	1.85 2.80 4.65	 Yes Yes Yes
24. Swimming pools	50	4.65 for the pool area; 1.40 on the deck	Yes 4
25. Warehouses	30	46.50	No
26. All others	50	9.3	

parked. Unenclosed vehicle ramps shall not be considered as required exits unless pedestrian facilities are provided. Interior exit stairways are not required to be enclosed.

7.11 EXIT ACCESS PASSAGEWAYS AND CORRIDORS

7.11.1 Access passageway: Direct exit access shall be provided to required exits through continuous passageways, aisles or corridors, conveniently accessible to all occupants and maintained free of obstruction.

7.11.1.1 Use Group F-2: Every patient sleeping room in buildings of Use Group F-2 shall have an exit access door leading directly to an exit access corridor.

Exception: Direct corridor access is not required where:

1. There is an exit door opening directly to the outside from the room at ground level;
2. One adjacent room, such as a sitting room or anteroom, intervenes and all doors along the means of egress are equipped with nonlockable hardware in accordance with Section 8.11.5.2, and the intervening room is not used as an exit access for more than eight patient beds.
3. A patient sleeping room is subdivided with non-fire resistance-rated, noncombustible partitions, provided that the arrangement allows for direct and constant visual supervision by nursing personnel and the suite complies with this section and Section 10.13. Such rooms which are so subdivided shall not exceed 465m[1].

7.11.2 Turnstiles and gates: Access through turnstiles, gates, rails or similar devices shall not be permitted unless such a device is equipped to readily swing in the direction of exit travel under a total force of not more than 73.23N.

1 This table shall not be used to determine working space requirements per person.

7.11.3 Restriction: The required width of passageways, aisles or corridors shall be maintained free of projections and restrictions; except that the minimum clear width resulting from doors opening into such spaces shall be one-half the required width. When fully open, the door shall not project more than 180mm into the required width.

7.11.4 Dead ends: Exit access passageways and corridors in all storeys which serve more than one exit shall provide direct connection to such exits in opposite directions from any point in the passageway or corridor, insofar as practicable. The length of a dead end corridor shall not be more than 6096 mm.

7.11.5 Width: The minimum required width of passageways, aisles and corridors shall be determined by the greater of the following criteria:

1. 1.10m where serving an occupant load of greater than 50.
2. .90m where serving an occupant load of 50 or less.
3. 2.40m in buildings of Use Group F used for the movement of beds.
4. 1.80m in buildings of Use Group C with more than 100 occupants.
5. The width required for capacity as determined by Section 10.9.

Aisles shall conform to the requirements of this Section or Section 10.27.

7.11.6 Enclosures: In buildings of other than Use Group F-2, all corridors serving as exit access shall be enclosed in fire separation walls having a fire-resistance rating of at least 1 hour. Corridors in buildings of Use Group F-2 shall comply with Section 8.11.5.
Tenant and dwelling unit separations which are also corridor walls shall comply with this Section and the requirements of Table 6.1.

7.11.6.1 Exceptions

1. In all uses other than Use Group H-1, H-2 and F-1, a fire resistance rating is not required for exit access corridors serving 30 or fewer occupants.
2. A fire resistance rating is not required for corridors contained within a dwelling unit.

7.11.7 Automatic fire suppression system alternatives: When an approved automatic fire suppression system is installed and supervised in accordance with Section 1020.1, parts 1, 2 or 3 and has its water flow alarm device connected to an approved central station system, proprietary system or remote station system of the jurisdiction, a fire resistance rating for exit access corridors, and tenant separation walls which are also corridor walls, is not required in Use Group A, B, C, D, G and I in Use Group H, I, H2 and F-1, the corridor walls, shall have a fire resistance rating of not less than *Vi* hour. Corridor walls and dwelling unit separation walls which are also corridor walls, in Use Group H-I, H-2 and F1 shall be constructed tight to the underside of the ceiling directly above.

7.11.8 Opening protective: All door assemblies from rooms opening onto a corridor required to be of fire-resistance rated construction shall be fire doors complying with Section 12.2.18.

7.12 LEVEL OF EXIT DISCHARGE PASSAGEWAYS USED AS AN EXIT ELEMENT

7.12.1 Passageways: Every required interior and exterior exit element which does not adjoin a public way shall be directly connected to the public way or to an open court leading to the public way by an enclosed passageway at the level of exit discharge or other unobstructed exit element constructed as provided in this Section.

7.12.2 Vestibule: Where an exit discharges into an interior vestibule, the vestibule shall be used for ingress and egress only, and the vestibule shall comply with Sections
10.12.3 and 10.12.4.

7.12.3 Depth and width: The vestibule depth from the exterior of the building is not greater than 3.0m and the width is not greater than 6.0m.

7.12.4 Separation: The vestibule is separated from the remainder of the level of discharge by self closing doors and the equivalent of 6mm thick wired glass in steel frames.

7.12.5 Lobby: Where an exit discharges into an interior lobby located at the level of exit discharge, such lobby shall be provided with an automatic fire suppression system, and any other portion of the floor with access to the lobby shall be provided with an automatic fire suppression system or shall be separated therefrom in accordance with the requirements for the enclosure of exits.

7.12.6 Width and height: The effective width of the passageway shall be not less than three quarters of the aggregate width of all required exit stairways leading thereto and all required exit doorways opening into the passageway. Such passageway shall have a minimum width of 1.10m and a minimum clear ceiling height of 2.40m.

7.12.7 Maximum stairway limitations: Not more than 50 percent of the required stairways shall discharge through the same passageway. Multiple lobbies constructed in accordance with Section 10.12.5 located adjacent to one another shall be separated from each other in accordance with the requirements for enclosure of exits.

7.13 MEANS OF EGRESS DOORWAYS

7.13.1 General: The requirements of this section shall apply to all doorways serving as a component or element of a means of egress from habitable and occupiable rooms; except as provided in Sections 10.17.4, 10.19.8, 10.19.9, 10.19.13 and 10.20.3.

7.13.2 Number of Doorways: Every room or tenant space with an occupant load of more than 50 or in which the travel distance exceeds 23.0m, shall have at least two egress doorways leading from the room or tenant space to an exit or corridor.

7.13.2.1 Exceptions

1. Use Group H-3.
2. Boiler, incinerator and furnace rooms shall be provided two egress doorways when the area exceeds 46.5m^2 and individual fuel-fired equipment exceeds 117.24W input capacity. Doorways shall be separated by horizontal dimension of the room. When two doorways are required by this exception, a fixed ladder access out of the room shall be permitted in lieu of one doorway.
3. In buildings of Use Group F-2, any room and any suite of rooms as permitted in Section 10.11.1. Exception No.3. of more than 93m^2, shall have at least two exit access doors remote from each other.

7.13.3 Entrance and egress doorways: Where separate doors are provided for entrance and egress use, the entrance door shall be clearly marked Entrance Only in letters not less than 152mm in height and legible from both inside and outside.

7.13.4 Location of doors: The required doorways opening from a room or space within a building and leading to an exit access shall be located as remote as practicable from each other and shall conform to Section 10.8.13 The distance of exit access travel from any point in room or space to a required exit door shall not exceed the limitations of Section 10.8.14.

7.13.5 Door arrangement: Doors in series shall have a space between them of not less than 2123mm when measured in their closed positions.

Exception: Power-operated doors and buildings of Use Groups F-1 and H-3.

7.13.6 Size of doors: The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 813mm except that for

door openings to resident sleeping rooms in buildings of Use Group F-3 and door openings within a dwelling unit the clear width shall be not less than 711mm. The maximum width of a door leaf shall be 1219mm nominal. Means of egress doors in Use Group F used for the movement of beds shall be at least 1118mm wide. The height of doors shall not be less than 2032mm, except that within a dwelling unit the height of the doors shall be not less than 2100mm.

7.13.6.1 Exception: An egress door serving a storage area of not more than 74m^2 and which is normally unoccupied shall have a maximum width of 3048mm.

7.13.7 Door hardware: All egress doors shall be of a side-hinged swinging type. All doors shall swing in the direction of egress when serving an occupant load of 50 or more persons or a high occupancy. The door latch shall release when subjected to a 73N force. The door shall be set in motion when subjected to a 146N force. The door shall swing to a full open position when subjected to a 73N force. Forces shall be applied to the latch side.

7.13.7.1 Exceptions

1. Private garages, factory and storage areas with an occupant load of 10 or less.
2. Horizontal sliding type doors complying with Section 8.12.4.2 shall be permitted in a means of egress in buildings of Use Group F-3.
3. Doors within or serving a single dwelling unit.
4. Revolving doors conforming to Section 10.14.

7.13.8 Locks and latches: All egress doors shall be readily operable from the side from which egress is to be made without the use of a key or special knowledge or effort.

7.13.8.1 EXceptions

1. Key operation is permitted from a dwelling unit provided the key cannot be removed from the lock when the door is locked from the side from which egress is to be made.
2. Locking devices conforming to Section 8.11.5.2 shall be permitted in buildings of Use Group F-2.
3. Locks conforming to Section 8.12.5 shall be permitted in buildings of Use Group F-3.
4. Egress doors from individual dwelling units and guest rooms of Use Group H having an occupant load of 10 or less are permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are operable from the inside without the use of a key or tool and mounted at a height not to exceed 1219 mm above the finished floor.

7.13.9 Flush and surface bolts: Manually-operated or surface-mounted flush bolts and surface bolts are prohibited, except on doors not required for egress within a dwelling unit. When egress doors are used in pairs and approved automatic flush bolts are used, the door leafs having the automatic flush bolts shall not have a door knob or surface mounted hardware. The unlatching of any leaf shall not require more than one operation.

Special locking arrangements: In Use Groups A-3, A-4, B, C, D, F, G, I and H-1, protected throughout by an approved automatic fire suppression system, or an approved automatic fire alarm system, doors in a means of egress shall be unlocked or be equipped with approved egress control devices which shall unlock in accordance with items 1 through 7 below.

1. Actuation of the automatic fire suppression system, or automatic fire alarm system.
2. Loss of power to the egress control device.
3. Loss of power to the building.
4. Be capable of being unlocked manually by signal from a required central control station on the premises.

5. The initiation of an irreversible automatic process which will release the latch within 15 seconds when a force of not more than 73N is applied for 1 second to the release device and not relock until the door has been opened and returned to the close position for not less than 30 seconds. Any attempt to exit which exceeds 1 second must render the door operable. The time delay and the minimum relocking cycle time shall not be field-adjustable.

7.13.9.1 Exceptions

a. An increase in the time delay to 30 seconds shall not be permitted except as approved by the code enforcement officer.
b. An increase in the relocking cycle time to 45 seconds shall not be permitted except as approved by the code enforcement officer.

6. Initiation of the irreversible process shall activate an audible alarm in the vicinity of the door.
7. A sign having block letters 25mm in height shall be provided on the door above and within 305mm of the release device stating “Keep pushing. This door will open in 15 seconds. Alarm will sound.”

7.13.10 Panic hardware: All doors equipped with latching devices in building of Use Groups A and C or potions of buildings used for assembly or educational purposes and serving rooms or spaces with an occupant load greater than 100 shall be equipped with approved panic hardware. Acceptance panic hardware will be a door latching assembly incorporating a device which causes the door latch to release and the leaf to open when a force of 73N is applied in the direction of egress to a bar or panel, the activating portion of which extends not less than one-half the width of the door leaf, and applied at a height greater than 792mm but less than 1118mm above the floor. The force shall be applied at the lock side of the door or 762mm from the hinged side, whichever is farther from the hinge. Where fire door assemblies are required to have panic hardware, approved fire exit hardware shall be used.

7.13.11 Power-operated doors: Where egress doors are operated by power, such as doors with a photoelectric-actuated mechanism to open the door upon the approach of a person, or doors, with power-assisted manual operation, the design shall be such that in the event of power failure the door is capable of being opened manually to permit egress travel or closed where necessary to safeguard means of egress. The forces required to open these doors manually shall not exceed those specified in Section 10.13 except that the force to set the door in motion shall not exceed 244N. The door shall be so designed and installed that when a force is applied to the door on the side from which egress is made, it shall be capable of swinging from any position to the full use of the opening in which it is installed.

7.13.11.1 Exceptions: Buildings of Use Group F-3

7.13.12 Security grilles: Horizontal sliding or vertical security grilles which are a part of a required means of egress shall be operable from the inside without the use of a key or special knowledge or effort when the space is occupied. The grilles shall remain secured in the full open position during the period of occupancy by the general public. Grilles shall not be brought to the closed single exit or 50 persons occupying spaces served by more than one exit. When two or more exits are required, not more than one- half of the exits shall be equipped with horizontal sliding or vertical grilles.

7.13.13 Level of exit discharge doors: Where glazed, doors at the level of exit discharge shall be glazed with approved safety glazing. Approved doors having one or more unframed edges shall be constructed of safety glazing not less than 12mm thick.

7.14 REVOLVING DOORS

7.14.1 General: All revolving doors shall comply with Sections 10.14.4 through 10.14.6. Revolving doors to be considered a component of a means of egress shall comply with

Section 10.14.2 through 10.14.7.

7.14.2 Collapse: Each revolving door shall be capable of collapsing into a book-fold position with parallel egress paths having an aggregate width of not less than 914mm. The revolving door shall collapse when a force of not more than 880N is applied within 76mm of the outer edge of a wing.

7.14.3 Exception: The maximum collapsing force shall not apply if the force required to collapse the door is reduced to not more than 635N when:

1. There is a power failure or power is removed to the device holding the wings in position.
2. There is an actuation of the automatic sprinkler system when such system is provided.
3. There is an actuation of a smoke detection system which is installed to provide coverage in all areas within the building which are within 22860mm of the revolving doors.
4. There is the actuation of a manual control switch which reduces the holding force to not more than the 635N force level. Such switch shall be in an approved location and shall be clearly identified.

7.14.4 Dispersal area: A revolving door shall not be located within 3048 mm of the foot or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.

7.14.5 Speed control: The revolutions per minute for a revolving doors shall not exceed the speeds indicated in Table 10.14.5.

TABLE 10.14.5 REVOLVING DOOR SPEED

INSIDE DIAMETERS (MM)	POWER-DRIVEN TYPE SPEED CONTROL (RPM)	MANUAL-TYPE SPEED CONTROL(RPM)
1981	11	12
2133	10	11
2286	9	10
2438	9	10
2590	8	9
2743	8	9
2895	7	8
3048	7	8

7.14.6 Adjacent area: Each revolving door shall have a conforming side-hinged swinging door in the same wall as, and within 3048 mm of the revolving door.

7.14.6.1 Exception: The adjacent swinging door is not required for street floor elevator lobbies if a stairway, escalator, or door from other parts of the building does not discharge through the lobby and the lobby does not have any occupancy or use other than as a means of travel between the elevators and street.

7.14.7 Means of egress: A revolving door to be considered as a component of a means of egress shall comply with Sections 10.14.2 through 10.14.6 and the following conditions:

1. Revolving doors shall not be given credit for more than 50 percent of the required exit

capacity of the building.

2. Each revolving door shall not be credited with more than a 50-person capacity.

3. Each revolving door shall be capable of being collapsed when a force of not more than 635 N is applied within 76 mm of the outer edge of a wing.

7.15 HORIZONTAL EXITS

7.15.1 General: Horizontal exits as herein defined shall be accepted as an approved element of a required means of egress when complying with the requirements of this Part. The connection between the areas of refuge as herein specified shall be accomplished by protected openings in a fire-resistance rated wall, by a vestibule, or by an open-air balcony or bridge.

7.15.2 Opening protectives: All doorway opening protectives shall be fire doors complying with Section 12.2.18. All doors shall swing in the direction of egress travel. When serving as a dual element of a means of egress, there shall be adjacent openings with swinging fire doors opening in opposite directions.

7.15.3 Size of doors: Size of openings in fire walls and fire separation walls shall comply with the provisions of Sections 12.2.11 and 12.2.12.

7.15.4 Area of refuge: The discharge area of a horizontal exit shall be either public area or spaces occupied by the same tenant, and each such area of refuge shall be adequate to house the total occupant load of both connected areas. The capacity of areas of refuge shall be computed on a minimum net floor area allowance for each occupant to be accommodated therein, not including areas of stairs, elevators and other shafts or courts, as follows:

1. At least 2.79 m^2 per patient for hospitals and nursing homes.
2. On storeys not housing beds or litter patients in buildings of Use Group 1-2 and in all buildings, of Use Group F-3,
3. 0.28 square meters in all other cases.

7.15.5 Unlocked doors: All horizontal exit doors shall be readily operable from the side or sides from which egress is to be made without the use of a key or special knowledge or effort.

7.15.6 Stairway exit: In multi-storey buildings of other than Use Group F-3, there shall be at least one interior enclosed stairway or smoke proof enclosure on each side of the horizontal exit, and any fire area not having a stairway accessible thereto shall be considered as part of an adjoining section with such stairway: but the length of exit access travel distance to the horizontal exit or the required exit shall not exceed the requirements of Section 10.8.14. Buildings of Use Group F-3 shall conform to Section 8.12.

7.16 RAMPS

7.16.1 Capacity: The capacity of a ramp used as an egress component shall be computed in accordance with Section 10.9.

7.16.2 Minimum dimensions: The minimum dimensions of egress ramps shall comply with section 10.16.3 through 10.16.5.

7.16.3 Width: The minimum width of an egress ramp shall be not less than that required for corridors by Section 10.11.5.

7.16.4 Headroom: The minimum headroom in all parts of the egress ramp shall be not less than 2100mm.

7.16.5 Restriction: Egress ramps shall not reduce in width in the direction of egress travel. Projections into the required ramp and landing width are prohibited except for handrails and stringers. Doors opening on to a landing shall not reduce the clear width to less than 1100mm.

7.16.6 Maximum gradient: The maximum gradient of egress ramps shall be one unit vertical in 8 units horizontal 1:8; except ramps required for the physically challenged according to Section 10.12, in which case the maximum gradient shall be one unit vertical in 8 units horizontal 1:8 if the rise is limited to 75 mm, one unit vertical in ten units horizontal (1:10) if the rise is limited to 150 mm or one unit vertical in 12 units horizontal (1:12) otherwise.

7.16.7 Landings: Landings shall be provided at all points of turning, entrance and exit and at doors. Ramps with a gradient of greater than one unit vertical in ten units horizontal 1:10 shall not have a vertical rise of greater than 3658 mm between landings. Ramps required for the physically challenged according to Section 10.12 shall not have a vertical rise greater than 762 mm between landings. All landings shall have a minimum length of 1524 mm.

7.16.8 Guards and handrails: Guards shall be provided on both sides. Handrails conforming to Section 10.29.2 shall be provided on at least one side of every ramp having a gradient greater than one unit vertical in 12 units horizontal 1:12. Ramps required by Section 10.12 for the physically challenged shall have handrails on both sides of the ramp whenever the vertical rise between landings exceeds 152 mm.

7.16.9 Ramp construction: Ramps used as an exit shall conform to the applicable requirements of Section 10.17.21 as to materials of construction and enclosure.

7.16.10 Surface: For all gradients exceeding one unit vertical in 12 units horizontal (1:12) and wherever the use is such as to involve danger of slipping, the ramp shall be surfaced with approved slip-resistant materials.

7.17 INTERIOR STAIRWAYS

7.17.1 Capacity: The capacity of stairways and doors shall be computed in accordance with Section 10.9.

7.17.2 Minimum dimensions: The minimum dimensions of interior exit stairways shall comply with Sections 10.17.3 through 10.17.5.

7.17.3 Width: All interior exit stairways shall be not less than 1118 mm in width.

7.17.3.1 EXCEPTION

1. Exit stairways in buildings of single exit construction where permitted by Section 10.10.3 shall be not less than 914 mm in width.
2. Spiral stairways as provided in Section 10.17.18.
3. Exit stairways in buildings of Use Group H-3 shall not be less than 914 mm in width.
4. Exit stairways serving and contained within a single residential dwelling unit shall be not less than 914 mm in width.
5. Exit stairways in buildings having a total occupant load of 50 or less shall be not less than 914 mm in width.

7.17.4 Headroom: The minimum headroom in all parts of the stair enclosure shall be not less than 2100 mm measured vertically from the tread nosing or from the floor surface of the landing or platform.

7.17.5 Restriction: Stairways shall not reduce in width in the direction of exit travel. Projections into a stairway width are prohibited, except for handrails as indicated in Section 10.29.3 stairway stringers which shall project not more than 38 mm at each side.

7.17.6 Landings and platforms: Landings and platforms of interior exit stairways shall comply with Sections 10.17.7 and 10.17.8.

7.17.7 Width: The least dimensions of landings and platforms shall be not less than the required width of stairway.

7.17.8 Vertical rise: In all buildings, a stairway shall not have a height of vertical rise of more than 3000mm between landings and intermediate platforms.

7.17.9 Treads and risers: Treads and risers of interior exit stairways shall comply with Section 10.17.10 through 10.17 12.

7.17.10 Limiting dimensions: Maximum riser height shall be 180 mm and minimum riser height shall be 100 mm. Minimum tread depth shall be 280mm, measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge.

7.17.10.1 EXCEPTION

1. Winders in accordance with Section 10.17.12.
2. Spiral stairways in accordance with Section 10.17.19.
3. Circular stairways in accordance with Section 10.17.19.
4. Stairways serving as aisles in assembly seating areas where the stairway pitch or slope is set, for sightline reasons, by the slope of the adjacent seating area.
5. Any stairway replacing an existing stairway within a space where, because of existing construction, the pitch or slope cannot be reduced.
6. Existing stairways.
7. In Use Group H-3 and within dwelling units in Use Group H-2, the maximum riser height shall be 210 mm and the minimum tread depth shall be 229 mm.

7.17.11 Dimensional uniformity: There shall not be variation exceeding 5mm in the depth of adjacent treads or in the height of adjacent risers. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed 10mm in any flight of stairs.

7.17.11.1 Exceptions

1. Where the bottom riser adjoins sloping public way, walk or driveway having an established grade and serving as a landing, a variation in height of the bottom riser shall not exceed 76mm in every 914mm of stairway width.
2. On stairways serving as aisles in assembly setting, where necessitated by changes in the gradient of adjoining seating areas to maintained adequate sightlines, the maximum non-uniformity of riser heights within a flight and the non-uniformity between adjacent risers shall not apply. Where a non-uniformity exceeds 5mm between adjacent risers, the exact location of the non-uniformity shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the non-uniform risers.
3. On stairways serving as aisles in assembly seating, where smaller intermediate steps are provided between larger treads level with seating platforms, such smaller intermediate steps shall have a uniform tread depth of not less than 330 mm.

7.17.12 Winders: Winders shall not be permitted in required exit stairways except in Use Group H-3 and stairways serving a single dwelling unit and in ornamental stairways not required as an element of exit. Such winders shall have a tread depth of not less than 229 mm at a point not more than 305 mm from the side where the tread is narrower and the minimum tread depth shall not be less than 152 mm.

7.17.13 Stairway guards and handrails: Stairways shall have continuous guards and handrails on both sides, and in addition thereto, stairways more than 2235 mm in required width shall have intermediate handrails dividing the stairways having a width of less than 1118 mm. Guards shall be constructed in accordance with Section 10.28. handrails shall be constructed in accordance with Section 10.29.

7.17.14 Stair exit doors: Stairway exit doors shall comply with Section 10.17.15 through 10.17.17.

7.17.15 Width: The minimum required width of every exit door to or from a stairway shall be

determined by the greater of the following criteria:

1. 711 mm clear width in buildings of Use group H-3.
2. 914 mm minimum width of door leaf in buildings of Use Group 1-2.
3. 813 mm clear width in all other cases.
4. The width required for the capacity of the stairway which serves the floor or area from which the exit door leads.

7.17.16 Direction of swing: All doors shall swing on a landing in the direction of egress travel. When opening, stair exit doors shall not reduce the width of landings to less than one-half of the required width. When fully open, the exit door shall not project more than 175 mm on to the landing.

7.17.16.1 Exception: Doors leading from a room or tenant space to a stairway in buildings in which only one exit is required are not required to swing in the direction of egress travel.

7.17.17 Door construction: All doorway opening protective shall be fire doors complying with Section 29.18. Labelled fire doors shall have a maximum of not more than 232oC. above ambient at the end of 30 minutes of standard fire test-exposure.

7.17.18 Spiral stairways: Spiral stairways shall not be used as an element of means of egress except in buildings of Use Group H-3 and within a single dwelling unit and from a mezzanine area not more than 23.25m^2 in area and serving not more than five occupants. The minimum width shall be 660 mm with each tread having a 19 mm minimum tread width at 305 mm from the narrow edge. All treads shall be identical and the rise shall be not more than 241 mm. A minimum headroom of 1981 mm shall be provided.

7.17.19 Circular stairways: Circular stairways shall not be used as an element of a means of egress except where a minimum tread depth and maximum riser height are provided in accordance with Section 10.17.10 and the smaller radius is not less than twice the width of the stairway.

7.17.20 Supplemental stairways: Stairways which are not a required means of egress element, serve one adjacent floor, are not connected with an exit access corridor, and are not connected with a stair serving other floors, are permitted in all use groups except Use Group F.

7.17.21 Stairway constructions: All required interior stairways shall be built of materials consistent with the types of materials permitted in Table 6.2.6 and 6.2.7 for the type of construction of the building; except that wood handrails shall be permitted for all types of constructions. Such stairways shall have solid treads and landing platforms, and all finish floor surfaces be of slip-resistant materials.

7.17.22 Strength: All stairways, platforms, landings and exits in other than Use Group H-3 shall be adequate to support a live load of 488.20 kg/m^2 and a concentrated load of 136.20 kg.

7.17.23 Enclosure: Required interior exit stairways shall be enclosed in fire separation assemblies of the fire resistance rating specified in Table 401. An exit enclosure shall not be used for any purpose other than means of egress. A space below a stairway shall be enclosed as required or kept open. Only exit doors shall open into the stairway enclosure.

7.17.23.1 Exception

1. This section shall not apply to exits in buildings of Use Group H-3.
2. This section shall not apply to exits serving and contained within a single residential dwelling unit.
3. This section shall not apply to supplemental stairways as provided in Section 10.17.20.
4. The minimum required fire resistance rating for exit enclosure connecting three floor

levels or less shall be 1 hour.

7.17.24 Discharge identification: Stairways which continue beyond the level of exit discharge shall be interrupted at the level of exit discharge by partitions, doors or other effective means of preventing persons from continuing past the floor of discharge while egressing. A sign shall be provided at each floor landing in all interior stairways connecting more than three stories designating the floor above and below the level of exit discharge.

7.17.25 Alternating tread stairways: Alternating tread stairways of non-combustible construction are permitted as an element of a means of egress in buildings from a mezzanine area not more than 23 m^2 in area and serving not more than 5 occupants. Alternating tread stairways are also permitted for access to roofs as provided in Section 10.18.

7.17.26 Handrails of Alternating tread stairways: Stair handrails shall be provided on both sides of alternating tread stairways and shall conform to section 10.29.

7.17.27 Treads of alternating tread stairways: Alternating tread stairways shall have a minimum projected tread of 127 mm, a minimum tread depth of 216 mm, a minimum tread width of 178 mm and a maximum riser to the next surface of the alternating tread of 241 mm. The initial tread of the stairway shall begin at the same elevation as the platform, landing or floor surface.

7.17.27.1 Exception: Alternating tread stairways of non-combustible construction used as an element of a means of egress in buildings from a mezzanine area not more than 23 m2 in area and serving not more than 5 occupants shall have a minimum projected tread of 216 mm with a minimum tread depth of 267 mm. The rise to the next alternating tread surface shall not be more than 203 mm.

7.17.28 ACCESS TO ROOF

7.17.28.1 By stairway or ladder: In buildings more than three storeys in height except those with a roof slope greater than four units vertical in 12 units horizontal (4:12), access to the roof shall be by means of a stairway, an alternating tread stair in accordance with Section 10.17.25 or a ladder and trap door. The ladder shall not be on the exterior of the building. Where the roof is used as a roof garden or for other habitable purposes, sufficient stairways shall extend to the roof to provide the necessary exit facilities from the roof as required for such occupancy. Roof trap doors shall be constructed to comply with Section 12.2.29.2.

7.17.28.2 Optional stairway or ladder: In buildings more than three storeys in height except those with a roof slope greater than one units vertical in three units horizontal (1:3), access to the roof shall be provided by means of a stairway, an alternating tread stair in accordance with Section 10.17.25 or a ladder and trap door. The ladder shall not be on the exterior of the building. Where the stairways shall extend to the roof to provide the necessary exit facilities from the roof as required for such occupancy, roof trap doors shall be constructed to comply with Section 12.2.29.2.

7.17.28.3 Optional stairway or ladder: In buildings not required to have a stairway, alternating tread stair or ladder to the roof, such devices, if provided, shall conform to the provisions of this section. Ladders placed on the exterior of the building shall be metal, and if exceeding 6096 mm in height, shall have a protective cage or other safety device. The side rails of exterior ladders shall be carried over the coping or the parapet to afford hand-hold. Other design details of such exterior ladders are subject to approval.

7.17.28.4 Roof enclosures: Stairways extending through roofs shall be enclosed in roof structures of fire resistance rated construction meeting the requirements of Section 29.29.

7.18 SMOKEPROOF ENCLOSURES

7.18.1 General: A smoke proof enclosure shall consist of an interior exit stairway conforming to Section 10.17, enclosed from the highest point to the lowest point, and meeting the

requirements of this section. When access to the roof is required by Section 10.18, such access shall be from the smoke proof enclosure where a smoke proof enclosure is required.

7.18.2 Where required: At least one of the required exits shall be a smoke proof enclosure in buildings having floors used for human occupancy located more than 22.860m above the lowest level of fire department vehicle access.

7.18.2.1 Exceptions

1. Buildings of Use Groups B, H-1 and H-2 complying with the area of refuge (compartmentation) option of Section 8.3.
2. Buildings of Use Group F-2.

7.18.3 Fire suppression system alternative: When the building is provided with an approved automatic fire suppression system throughout, the smoke proof enclosure is not required provided all interior exit stairways are pressurized to a minimum of water column 37.33Pa and a maximum of 8mm of water column 87.10Pa in the shaft relative to the building with all stairway doors closed.

7.18.4 Access: Access to the smoke proof enclosure shall be from every storey and shall be by way of a vestibule or by way of an open exterior balcony.

7.18.5 Outlet: The smoke proof enclosure shall discharge on to a street, yard or open court with direct access to a public way, or into a level of exit discharge passageway leading to a public way. The level of exit discharge passageway shall be without other openings and shall be separated from the remainder of the building by 2-hour fire resistance rated construction.

7.18.6 Construction: The walls of the smoke proof enclosure and the vestibule shall provide a 2-hour fire resistance rating without openings other than the required doorways. The open exterior balcony shall be constructed in accordance with the fire resistance rating requirements for floor construction.

7.18.7 Smoke proof enclosure by natural ventilation: The provisions of Section 10.19.8 through 10.19.14 shall apply to ventilation of smoke proof enclosures by natural means.

7.18.8 Balcony doors: Where access to the smoke proof enclosure is by way of an open exterior balcony, the door assembly into the enclosure shall be a fire door complying with Section 29.18.

7.18.9 Vestibule doors: Where access to the smoke proof enclosure is by way of a vestibule, the door assembly into the vestibule shall be a fire door complying with Section 29.18. The door assembly from the vestibule to the stairs shall have not less than a 20-minute fire resistance rating complying with Section 29.18.

7.18.10 Vestibule ventilation: Each vestibule shall have a minimum net area of 1.49m2 of opening in a wall facing an outer court, yard, or public way at least 6096 mm in width.

7.18.11 Vestibule size: The minimum dimension of the vestibule shall be not less than the required width of the corridor leading to the vestibule.

7.18.12 Smoke proof enclosure by mechanical ventilation: The provisions of Sections 10.19.13 through 10.19.20 shall apply to ventilation of smoke proof enclosure by mechanical means.

7.18.13 Vestibule doors: The door assembly from the building into the vestibule shall be a fire door complying with Section 29.18. The door assembly from the vestibule to the stairway shall have not less than a 20-minute fire resistance rating complying with Section 29.18. The door to the stairway shall be provided with a drop sill or other provisions to minimize air leakage.

7.18.14 Vestibule size: The vestibule shall be supplied with not less than one air change per minute, and exhausted at a rate sufficient to maintain an under pressure relative to the atmosphere of 1mm of water column 12.44Pa, and of 2.5mm of water column 24.88 Pa relative to the stair shaft. Supply air shall enter and exhaust air shall discharge from the

vestibule through separate, tightly-constructed ducts used only for that purpose. Supply air shall enter the vestibule within 152 mm of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 152 mm down from the top of the trap and shall be entirely within the smoke trap area. Doors, when in the open position, shall not obstruct duct openings. Duct openings with controlling dampers are permitted where necessary to meet the design requirements, but dampers are not otherwise required.

7.18.15 Engineering ventilation system: Where a specially engineered system is used, the system shall provide 1.18m^3/s exhaust from a vestibule when in emergency operation and shall be sized to handle three vestibules simultaneously. The smoke detectors located outside each vestibule shall upon release, open the supply and exhaust duct dampers in that affected vestibule.

7.18.16 Smoke trap: The vestibule ceiling shall be at least 508 mm higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward moving air column. The height shall not be decreased unless approved and justified by design and test.

7.18.17 Stair shaft air movement system: The stair shaft shall be provided with a dampened relief opening at the top and supplied with sufficient air to discharge a minimum positive pressure of 1.18m^3/s through the relief opening while maintaining a minimum positive pressure of 1mm of water column 12.44Pa in the shaft relative to the atmosphere with all doors closed.

7.18.18 Ventilation equipment: The activation of ventilating equipment shall be by a smoke detector installed outside the vestibule door in an approved location. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall operate at the levels specified in Section
10.19.15 and 10.19.17

7.18.19 Standby power: Mechanical vestibule and stair shaft ventilation systems and detector systems shall be powered by an approved standby power system conforming to Sections 2.6.8 and 8.3.9.

7.18.20 Acceptance and testing: Before the mechanical equipment is approved, the system shall be tested in the code enforcement officer's presence to confirm that the system is operating in compliance with these requirements.

7.19 EXTERIOR STAIRWAYS

7.19.1 As required exit: Exterior stairways used as an element of a required means of egress shall conform to the requirements for interior stairways as required in Section 10.17, except as to enclosures and fire doors and except as herein specifically modified. Exterior exit stairways shall not be used as an element of a required means of egress in the following cases:

1. Buildings of Use Group F-2 exceeding four storeys or 1524mm in height.
2. Buildings of Use Group F-3.
3. Floors exceeding five storeys or 19812mm in height above the level of exit discharge.

7.19.2 Location and arrangement: Exterior stairways utilized as a means of egress shall have at least one door from each tenant space opening onto a roofed-over open balcony served by at least two stairways, except where one stairway is permitted in Section 10.10.3, so located as to provide a choice of independent, unobstructed means of egress directly to the grade. The stairways shall be located remotely from each other. Balconies shall conform to the same width requirements as corridors as required by Section 10.11. The maximum travel distance from any tenant space to the nearest stairway shall be as specified in Table 10.8. Balconies and stairways shall be located at least 3048mm from adjacent plot lines and from other buildings on the same plot unless openings in such buildings are protected by %-hour fire resistance rated doors or windows.

7.19.2.1 Exception: Non-combustible exterior stairways constituting not more than 50 percent

of the required means of egress shall be exempt from the 3088 m fire separation distance requirement.

7.19.3 Opening protective: All openings below and within (3048 mm) horizontally of the stairway and all doors opening on to the stairway except at the top storey shall be protected with approved %-hour fire resistance rated fixed or automatic opening protective.

7.19.3.1 Exception

1. Buildings two storeys or less above grade when the level of exit discharge is the first storey above grade.
2. Opening protectives are not required when two independent exterior stairways serve an exterior balcony.

7.19.4 Location: All required exterior stairways shall be located so as to lead directly to a street or open space with direct access to a street; or when located on the rear of the building shall lead through a passageway at the level of exit discharge complying with Section 10.12. Exterior stairways shall not project beyond the street lot line.

7.19.5 Construction: Exterior stairs, porches and balconies shall be constructed of materials consistent with the types of materials permitted in Table 6.1 for the type of construction of the building to which the stairway is attached.

7.20 ESCALATORS AND MOVING WALKS

7.20.1 Means of egress: Escalators and moving walks shall not constitute a part of the required means of egress.

7.20.2 Reference standards: Escalators and moving walks shall conform to ASME A17 listed in the Schedule and Section 10.21.

7.21 FIRE ESCAPES

7.21.1 Where permitted: Fire escapes shall be permitted only as provided in Sections 10.22.1 through 10.22.5.

7.21.2 New buildings: Fire escapes shall not constitute any part of the required means of egress in new buildings.

7.21.3 Existing fire escapes: Existing fire escapes shall be continued to be accepted as a component in the means of egress in existing buildings only.

7.21.4 New fire escapes: New fire escapes for existing buildings shall be permitted only where exterior stairs cannot be utilized due to plot lines limiting stair size or due to the sidewalks, alleys or roads at grade level. New fire escapes shall not incorporate ladders or access by windows.

7.21.5 Limitations: Fire escapes shall comply with this section and shall not constitute more than 50 percent of the required number of exits nor more than 50 percent of the required exit capacity.

7.21.6 Location: When located on the front of the building and projecting beyond the building line, the lowest landing shall be not less that 2134 mm or more than 3658 mm above grade, equipped with a counter-balanced stairway to the street. In alleyways and thoroughfares less than 9144 mm wide, the clearance under the lowest landing shall be not less than 3658 mm.

7.21.7 Construction: The fire escape shall be designed to support a live load of 488.20 kg/m^2 and shall be constructed of steel or other approved non-combustible materials. Fire escapes constructed of wood not less than 508mm thick are permitted on buildings of Type 5 construction.

7.21.8 Dimension: Stairs shall be at least 559mm wide with risers not more and treads not less than 203mm and landings at the foot of stairs not less than 1016mm wide by 914 mm long, located not more than 203mm below the access window or door.

7.21.9 Opening protective: Doors and windows along the fire escape shall be protected with 3/4-hour fire resistance rated opening protective.

7.22 SLIDE ESCAPE

7.22.1 Where permitted: Slide escape and safety chutes shall be permitted in buildings of Use Group E, in existing school buildings of Use Group C and in existing buildings of Use Group F when approved and constructed in an approved manner.

7.22.2 General: The arrangement and location of slide escape shall conform to this part for means of egress and shall be designated by Exit signs and lights as provided in Section 10.24.

7.22.3 Construction: All chutes shall be constructed of approved non-combustible materials with a pitch in the line of travel of not less than 24 nor more than 42 degrees

0. 42 rad to 0.73 rad, measured on the developed circumference of spiral chutes. Straight chutes shall be not less than 610mm and 1118mm wide in any case. When erected on the interior stairways with direct means of egress to a street or other public way.

7.22.4 Capacity: Slide escape, where permitted as an element of a required exit, shall be rated at one unit of egress width per slide, with a rated capacity of 60. Slide escape, except as permitted for buildings of Use Group E, shall not constitute more than 25 percent of the required number of units of egress width from any building or structure or any individual storey.

7.23 EXIT SIGNS AND LIGHTS

7.23.1 Location: In all buildings, rooms or spaces required to have more than one exit or exit access, all required means of egress shall be indicated with approved internally- illuminated signs reading EXIT, visible from the exit access and, when necessary, supplemented by directional signs in the exit access corridors indicating the direction and way of egress. All exit signs shall be located at exit doors or exit access areas, so as to be readily visible.

7.23.2 Exception: Exit signs are not required in sleeping room areas in buildings of Use Group F-3.

7.23.3 Size and colour: Exit signs shall have red letters at least 152mm high and the minimum width of each stroke shall be 19mm on a white background or in other approved distinguishable colours. If an arrow is provided as part of an exit sign, the construction shall be such that the arrow direction cannot be readily changed. The word Exit shall be clearly discernible when the internally-illuminated sign is not energised

7.23.4 Illumination: Each signs shall be illuminated by a source providing not less than 53.82 lux at the illuminated surface.

7.23.4.1 Exception: Approved self-luminous signs which provide evenly illuminated letters shall have a minimum luminance of 0.21 cd/m^2.

7.23.5 Power Source: All exit signs shall be illuminated at all times when the building is occupied. To assure continued illumination for a duration of not less than 1 hour in case of primary power loss, the EXIT signs shall be connected to an emergency electrical system that complies with Section 26.7.

7.23.5.1 Exception: Approved self-luminous signs which provide continuous illumination independent of external power supplies are not required to comply with Section 26.7.

7.24 MEANS OF EGRESS LIGHTING

7.24.1 Artificial lighting: All means of egress in other than buildings of Use Group H-3 shall be equipped with artificial lighting facilities to provide the intensity of illumination herein prescribed continuously during the time that conditions of occupancy of the building require that the exits be available. Lighting shall also be provided to illuminate the exit discharge. In buildings of Use Group H-2 means of egress lighting, except that lighting within a dwelling unit, shall be

wired on a circuit independent of circuits within any dwelling unit. The disconnecting means and overcurrent protection device shall not be located within a dwelling unit or such that access is obtained by going through a dwelling unit.

7.25 HAZARDS TO MEANS OF EGRESS

7.25.1 Floor openings: Manholes or floor access panels shall not be located in the line of egress which reduce the clearance to less than (813mm).

7.25.2 Protrusions: There shall not be low-hanging door closers that remain within the opening of a doorway when the door is open, or that protrude hazardously into the corridor or line of egress when the door is closed. There shall not be low-hanging signs, ceiling lights or similar fixtures which prottrude into corridors or lines of egress.

7.25.3 Identification of hazardous exits: Doors leading to dangerous areas such as fire escapes, loading platforms, switch rooms and mechanical rooms shall be equipped with knobs, handles or push bars that have been knurled.

7.25.4 Floor surface: All floors of corridors and lines of egress shall have a slip- resistant surface.

7.25.5 Open-sided floor areas: Guards shall be located along open-sided walking surface, mezzanines and landings. The guards shall be constructed in accordance with Section 10.28.

7.25.6 Elevation change: Where changes in elevation exist in exit access corridors, exits or exit discharge, ramps shall be used when the difference in elevation is less than (305mm).

7.25.6.1 Exception: At exterior doors not required for the physically challenged and aged by Section 5.2.7, a maximum of 203mm step down shall be permitted.

7.26 ASSEMBLY AISLES

7.26.1 Where required: Buildings or portions of buildings of Use Group A which contain seats, tables, displays, equipment or other material shall be provided with aisles leading to exist in accordance with this section.

7.26.2 Aisle width: The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle (see Section 10.27.5). The catchment areas served by an aisle is that portion of the total space that is naturally served by that section of the aisle. In establishing catchment areas the assumption shall be made that there is a balanced use of all means of egress, with the number of persons in proportion to egress capacity.

7.26.3 Covering aisles: Where aisles converge to form a single means of egress travel, the required egress capacity of that path shall be not less than the combined required capacity of the converging aisles.

7.26.4 Uniform width: Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

7.26.5 Capacity: The width of aisles shall provide sufficient capacity in accordance with the following formulas where width is measured to walls, edges of seating and tread edges; except that handrail projections are permitted.

1. At least 7.5mm of width for each person served shall be provided on stairs having riser heights 178mm or less and tread depths 279mm or greater, measured horizontally between treat nosing.
2. At least 0.1mm of additional stair width for each person shall be provided for each 2.5mm of riser height above 178mm.
3. Where egress requires stair descent, at least 2mm of additional width for each person shall be provided on those portions of stair width not having handrails within a horizontal distance of 762mm.
4. Level or ramped means of egress with slopes less than one unit vertical in eight units horizontal (1:8), shall have at least 5mm of clear width for each person served.

7.26.6 Minimum width: The minimum clear width of aisles shall be: 1219mm for stairs having seating on each side; 914mm for stairs having seating on only one side; (584mm) between a stair handrail or guardrail and seating when the aisle is subdivided by a handrail (see section 10.17.11); 1067mm for level or ramped aisles having theatre style seating on both sides; 914mm for level or ramped aisles; and 584mm between a stair handrail and seating when a aisle does not serve more than five rows on one side.

7.26.7 Termination: Each end of a cross aisle shall terminate at an aisle, foyer, doorway or vomitory giving access to an exit. Dead end aisles which terminate only at one end with a cross aisle, foyer, doorway or vomitory giving access to an exit shall be not greater than 6096mm in length.

7.26.7.1 Exception: A longer dead end aisle is permitted where seats served by the dead end aisle are not more than 24 seats from another aisle, measured along a row of seats having a minimum clear width of (305mm) plus (15mm) for each additional seat above seven in the row.

7.26.8 Walking surfaces: Aisles with a gradient of one unit vertical in eight units horizontal (1:8) or less shall consist of a ramp having a slip-resistant walking surface. Aisles with a gradient exceeding one unit vertical in eight units horizontal (1:8) shall consist of a series of risers and treads extending across the full width of aisle and complying with Section 10.27.9 and 10.27.10.

7.26.9 Treads: Tread depths shall be a minimum of 279mm and be uniform within each aisle.

7.26.9.1 Exception: Non-uniformities shall not exceed 5mm between adjacent treads.

7.26.10 Risers: Where the gradient of aisle stairs is to be the same as the gradient of adjoining seating areas, the riser height shall be not less than 9102mm nor more than 203mm and shall be uniform within each flight.

7.26.10.1 Exception: Riser height non-uniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where non-uniformities exceed 5mm between adjacent risers, the exact location of such non-uniformities shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the non-uniform risers. Such stripe shall be a minimum of 25mm wide and a maximum of 51mm wide.

7.26.11 Handrails: Ramped aisles having a gradient exceeding one unit vertical in fifteen units horizontal (1:15) and aisle stairs shall be provided with handrails located either at the side or within the aisle width.

7.26.11.1 Exceptions

1. Handrails are not required if, at the side of the aisle, there is a guardrail that complies with the requirements for handrails.
2. Handrails are not required for aisles with seating on both sides unless there is more than one riser per row of seating. The single riser shall be indicated by a distinctive marking stripe on the leading edge of the tread.

7.26.12 Discontinuous rails: Where there is seating on both sides of the aisle, the handrails shall be discontinuous with gaps or breaks at intervals not exceeding five rows to facilitate access to seating and to permit crossing from one side of the aisle to the other. These gaps or breaks shall have a clear width of at least 559mm and not greater than 914mm, measured horizontally, and the handrail shall have rounded terminations or bends.

7.26.13 Intermediate rails: Where handrails are provided in the middle of aisle stairs, there shall be an additional intermediate handrail located appropriately 305mm below the main handrail.

7.26.14 Row width: The row minimum clear width shall be not less than (305mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic

or self-rising seat, the measurement shall be made with the seat in the down position.

7.26.15 Dual access: For rows of seating served by aisles or doorways at both ends, there shall be not more than 100 seats per row and the row minimum clear width of 305mm in rows shall be increased by 7.5mm for every additional seat beyond 14 but the minimum clear width is not required to exceed 559mm.

7.26.16 Single access: For rows of seating served by an aisle or doorway at only one end of the row, the minimum clear width of 305mm between rows shall be increased by 15mm for every additional seat beyond seven but the minimum clear width is not required to exceed 559mm. However, the path of travel shall not exceed 9144mm from any seat to a point where a person has a choice of two paths of travel to two exits.

7.26.17 Guardrails: Guardrail shall be provided on balconies and galleries in accordance with Section 10.28.

7.27 GUARDS

7.27.1 General: Where required by the provisions of Sections 8.10.2.3, 10.16.8, 10.16.9, 10.26.5 and 25.23.5 guards shall be designed and constructed in accordance with the requirements of this Section and Section 25.23.5. A guardrail system is a system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level.

7.27.2 Height: The guards shall be at least 1.1m in height measured vertically above the leading edge of the tread or adjacent walking surface.

7.27.2.1 Exceptions

1. In other than buildings of Use Group C, guards shall be not less than 792mm in height above the leading edge of the tread along stair which are not more than 6096mm in height or which reversed direction at an intermediate landing with 305mm or less measured horizontally between successive flights.
2. Guards in buildings of Use Group H-3 shall be not less than 914mm in height.

7.27.3 Construction: Open guards shall have intermediate rails, balusters or other construction such that a sphere with a diameter of 152mm cannot pass through any opening.

7.27.3.1 Exception: In buildings of use Groups D, E or I, the construction shall not permit a sphere with a diameter of 350mm to pass through any opening.

7.27.4 Railings: Metal or other approved non-combustible railings shall be provided on balconies and galleries as prescribed in Sections 10.28.5 through 10.28.7.

7.27.5 At fascia: At the fascia of boxes, balconies and galleries not less than 660mm in height; not less than 9w14mm in height at the end of aisles extending to the fascia for the full width of the aisle; and not less than 1067mm in height at the foot of steps for the full width of the steps.

7.27.6 At cross aisles: Along cross aisles, not less than 660mm in height except where the backs of the seats along the front of the aisles project 610mm or more above the floor of the aisle.

7.27.7 Successive tiers: Where seating are arranged in successive tiers, and the height of rise between platforms exceeds 457mm, not less than 660mm in height along the entire row of seats at the edge of the platform.

7.28 HANDRAILS

7.28.1 General: Where required by the provisions of Sections 8.14.2, 10.16.8, 10.17.13, 10.17.25, and 10.27.11, handrails shall be designed and constructed in accordance with this Section and Section 24.9.7. A handrail is a horizontal or sloping rail grasped by hand for

guidance or support, and for arresting falls on the adjacent walking surface.

7.28.2 Handrail details: Handrails shall conform to the requirements of Sections 10.29.1 through 10.29.7.

7.28.3 Projection: Handrails shall not project more than (89mm) into the required stair or ramp width.

7.28.4 Height: Handrails shall not be less than (864mm) nor more than (965mm), measured vertically, above the nosing of the treads or above the finished floor of the landing or walking surfaces.

7.28.4.1 Exception: Handrails that form part of a guardrail shall have a height not less than (864mm) and not more than (1067mm).

7.28.5 Handrail ends: Except for stairways within a dwelling unit, handrails shall extend at least 305mm beyond the top riser and at least 305mm plus the width of one tread beyond the top riser. At the top, the handrail extension shall be parallel to the walking surface. At the bottom, the handrail shall continue to slope for a distance of the width of one tread from the bottom riser with the remainder parallel to the walking surface. The handrails ends shall be returned to a wall or post. Handrails between runs of stairs shall be continuous around newel posts or shall terminate 305mm beyond the last riser as required above.

7.28.6 Handrail grip size: For all stair handrails located within a dwelling unit, the maximum horizontal cross-sectional dimension of the handrail shall not exceed 67mm.

7.28.7 Handrails of alternating tread stairways: Stair handrails of alternating tread stairways shall be of such a configuration as to provide an adequate hand-hold for a person grasping the handrail to avoid falling. A minimum distance of 152mm shall be provided between the stair handrail and any other object. A minimum of 305mm shall be provided between the stair handrails of adjacent alternating treads stairways.
Handrails on alternating tread stairways shall be spaced a minimum width of 432mm, not to exceed (610mm), between the handrails.

7.29 SIGNAGE

7.29.1 GENERAL

7.29.1.1 Scope: The provisions of this Chapter shall govern the construction, alteration, repair and maintenance of all signs together with their appurtenant and auxiliary devices in respect to structural and fire safety.

7.29.1.2 Zoning law: Where more restrictive in respect to location, use, size or height of signs, the limitations of the zoning laws affecting light and ventilation requirements and use of land shall take precedence over the regulations of this code.

7.29.1.3 Plans, specifications and permits

7.29.1.3.1 Owner's consent: Before any permit is granted for the erection of a sign, plans and specifications shall be filed with the code enforcement officer showing the dimensions, materials and required detail of construction, including loads, stresses and anchorage. The applications shall be accompanied by the written consent of the owner or lessee of the premises upon which the sign is to be erected.

7.29.1.3.2 New signs: A new sign shall not hereafter be erected, constructed, altered or maintained except as herein provided, and until after a permit has been issued by the code endorsement officer and the required bond shall have been filed in accordance with Section 14.6.

7.29.1.3.3 Identifications: Every sign for which a permit has been issued and hereafter erected, constructed or maintained shall be plainly marked with the name of the person, firm or corporation owning, erecting, maintaining or operating such sign. The method and location

of this identification shall appear on the plans and within the specifications filed with the code endorsement officer.

7.29.1.3.4 Alterations: A sign shall not be enlarged or relocated except in conformity to the provisions of this chapter of new signs, until a proper permit has been secured. The changing of movable parts of an approved sign that is designed for such changes, or the repainting or reposting of display matter, shall not be deemed an alteration, provided the conditions of the original approval and the requirements of this chapter are not violated.

7.30 EXCEPTIONS

7.30.1 General: A permit shall not be required for the signs covered by the provisions of this section. Such exceptions, however, shall not be construed to relieve the owner of the sign from responsibility for its erection and maintenance in a safe manner.

7.30.2 Wall signs: A sign painted on the surface of a fence or approved building wall, or any non-illuminated wall sign on a building or structure which is not more than 1 square meter in area.

7.30.3. Ground signs: The ground signs listed in Sections 14.2.4 through 14.2.6 shall not require a permit.

7.30.4 Sale or rent: Signs erected to announce the sale or rent of the property so designated, provided such signs are not more than 2.5 square meters in area.

7.30.5. Transit signs: The erection or maintenance of a sign designating the location of a transit line, a railroads station or other public carrier when not more than 0.3 square meter in area.

7.30.6 Street signs: Signs erected by a jurisdiction for street direction.

7.30.7 Projecting signs: A projecting sign not exceeding 0.25 square meters of display surface shall not require a permit.

7.31 UNSAFE AND UNLAWFUL SIGNS

7.31.1 Notice of unsafe signs: When any sign becomes insecure, or in danger of falling or otherwise unsafe, or if any sign shall be unlawfully installed, erected or maintained in violation of any of the provisions of this code, the owner thereof or the person or firm maintaining same shall upon written notice of the code enforcement officer, forthwith in the case of immediate danger and in any case within not more than ten days, make such sign conform to the provisions of this Chapter or shall remove it. If within ten days the said sign does not conform to the provisions of this Chapter, the Code Enforcement Officer is authorised to remove such sign at the expense of the owner or lessee thereof provided in section 2.3.

7.31.2 Unlawful signs: The location or positioning of signs listed in the following Sections 14.3.7 shall be considered unlawful.

7.31.3 Egress obstructions: A sign shall not be erected, constructed, or maintained so as to obstruct any fire escape, means of egress, window or door opening used as an element of a means of egress, or to prevent free passage from one part of a roof to another part thereof or access thereto as required by the provisions of Part 8 or for the fire-fighting services having jurisdiction.

7.31.4 Obstruction to ventilation: A sign shall not be attached in any form, shape or manner which interfere with any opening required for ventilation except that such signs are permitted to be erected in front of or cover transom windows when not in violation of the provisions of this Code.

7.31.5 Obstruction to view of traffic: A sign shall not be erected, constructed, installed or maintained so as to obstruct the sightlines of vehicular and pedestrian traffic in such a manner

as to constitute a traffic hazard.

7.31.6 Projecting signs: A projecting sign erected at other than right angles to the wall of a building or structure outside of the building line which extends above the roof cornice or parapet wall, or above the roof level when there is not a cornice of parapet wall and which obstructs access to the roof is hereby deemed unlawful. Such signs shall be reconstructed or removed as herein required.

7.31.7 Alleys signs: Signs shall not be permitted to project beyond alley plot lines.

7.32 EXISTING SIGNS

7.32.1 Removing or reconstructing signs: A sign heretofore approved and erected shall not be repaired, altered or moved, nor shall any sign or any substantial part thereof which is blown down, destroyed or removed be re-erected, reconstructed, rebuilt or relocated unless it is made to comply with all applicable requirements of this Chapter.

7.32.2 Repair of unsafe signs: Any sign that is moved to another location on the same or other premises shall be considered a new sign, and a permit shall be secured for any work performed in connection therewith when required by this Chapter.

7.33 MAINTENANCE AND INSPECTION

7.33.1 Removal: The Code Enforcement Officer is authorised to order the removal of any sign that is not maintained in accordance with the provisions of this Chapter.

7.33.2 Maintenance: All signs for which a permit is required, together with all their supports, braces, guys, and anchors, shall be kept in repair in accordance with the provisions of this Chapter. When not galvanised or constructed of approved corrosion resistive, non-combustible materials, signs shall be painted when necessary to prevent corrosion.

7.33.3 Housekeeping: It shall be the duty and responsibility of the owner or lessee of every sign to maintain the immediate premises occupied by the sign in a clean, sanitary and healthful condition.

7.33.4 Inspection: Every sign shall be subject to the periodic inspection and approval of the Code Enforcement Officer.

7.34 BONDS AND LIABILITY INSURANCE

7.34.1 Filing: A person shall not erect, install, remove, re-hang or maintain over public property any sign for which a permit is required under the provisions of this Code until an approved bond shall have been filed in a sum approved by the Building Code Enforcement Officer or until an appropriate insurance policy cover shall have been secured in respect of public liability.

7.34.2 Conditions: Such bond or insurance policy shall protect and save the jurisdiction harmless from any and all claims or demands for damages by reason of any negligence of the sign hanger, contractor or agents, or by any reason of defects in the construction, or damages resulting from the collapse, failure or combustion of the sign or parts thereof.

7.34.3 Notice of cancellation: The obligation herein specified shall remain in force and effect during the life of every sign and shall not be cancelled by the principal or surety until after a 30-day notice to the Code Enforcement Officer.

7.35 GENERAL REQUIREMENTS FOR ALL SIGNS

7.35.1 Construction: All signs shall be designed and constructed in conformance with the provisions for materials, loads and stresses of this Code.

7.35.2 Design loads: Loads listed in Section 14.7.3 shall be the minimum for the design of signs.

7.35.3 Wind: All signs shall be designed and constructed to withstand wind pressure.

7.35.4 Illumination: A sign shall not be illuminated by other than electrical means and electrical devices and wiring shall be installed in accordance with the requirements of Power Holding Company of Nigeria (PHCN Plc) or any other power generating entity. Any open spark or flame shall not be used for display purposes unless specifically approved.

7.35.5 Use of combustibles: Wood or approved plastic or other materials of combustible characteristics similar to wood, when used for moldings, cappings, nailing blocks, letters and latticing, shall comply with Section 14.8.1, and shall not be used for other ornamental features of signs, unless approved.

7.35.6 Earthquake: Signs adequately designed to withstand wind pressures shall generally be considered capable of withstanding earthquake shocks, except as provided under wind load and for combined loading under Earthquake load.

7.36 GROUND SIGNS

7.36.1 Structural frame: The structural frame of ground signs shall not be erected of combustible materials to a height of more than 10.7m above the ground.

7.36.2 Maximum size: In all locations, when constructed entirely of non-combustible material, ground signs shall not be erected to a height of greater than 30.5m above the ground. Greater heights are permitted when approved and located so as not to create a hazard or danger to the public.

7.37 ROOF SIGNS

7.37.1 Materials: All roof signs shall be constructed entirely of metal or other approved materials except as provided in Section14.7.5. Provisions shall be made for electric earthing of all metallic parts. Where combustible materials are permitted in letters or other ornamental features, all wiring and tubing shall be kept free and insulated therefrom.

7.37.2 Bottom clearance: There shall be a clear space of not less than 1.8m between the lowest part of the sign and the roof level, except for necessary structural supports.

7.38 WALL SIGNS

7.38.1 Materials: Wall signs which have an area exceeding 4m^2 shall be constructed of metal or other approved non-combustible materials, except for nailing rails and as provided in this Code.

7.38.2 Exception: Wall signs shall not be erected to extend above the top of the wall, nor extend beyond the ends of the wall to which they are attached unless meeting all the requirements for roof signs, projecting signs or ground signs.

7.39 PROJECTING SIGNS

7.39.1 Materials: Projecting signs shall be constructed entirely of metal or other approved non-combustible materials except as provided in Section 14.7.5.

7.39.2 Clearance: A clear space of not less than 3.0m shall be provided below all parts of such signs.

7.39.3 Additional loads: Projecting signs structures which could be used to support an individual on a ladder or other servicing device whether or not specifically designed for the servicing device shall be capable of supporting the anticipated additional load but not less than 45.4kg concentrated horizontal load and 136.2kg vertical concentrated load applied at the point of assumed or most eccentric loading. The building component to which the projecting sign is attached shall also be designed to support the additional loads.

7.40 MISCELLANEOUS AND TEMPORARY SIGNS

7.40.1 Banner and cloth signs: Temporary signs and banners attached to or suspended from

a building, constructed of cloth or other combustible material, shall be constructed in an approved manner and shall be securely attached to their supports.
They shall be removed as soon as torn or damaged, and not later than 60 days after erections. Permits for temporary signs suspended from or attached to a canopy or marquee shall be limited to a period of ten days.

7.40.2 Maximum size: Temporary signs of combustible construction shall be not more than 3 meters in one dimension nor more than 46.5m^2 in area.

7.40.3 Supports: When more than 9.3m^2 in area, temporary signs and banners shall be constructed and fastened to supports capable of withstanding the designed load.

7.40.4 Special limits: Temporary signs used for holidays, public demonstrations or promotions of civic welfare or charitable purposes which extend across streets or other public spaces shall be subject to special approval of the authority having jurisdiction.

7.41 ILLUMINATED SIGNS

7.41.1 Certificates: All electrically illuminated signs shall be certified as to electric wiring and devices by the agency having jurisdiction, and all wiring and accessory electrical equipment shall conform to the requirements of PHCN PLC and relevant electrical standards.

7.41.2 Additional permits: Electrical permits shall be issued for the erection or maintenance of illuminated signs.

7.41.3 Relettering signs: The requirements of this Section shall not apply to the relettering of illuminated signs, except where such relettering requires a change of wiring or piping of the sign

7.42 PORTABLE SIGNS

7.42.1 Conformance: Portable signs shall conform to all requirements for ground, roof, projecting, flat and temporary signs when they are used in a similar capacity. The stipulations in this section shall not be construed to require portable signs to have connections to surface, tie-downs or foundations when provisions are made by temporary means or configuration of the structure to provide stability for the expected duration of the installation.

7.42.2 Electrical: Portable signs which require electrical service shall have a positive connecting device on the sign. Electrical service lines to the sign shall be protected from damage from all anticipated traffic.

7.43 REPAIR, ALTERATION, ADDITION TO AND CHANGE OF USE OF EXISTING BUILDINGS

7.43.1 General

7.43.1.1 Scope: The provisions of this Section are intended to maintain or increase the current degree of public safety, health, and general welfare in existing buildings while permitting repair, alteration, addition, and/or change of use without requiring full compliance with Sections 2, 3, 4, 5, 6, 7, 8 and 9, except where compliance with other provisions in this code is specifically required in this Chapter.

7.43.2 COMPLIANCE

7.43.2.1 General: For repairs, alterations, additions, and changes of use to existing buildings are evaluated in accordance with this Chapter, compliance with this Section shall be accepted by the Code Enforcement Division/Section/Unit.

7.43.2.2 Hazards: Where the Code Enforcement Officer determines that an unsafe condition exists, as provided for in Section 2.5, such unsafe condition shall be abated in accordance with Section 2.5.

7.43.3 APPLICABILITY

7.43.3.1 General: The provisions in the following Sections 12.1.3.2 through 12.1.3.6 shall apply to existing buildings that will continue to be, or are proposed to be, in Use Groups A, B, C, D, G ,H and I. These provisions shall not apply to historic buildings as provided for in Section 11.13.0.

7.43.3.2 Change in use: If an existing building is changed to a new use group classification and this chapter is applicable, the provisions of Chapter 12 for the new use group shall be used to determine compliance with this Code.

7.43.3.3 Part Change in use: If a portion of the building is changed to a new use group classification, and that portion is separated from the remainder of the building with vertical and horizontal fire separation assemblies having a fire-resistance rating corresponding to the highest fire grading prescribed in Table 29.3.0 for the separate uses, or with approved compliance alternatives, the portion changed shall be made to conform to the provisions of this Chapter.

If a portion of the building is changed to a new use group classification, and that portion is not separated from the remainder of the building with vertical and horizontal fire separation assemblies having a fire-resistance rating corresponding to the highest fire grading prescribed in Table 2.9.3 for the separate uses, or with approved compliance alternatives, the provisions of this Chapter applying to each use shall apply to the entire building. If there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.

7.43.3.4 Additions: Additions to existing buildings shall comply with all requirements of this Code and other regulations and bye laws derived therefrom for new construction. The combined height and area of the existing building and new addition shall not exceed the height and area allowed by Sections 11.2.0 and 11.3.0. Where a fire wall complying with Section 29.10.0 is provided between the addition and the existing building, the addition shall be considered a separate building.

7.43.3.5 Alterations and repairs: An existing building, or portion thereof, which does not comply with the requirements of this code for new construction shall not be altered or repaired in a manner that results in the building being less safe or sanitary than it is currently. If, in the alteration or repair, the current level of safety or sanitation is to be reduced, the portion altered or repaired shall conform to the requirements of this code.

7.43.3.6 Requirements for the physically challenged: All portions of the buildings proposed for change in use shall conform to the provisions of Section 11.12.0 as required by Section 11.12.1.

7.44 IMPLEMENTATION

7.44.1 Investigation and evaluation: For all proposed work covered by this section, the building owner shall cause the existing building to be investigated and evaluated by the relevant professionals.

7.44.2 Structural analysis: The owner shall have a structural analysis of the existing building made to determine adequacy of all structural systems for the proposed alteration, addition or change of use. The existing building shall be capable of supporting the minimum required loads.

7.44.3 Submittal: The results of the investigation and evaluation required in Section 12.2.1, along with all proposed compliance alternatives, shall be submitted to the Code Enforcement Division/Section/Unit.

7.44.4 Determination of compliance: The code enforcement officer shall determine whether the existing building, with the proposed additions, alteration or change of use, complies with the provisions of this Chapter and the provisions of Chapters 10,29 and 30.

7.45 FIRE SAFETY EVALUATION

7.45.1 General: The evaluation of the building for fire safety purposes shall be assessed as follows: (a) Fire Safety (b) Means of egress and (c) General safety as defined in Sections 12.3.2.1, 12.3.2.2 and 12.3.2.3.

7.45.1.1 Fire safety: Included within the fire safety category are the structural fire- resistance, detection, alarm and extinguishing system features of the facility.

7.45.1.2 Means of egress: Included within the means of egress category are the configuration, characteristics and support features for means of egress in the facility.

7.45.1.3 General safety: Included within the general safety category are the fire safety parameters and the means of egress parameters.

7.46 PRECAUTIONS DURING BUILDING OPERATIONS

7.46.1 GENERAL

7.46.1.1 Scope: The provisions of this Chapter shall apply to all construction operations in connection with the erection, alteration, repair, rehabilitation, demolition or removal of buildings and structures.

7.46.1.2 Other laws: Nothing herein contained shall be construed to nullify any rules, regulations or statutes of state agencies governing the protection of the public or workers from health or other hazards involved in manufacturing, mining and other processes and operations which generate noise toxic gases, dust or other elements dangerous to the respiratory system, eyesight or general well-being.

7.46.1.3 Combustible and explosive hazard: The provisions of this Code which apply to the storage, use or transportation of explosives, highly flammable and combustible substances, gases and chemicals shall be construed as supplemental to the requirements of the federal laws, and the rules and regulations of the states and local governments.

7.46.2 PLANS, SPECIFICATIONS AND SPECIAL PERMITS

7.46.2.1 Temporary construction: Before any construction operation is started, plans and specifications shall be filed with the Code Enforcement Division/Section/Unit showing the design and construction of all temporary construction interfacing the public highways access and services. Approval shall be secured before the commencement of any such work.

7.46.2.2 Special permits: All special licenses and permits for the storage of materials on sidewalks and highways, for the use of water or other public facilities and for the storage and handling of explosives shall be secured from the administrative authorities having jurisdiction.

7.46.2.3 Temporary encroachments: Subject to approval, sidewalk sheds, underpinning and other temporary protective guards and devices shall project beyond the interior and street plot lines where required to ensure the safety of the adjoining property and the public. When necessary, the consent of the adjoining property owner shall be obtained.

7.46.3 TEST

7.46.3.1 Loading: It shall be unlawful to load any structure, temporary support, scaffolding, sidewalk bridge or sidewalk shed or any other device or construction equipment during the construction or demolition of any building or structure in excess of its safe working capacity as provided in Chapters 24 and 25 for allowable loads and working stresses.

7.46.3.2 Unsafe equipment: Whenever any doubt arises as to the structural quality or strength of scaffolding plank or other construction equipment, such material shall be replaced,

or the Code Enforcement Officer shall require a strength test to four times the superimposed live load to which the material or structural member is to be subjected. The member shall sustain the test load without failure.

7.46.4 INSPECTION

7.46.4.1 Unsafe condition: When inspection of any construction operation reveals that any unsafe or irregular conditions exist, Code Enforcement Officer shall notify the owner and direct the owner to take the necessary remedial measures to remove the hazard or violation.

7.46.4.2 Failure to comply with orders: Unless the owner so notified proceeds to comply with the orders of the code enforcement officer within 7 days, the Code Enforcement Officer shall have full power to correct the usage conditions as provided in Section 2.3.6.2 and 2.6. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

7.46.4.3 Unsafe construction equipment: When the strength and adequacy of any scaffolding or other device or construction equipment is in doubt, or when any complaint is made, the code enforcement officer shall inspect such equipment and shall prohibit its use until tested as required in Section 13.1.6.2 or until all danger is removed.

7.47 MAINTENANCE

7.47.1 General: All construction equipment and safeguards shall be constructed, installed and properly maintained and shall be so operated as to ensure protection to the workers engaged thereon and to the general public. It shall be unlawful to remove or render inoperative any structural, fire protection or sanitary safeguard or device herein required except when necessary for the actual installation and prosecution of the work.

7.48 EXISTING BUILDINGS

7.48.1 Protection: All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

7.48.2 Chimney, soil and vent stacks: Whenever a new building or structure is erected to greater or less heights than an adjoining building, the construction and extension of new or existing chimneys shall conform to the provisions of the Mechanical Code listed in the Schedule, and the construction and extension of soil and vent stacks and the location of window openings shall comply with the provision of Section 28.5.4.

7.48.3 Adjoining walls: The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. The owner shall underpin where necessary and support the adjoining building or structure by proper foundations to comply with Section 13.6.

7.48.4 Maintenance: In case an existing party wall is intended to be used by the person who causes an excavation to be made, and such party wall is in good condition and sufficient for the use of both the existing and proposed building, such person shall preserve the party wall from injury and support it by proper foundations at his own expense, so that it shall be and remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weatherproof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.

7.48.5 Beam holes: When a structure involving a party wall is being demolished the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick up all open beam holes and otherwise maintain the safety and usefulness of the wall.

7.48.6 Party wall exits: A party wall balcony or horizontal exit shall not be destroyed unless

and until a substitute means of egress has been provided and approved by the Code Enforcement Officer.

7.48.7 Adjoining roofs: When a new building or demolition of an existing building is being undertaken at a greater height, the roof, roof outlets and roof structures of adjoining buildings shall be protected against damage with adequate safeguards by the person doing the work.

7.49 PROTECTION OF PUBLIC WORKERS

7.49.1 General: Whenever a building or structure is erected, altered, repaired, removed or demolished, the operation shall be conducted in a safe manner and suitable protection for the general public and workers employed thereon shall be provided.

7.49.2 Fences: Every construction operation located 1.5m or less from the street plot line shall be enclosed with a fence not less than 2.4m high to prevent entry of unauthorized persons. When located more than 1.5m from the street plot line, a fence or other barrier shall be erected when required by the Code Enforcement Division/Section/Unit. All fences shall be of adequate strength to resist wind pressure.

7.49.3 Sidewalk bridge: Whenever the ground is excavated under the sidewalk, a sidewalk bridge shall be constructed at least 1.2m wide, or a protected walkway of equal width shall be erected in the street, provided the required permit for such walkway is obtained from the administrative authority as provided for in Section
13.1.4.1.

7.49.4 Sidewalk shed: Sidewalk sheds shall be provided in accordance with Section
13.4.5 through to 13.4.8. as follows:

7.49.5 Within 3 meters of street plot line: When any building demolished or erected is located within 3 meters of the street plot line is to be erected or raised more than
12 meters in height, or whenever a building more than 12 meters in height within 3 meters of the street plot line is to be demolished, a sidewalk shed shall be erected and maintained for the full length of the building on all street fronts, for the entire time that work is performed on the exterior of the building.

7.49.6 Within 6 meters of street plot line: When the building being demolished or erected is located within 6 meters of the street plot line and is more than 12 meters in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than two floors.

7.49.7 Buildings higher than six floors: When the building being demolished or erected is more than six floors or 22 meters (22860mm) in height, unless set back from the street plot line a distance more than one-half its height, a sidewalk shed shall be provided.

7.49.8 Walkway: An adequately lighted walkway at least 1.2meters wide and 2.4 meters high in the clear shall be maintained under all sidewalk sheds for pedestrians. When ramps are required, they shall conform to the relevant provisions of this Code.

7.49.9 Thrust-out platforms: Thrust-out platforms or other substitute protection in lieu of sidewalk sheds shall not be used unless approved and deemed adequate to ensure the public safety. Thrust-out platforms shall not be used for the storage of materials.

7.49.10 Watchman: Whenever a building is being demolished, erected or altered, a watchman shall be employed to warn the general public when intermittent hazardous operations are conducted across the sidewalk or walkways.

7.50 DEMOLITION AND EXCAVATION

7.50.1 Notice of intent: The person intending to cause a demolition or an excavation shall deliver written notice of such intent to the owner of each potentially affected adjoining plot, building or structure at least 30 days prior to the commencement of work. The notice shall request license to enter the potentially affected plot, building or structure prior to the

commencement of the work and at reasonable intervals during its execution to inspect and preserve it from any damage which might result from the intended work. The potentially affected adjoining owner shall have the right to inspect the drawings of the proposed works.

7.50.2 Protection of adjoining property: If afforded the necessary license to enter the adjoining plot, building or structure, the person causing the demolition or excavation to be made shall at all times and at his own expense preserve and protect it from damage or injury. If the necessary license is not afforded, it shall be the duty of the owner of the adjoining plot, building or structure to make safe his own property, for the prosecution of which he shall be granted the necessary license to enter the premises of the demolition or excavation.

7.50.3 Removal of debris: All waste materials shall be removed in a manner which prevents injury or damage to persons, adjoining properties and public rights of way and keep such premises in safe and sanitary condition.

7.50.4 Notice to the Code Enforcement Division/Section/Unit: If the person causing a demolition or excavation to be made is not afforded license to enter an adjoining structure, plot or building, he shall immediately notify in writing both the Code
Enforcement Officer and the owner of the adjoining property that the responsibility of providing support to the adjoining plot, building or structure has become his (the person causing the demolition or excavation) exclusive responsibility.

7.51 REGULATION OF PLOTS

7.51.1 General: When a building has been demolished and building operations have not been projected or approved, the following shall apply:

7.51.1.1 Grading of plot: The vacant plot shall be filled, graded and maintained in conformity to the established street grades at curb level. The plot shall be maintained free from the accumulation of rubbish and all other unsafe or hazardous conditions which endanger the life or health of the public. Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

7.51.1.2 Utility connections: All service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.

7.52 RETAINING WALLS AND PARTITION FENCES

7.52.1 General: When the adjoining grade is not higher than the permissible level, the person causing an excavation to be made shall erect, when necessary, a retaining wall at his own expense and on his own land. Such wall shall be built to a height sufficient to retain the adjoining earth, shall be properly coped and shall be provided with a guardrail or fence not less than 1 meter in height.

7.52.2 Design capacity: Materials or equipment stored within the building, or on sidewalk, sheds or scaffolds shall be placed so as not to overload any part of the construction beyond its design capacity, nor interfere with the safe prosecution of the work.

7.52.3 Special loading: Unless the construction is designed for special loading, materials stored on sidewalk sheds and scaffolds shall not exceed a one-day supply. All materials shall be piled in an orderly manner and height, to permit removal of individual pieces without endangering the stability of the pile.

7.52.4 Pedestrian walkways: Materials or equipment shall not be stored on the street without a permit issued by the administrative official having jurisdiction. When so stored, they shall not unduly interfere with vehicular traffic or the orderly movement of pedestrians on the highway or street. The piles shall be arranged to maintain a safe walkway not less than 1.2m wide, unobstructed for its full length, and adequately lighted at night and at all necessary times for

the use of the public.

7.52.5 Obstruction: Material and equipment shall not be placed or stored so as to obstruct access to fire hydrant, standpipes, fire or police alarm boxes, utility boxes, catch basins or manholes, nor shall they be located within 6 meters of a street intersection, or so placed as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

7.53 REMOVAL OF WASTE MATERIAL

7.53.1 General: Material shall not be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection. Wood or metal chutes shall be provided for this purpose and any material which in its removal will cause an excessive amount of dust shall be wet down to prevent the creation of a nuisance.

7.54 PROTECTION OF ADJOINING PROPERTY

7.54.1 General: Adjoining property shall be completely protected from any damage incidental to the building operation when the owner of the adjoining property permits free access to the building at all reasonable times to provide the necessary safeguards in accordance with Section 13.6.

7.54.2 Guardrails: All floor and wall openings shall be protected with adequate guardrails and toe board.

7.55 SCAFFOLDS

7.55.1 Load capacity: Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load. All platform and supporting elements of scaffolds shall be designed and constructed to support uniform minimum live loads in kilograms per meter square of the platform area in accordance with the classifications described in Table 13.10.

7.55.2 Erection: Built-up, swinging and suspended scaffolds shall be erected by competent workers only.

7.55.3 Scaffolding: All scaffolding shall be constructed in accordance with Sections 13.10.4 and 13.10.5 as follows:-

7.55.4 All buildings: All scaffolding exceeding 26 meters or seven floors in height used in construction operations involving the erection, alteration or maintenance of buildings, shall be constructed of non-combustible or fire-retardant materials complying with the provision of Section 29.4.

TABLE 13.10 SCAFFOLD LOAD CAPACITY

CLASSIFICATION	SERVICE TYPE	LOAD KILOS PER SQUARE METER
Light duty	Carpenters	122.05
	Stone setters	122.05
	(No stone on scaffold) Miscellaneous	122.05
Medium duty	Bricklayers	244.10
	Stucco	244.10
	Lathers and Plasterers	244.10
Heavy duty	Stone masons	366.15

7.55.5 Use Group F: All scaffolding used in construction operations involving the repair or partial demolition during occupancy of buildings of Use Group F-2 and F-3 shall be constructed of non-combustible or fire-retardant materials complying with the provisions of Section 29.4.

7.56 HOISTS

7.56.1 Hoist protection: All material hoists shall be adequately protected. When erected on the outside of a building over 26 meters or seven floors in height, the hoist structure shall be built of non combustible or approved fire-retardant materials with the exception of the loading platform.

7.56.2 Passengers prohibited: Persons shall not be permitted to ride a material hoist. Temporary elevators shall be installed when necessary to transport workers as provided in Chapter 27.

7.56.3 Guarding of cables: All hoisting cables and signal cords shall be guarded whenever they pass through working spaces to prevent injury to persons.

7.56.4 Rigger's license: All persons engaged in the erection of derricks and other hoisting apparatus shall secure a license or certificate of fitness for the performance of such work from the authorised administrative official.

7.57 STAIRWAYS AND LADDERS

7.57.1 Temporary stairways: When a building has been constructed to a greater height than 15 meters or four floors, or when an existing building exceeding 15 meters in height is altered, at least one temporary lighted stairway shall be provided unless one or more of the permanent stairways are erected as the construction progresses.

7.57.2 Ladders: Temporary ladders, when permitted for access to floors before stairways are installed, or which are designed for other working purposes, shall extend at least 1.0 meter above the floor level which they serve.

7.58 LIGHTING

7.58.1 General: All stairways and parts of buildings under demolition, erection or repair shall be adequately lighted while persons are engaged at work, to comply with the provisions of Sections 10.25 and 26.2.7.

7.59 FIRE HAZARDS

7.59.1 General: The provisions of this code and of the fire prevention code listed in the Schedule, shall be strictly observed to safeguard worker against hazards attendant upon construction operations.

7.59.2 Storage of flammables: Storage of gasoline for hoist, oils, paints and other highly flammable materials shall be permitted only as specified in Chapter 6 and when stored in approved safety containers. The storage of larger quantities shall not be approved unless stored in separate compartments or enclosures of approved noncombustible construction.

7.59.3 Flame cutting and welding: The use of oxyacetylene torches for cutting or welding shall be permitted only in accordance with ANSI Z49.1 listed in the Schedule.

7.59.4 Concrete forms: Combustible materials shall not be stored on any floor of a building under construction until all combustible concrete forms are removed from the tier immediately above.

7.59.5 Fire extinguishers: Fire extinguishers shall be provided as required by Section 30.22.

7.59.6 Standpipes and fire lines: Where standpipes are provided as a permanent part of the building, they shall be installed and made ready for instant use by the fire service as the

structure progresses in accordance with the provisions of Section 30.14. Free access from the street to such standpipes shall be maintained at all times. Materials shall not be stored within 1.5 meters of any fire hydrant or in the roadway between such hydrant and the center line of the street.

7.59.7 Housekeeping: Rubbish and trash shall not be allowed to accumulate on the site and shall be removed as fast as conditions warrant. Combustible rubbish shall be removed daily, and shall not be disposed of by burning on the premises or in the immediate vicinity. The entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulation of trash, rubbish, nuts, bolts small tools and other equipment.

7.60 HEALTH HAZARDS

7.60.1 General: Every construction or maintenance operation which results in the diffusion of noise, dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of local ventilation or other protective devices to ensure the safety of the workers and the public as required by this Code and contained in Tables 13.15(a), 13.15(b), 13.15(c), and 13.15(d).

7.60.2 Removal of dust: Dust, sand blasts or other harmful agents, when employed or occurring in construction operations shall be disposed of at or near the point of origin to prevent their diffusion over adjoining premises or streets as contained in 13.15(b).

7.60.3 Protective equipment: Facilities shall be provided in approved closed containers for housing the necessary vision, respiratory and protective equipment required in welding operations, and in accordance with the regulations of the administrative official.

7.60.4 Welding enclosures: All welding and flame-cutting operations shall be performed in protected areas with full consideration of safety and fire hazards. Such closed spaces shall be properly ventilated while welding or cutting is being done. Suitable protection against the rays of the electric arc shall be maintained by the contractor where welding operations might be viewed within harmful range by persons other than the welding operations and inspectors.

7.60.5 Flammable materials: Proper precautions shall be taken to avoid all risk of fire or explosion, and flammable or explosive materials shall not be stored in the vicinity of welding or cutting operations.

7.61 SANITATION

7.61.1 General: Every building in the course of demolition, erection or repair shall be provided with toilet and drinking water facilities which shall be constructed and installed in accordance with the Plumbing Code listed in the Schedule.

7.61.2 DISPUTES

7.61.2.1 GENERAL: The Code Enforcement Division/Section/Unit when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner, tenant and their agents who fail to conform to the requirements of this Chapter, directing such person to take the necessary remedial action. If the person whose duty it is to protect his own or adjoining property under those provisions fails to proceed to fully comply with such notice within seven days of receipt thereof, or within a reasonable time thereafter as determined by the Code Enforcement Officer, the code enforcement officer is authorised to cause the necessary work to be done when the health, safety and general welfare of the public are involved. The cost of such work shall become a lien against the property of the offending owner, and the legal authority of the jurisdiction shall institute appropriate action for its recovery.

TABLE 13.15(a)

ACCEPTABLE NOISE LEVEL

The Table below shows recommended maximum daily exposure

Sound Pressure Level (dB(A)	Max. Exposure in any 24 hours
85 or less	24 hours
87	16 "
90	8 "
93	4 "
96	2 "
99	1 hour
102	30 minutes
105	15 "
108	7/ "
111	3% "

TABLE 13.15(b)

DUST

THRESHOLD LIMIT VALUES in mg/m^3 (Total and Respirable Mass) FOR SOME DUSTS

	Threshold Limit Value	
Substance	Respirable Mass mg/m3	Total Mass mg/m^3
Asbestos, all forms	2 fibres/c.c 5 um in length	2 fibres/c.c 5 um in length
Silica (Si02) Amorphous	(3)	(6)

Cristobalite	0.05	0.15
Fused Silica	0.1	0.3
Quartz	0.1	0.3
Tridymite	0.05	0.15
Lead	0.15	0.15
Coal	2 5% quartz	(4) 5% quartz
Nuisance particulates	(5)	10
Aluminium metal and/or oxide	10mg/m^3	10mg/m^3
Ferric Oxide (iron oxide)	5mg/m^3	5MG/m^3
Portland cement	(%)	(10)
Diatomaceous Earth, Natural	1.5	
Graphite	(2.5)	(5)

TABLE 13.15 (c) First Aid Facilities 1 SUPPLEMENT

Waterproof dressings	Anti-diarrhea e.g. mexoform
Antiseptic lotion and cream	Anti-malarial e.g. malaria
Antihistomine lotion and cream	Anti acids e.g. Gilusil
Splints (all sizes)	Splint forceps
Rubber bandages	Eye lotion
Stretchers e.g. Neil Robertson type where necessary	Book for record keeping
Anti-snake venom	Scissors
Anti-tetanus serum	Razor blades
Morphine injection (individual plits)	Oxygen cylinder
Amyl mitrite ampodes	Mechanical resuscitaror e.g. Ambu Bay
Analgesics	Airways.

plus 7 - 14 as per standing order of medical officer.

TABLE 13.15(D)

FIRST AID FACILITIES 2

Sterilized medicated dressing	plus 1-20	plus 21-100	plus 101-199
(a) Finger	12	24	50
(b) Medium sized	6	12	25
(c) Large sized	6	12	25
Adhesive wound dressing (all sizes)	25	40	100
Triangular bandages of unvleached colics	2	4	12
Adhesive plaster (all sizes)	6	12	24
1/2 oz. packets of cotton wool	1	4	12
Sterilized eye pads	2	6	12
Safety pins	6	12	24
Rubber bandages/pressure dressing	1	1	1

plus 1 - 20 - First Aid Kit; 21 - 100 - First Aid Box; 101 - 199 First Aid Post

SECTION 8 CIVIL / STRUCTURAL / GEO-TECHNICAL DESIGN REQUIREMENTS

Sections

SECTION 8 CIVIL / STRUCTURAL / GEO-TECHNICAL DESIGN REQUIREMENTS

8.1 BUILDING DESIGN REQUIREMENTS

8.2 SPECIAL BUILDING DESIGN REQUIREMENTS

8.3 SIGNAGE

8.4 REPAIRS, ALTERATIONS

8.5 PRECAUTIONS DURING

The provisions of sections 7.1, 7.2, 7.4, 7.5 and 7.6 of this Code shall apply to these sub-sections.

8.6 MATERIALS AND COMPONENTS

The provisions of sections 10.1 to 10.9 of this Code shall apply to these sub-sections.

8.7 FIRE

The provisions of sections 12.1 and 12.2 of this Code shall apply to these sub-sections.

8.8 STRUCTURAL LOADS/STABILITY

8.8.1 Scope: The provisions of these sections shall control the structural designs of all buildings and structures or portions thereof.

8.8.2 PLANS AND SPECIFICATIONS

8.8.2.1 General: Design plans drawn to minimum scale of 1:100 shall show the size, section and relative locations of all structural members with floor levels, column centres and all offsets fully dimensioned. The design loads shall be clearly indicated for all parts of the building of structure.

8.8.3 DESIGN SAFE LOAD

8.8.3.1 Safe Support required: Building or other structures, and all parts thereof, shall be designed and constructed to support safely all loads, without exceeding the allowable stresses (or specified strengths when appropriate load factors are applied) for the materials of construction in the structural members and connections.

8.8.3.2 Progressive collapse: Buildings and structural systems shall provide such structural integrity that the hazards associated with progressive collapse are reduced to a level consistent with standard practice. Structures shall be able to sustain local damage or failure with the structure as a whole remaining stable. Compliance with the applicable provisions as listed in Schedule 24.1 shall be deemed to meet the requirements of this section.

8.8.3.3 Load tests: The code enforcement officer is authorised to require a load test or certified report of such tests, conducted in an approved manner by approved testing agencies, of any construction whenever there is reason to question its safety for the intended occupancy or use.

8.8.4 DESIGN LIVE LOAD

8.8.4.1 Required live load: The live loads to be assumed in the design of buildings and structures shall be the greatest load produced by the intended use and occupancy, but not less than the minimum uniformly distributed unit loads required in Section 24.6.0 for specific uses.

8.8.4.2 Load not specified: The code official shall approve the required live load for any use not specifically provided for in Table 24.6.

8.8.5 DESIGN DEAD LOAD

8.8.5.1 Weights of materials and construction: In estimating dead load for the purposes of structural design, the actual weights of materials and constructions shall be used, but not less than the unit dead loads prescribed in N.C.P.I Part 3 (loading) as listed in Schedule 24.2. In the absence of definite information, any values assumed by the designers shall be subject to the approval of the code enforcement officer.

8.8.5.2 Weight of fixed service equipment: In estimating dead loads for purposes of design, the weight of fixed service equipment such as plumbing stacks and risers, electrical feeders, heating, ventilating, air-conditioning and sprinkler systems shall be included.

8.8.5.3 Partition load; In offices and other buildings, in which subdividing partitions are subsequently erected, re-arranged or relocated, provision shall be made to support the actual weight of such partitions where they occur, or for an equivalent uniform load, which shall be assumed not less than 1 KN/m^2 of floor area in addition to the specified uniformly distributed live load. Provision for partition weight shall be made whether or not partitions are shown on the plans, unless the specified live load exceed 4 KN/m^2.

8.8.6 EXISTING BUILDINGS

8.8.6.1 General: In the reconstruction, repair, extension or alteration of existing buildings, the allowable working stresses used in design shall be as indicated in Section 24.5.2 through 24.5.5.

8.8.6.2 Building extended: When an existing building is altered by an extension in height or area, all existing structural parts affected by the addition shall be strengthened where necessary, and all new structural parts shall be designed to meet the requirements for buildings hereafter erected.

8.8.6.3 Building repaired: When repairs are made to the structural portion of an existing building, and the uncovered structural portions are found to be unsound, such parts shall be made to conform to the requirements for buildings hereafter erected.

8.8.6.4 Existing live load: When an existing building heretofore approved is altered or repaired the minimum design loads and stresses for the structure shall be the loads and stresses applicable at the time of erection, provided the public safety is not endangered thereby.

8.8.6.5 Posted live load: Any existing building heretofore approved, in which there is not a change in use to a new use group requiring greater floor loads, is permitted to be posted for the originally-approved live loads, provided the building is structurally safe in all its parts and adequate for its existing use, and the public safety is not endangered thereby.

8.8.7 UNIFORMLY DISTRIBUTED LIVE LOAD

8.8.7.1 Uniform live load: The minimum uniformly distributed live load in KN per square meter shall be as provided in Table 8.6.1, and all concentrated loads wherever they occur shall be provided in Section 8.6.0. The live loads in Table 8.6.1 are the minimum loads to be used for the occupancies listed. Where the buildings will be subjected to greater live loads, such loads shall be used for design.

8.8.7.1.1 Trucks and buses: Minimum live loads for garages having trucks or buses shall be in accordance with live loads of Federal Ministry of Works recommendations as listed in Schedule 8.3, but shall not be less than 2.45 KN/m^2.

8.8.7.1.2 Residential attics: A live load shall be applied to joists or to bottom chords of trusses or trussed rafters only in those portions of attic space having a clear height of over 1m between joist and rafter in conventional rafter construction; and between bottom chord and any other member in trusses or trussed rafter construction. However, joists or the bottom

chords of trusses or trussed rafters shall be designed to sustain the imposed dead load or 0.5KN/m^2, whichever is greater, uniformly distributed over the entire span. A further ceiling dead load reduction to a minimum of 0.25KN/m^2 or the actual dead load, whichever is greater, applied to joists in conventional rafter construction or to the bottom chords of trusses or trussed rafters is permitted under either or both of the following conditions where the clear height:

Is not over 7.5m between joist and rafter in conventional construction and between the bottom chord and any other member for trusses or trussed rafter construction.

Of greater than 7.5m, as defined in sub-clause 24.6.1.2.1 directly above, does not exist for a horizontal distance of more than 3.5m along the member.

8.8.7.2 Posting of live loads: In every building or other structure or part thereof the design loads shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or the owner's authorised agent, in a conspicuous place in each space to which they relate. Any plates lost, removed or defaced shall be replaced by the owner or the owner's agent.

TABLE 8.6.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

OCCUPANCY OR USE	Live Load KN/m^2
Apartments (Flats) see Residential	-
Armories and drill rooms	7.5
ASSEMBLY AREAS:	
Fixed seats	4.0
Movable seats	5.0
Platforms (Assembly)	5.0
Stage floors	7.5
Balconies (Exterior)	5.0

One and two family dwellings only	3.0
Poolrooms and billiard rooms	5.0
Corridors, except as otherwise indicated	5.0
DWELLINGS: (See Residential)	
Fire Escapes	5.0
Single - family residential buildings only	2.0
GARAGES:	
Passenger cars	2.5
Trucks and buses	2.5
GRAND STANDS (SEE REVIEWING STAND)	5.0
GYMNASIA, MAIN FLOORS AND BALCONIES	5.0
HOSPITAL:	
Operating rooms, laboratories	3.0
Private rooms	2.0
Wards	2.0
Corridors above first floors	4.0
INSTITUTIONAL - Residential care (See Residential)	
LIBRARIES:	
Reading rooms	3.0
Stack rooms	7.5
MANUFACTURING:	
Light	5.0
Heavy	7.5
Marquees (large tent)	4.0
OFFICE BUILDING:	
Offices	2.5
Lobbies	5.0
Corridors, above first floor	4.0
File and computer rooms require heavier loads based upon anticipated	5.0
Occupancy	2.0
PENAL INSTITUTIONS (Prisons):	
Cell blocks	1.0
RESIDENTIAL:	
Attics	2.5
MULTI-FAMILY DWELLINGS:	
Dwelling units	5.0
Public rooms	4.0
Corridors	2.0
One and two family dwellings	1.5
Sleeping rooms (bedrooms)	2.0

HOTELS:	
Guest rooms	5.0
Public rooms	5.0
Corridors serving public rooms	8.0
Corridors	5.0
REVIEWING STANDS, GRANDSTANDS AND BLEACHERS SCHOOLS:	
Classrooms	2.0
Corridors	4.0
Side walk, vehicular driveways, subject to trucking	12.5
Stairs and exits	5.0
STORAGE AREAS:	
Light	6.0
Heavy	12.5
STORES:	
Retail	4.0
Wholesale	5.0
Yards and terraces for pedestrians	5.0

TABLE 8.7.1 MINIMUM CONCENTRATED LOADS

LOCATION	KN
Elevator machine room grating (on area of 2600 sq.mm)	1.5
Finish light floor plate construction (on area 6500 sq.mm)	0.9
Garages	See section 24.7.1.2
Greenhouse roof bars, purlins and rafters	0.45
Hospitals and ward rooms	4.5
Libraries	4.5
Manufacturing and storage buildings	9.0
Mercantile area	9.0
Office	9.0
Schools	4.5
Scuttles (Trap door) skylight ribs and accessible ceilings	0.9
Sidewalks or vehicular driveway subject to trucking	35.6
Stair treads (on area of 2600 sq.mm at centre of tread)	1.5

8.8.8 CONCENTRATED LOADS:

8.8.7.1 General: Floors of buildings in the locations specified in Table 1107 shall be designed to support the uniformly distributed live loads prescribed in Section 8.6.0 or the following minimum concentrated loads in pounds, whichever produces the greater stresses. If the anticipated actual loads are higher, the actual loads shall be used. Unless otherwise specified,

the indicated concentration shall be assumed to occupy an area of 0.00075m^2 and shall be so located as to produce the maximum stress conditions in the structural members.

8.8.8.2. Garages: Minimum concentrated loads for garages or portions of buildings used for parking motor vehicles shall be:

For passenger cars accommodating not more than nine passengers, 9.0KN acting on an area of 13000.0 square mm (0.013m^2), mechanical parking structures without slab, passenger car only, 6.7KN per wheel; and for trucks or buses, on slabs, maximum axle load on an area of 13 x 103mm^2.

8.8.9 IMPACT LOADS:

8.8.9.1 General: The live loads specified in Section 24.6.0 shall be assumed to include adequate allowance for ordinary impact conditions. Provisions shall be made in the structural design for special uses and loads which involve vibration and impact forces.

8.8.9.2 Elevator (Lift): All moving elevator loads shall be increased to 100 percent for impact, and the structural supports shall be designed within the limits of deflection prescribed by ASME A17.1 listed in Schedule 24.4.

8.8.9.3 Machinery: For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact:

Elevator machinery ..... 100 percent

Light machinery, shaft- or motor-driven .....20 percent

Reciprocating machinery or power-driven units ..... 50 percent

Hangers for floors or balconies ..... 33 percent

These percentages shall be increased when so recommended by the manufacturer.

8.8.9.4 Craneways: The design loads and appropriate impact factors for the design of buildings with bridge, monorail, jib, and single-leg gantry cranes Schedule 24.5.

8.8.9.5 Assembly structures: Grandstands, stadia and similar assembly structures shall be designed to resist the loads specified in Table 8.6.1. Loads of 1.8 KN/m on footboards and seatboards shall be used. Lateral sway bracing loads of 0.4KN/m parallel to and
0. 2KN/m per DS.

8.8.10 SPECIAL LOADS:

8.8.10.1 General: Provisions shall be made for all special loads herein prescribed and all other special loads to which the building or structure is subjected.

8.8.10.2 Retaining walls: Retaining walls shall be designed to resist the lateral pressure of retained material. Walls retaining drained earth shall be designed for a minimum pressure equivalent to that exerted by fluid weighing not less than 0.21 KN/m^3 and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

8.8.10.3 Hydrostatic uplift: All foundation slabs and other footings subjected to water pressure shall be designed to resist a uniformly distributed uplift equal to the full hydrostatic pressure.

8.8.10.4 Construction loads and erection stresses: Provision shall be made for temporary construction and wind loads which occur during the erection of the building; and all structural members and connections shall be designed and erected so as to prevent overstressing during construction.

8.8.10.5 Partial loading: The full intensity of the appropriately reduced live load applied only to a portion of the length of a structure or member shall be considered if it produces a more

unfavourable effect than the same intensity applied over the full length of the structure or member.

8.8.10.6 Interior finish: Finishing materials used on interior walls and partitions shall have adequate strength to resist a horizontal load of not less than 0.25 KN/m^2.

8.8.10.7 Guardrails and handrails: All required guardrails and handrails shall be designed and constructed to the structural loading conditions set forth in Sections 8.9.7.1 and 8.9.7.2 without exceeding the allowable design working stress of the materials, anchorage and connecting devices utilised. The allowable working stresses shall be as defined by the appropriate design standard. Each load shall be applied so as to produce the maximum stress in each of the respective components.

8.8.10.7.1 Handrail design and construction: Handrails shall be designed and constructed for a concentrated load of 1KN applied at any point and in any direction. Handrails located in (other than dwelling units) buildings shall also be designed and constructed for a uniform load of 1.2KN/m applied in any direction. The concentrated and uniform loading conditions shall not be applied simultaneously.

8.8.10.7.2 Guardrail system design and construction: Guardrails shall be designed and constructed for a concentrated load of 1.4KN applied at any point and in any direction along the top railing member. Guardrail systems located in other than dwelling units in buildings shall also be designed and constructed for a uniform load of 1.5KN/m applied in any direction at the required guardrail height. The concentrated and uniform loading conditions shall not be applied simultaneously.

The infill area of a guardrail system shall be designed and constructed for a horizontal concentrated load of 1KN applied on a 0.1m^2 at any point in the system, including intermediate rails or other elements serving this purpose.

8.8.11 ROOF LOADS

8.8.11.1 General: The structural supports of roofs and marquees shall be designed to resist wind (Section 8.12.0) and earthquake loads (Section 8.13.0). In addition to the dead load of construction and the appropriate live loads as prescribed in this section or in Figure 24.6.1.

8.8.11.2 Minimum roof loads: Ordinary roofs, flat, pitched or curved, shall be designed for the live loads as specified in Table 8.10.

8.8.11.3 Overhanging eaves: Except where the overhang framing is a continuation of the roof framing, overhanging eaves, and other roof projections shall be designed for a minimum uniformly distributed live load of 3KN/m^2.

8.8.11.4 Ponding: Roofs shall be designed for the maximum possible depth of water that would pond thereon as determined by the relative levels of roofs deck and overflow weirs, edges or serviceable drains in combination with the deflected structural elements. In determining the maximum possible depth of water, all primary roof drainage means shall be assumed to be blocked.

8.8.11.5 Special purpose roofs: When used for incidental promenade purposes, roofs shall be designed for a minimum live load of 23KN/m^2. When used for roof gardens or assembly or educational uses, the minimum designed load shall be 5.0KN/m^2.

8.8.11.5.1 Landscape roofs: When roofs are to be landscaped, the uniform design live load in the landscape area shall be 1KN/m^2. The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil.

Roofs to be used for other for other special purposes shall be designed for appropriate loads,

or as otherwise approved.

Table 8.10.

Roof slope	Tributary loaded area in sq.metre for any structural member		
	0 to 1000	1001 to 3000	over 3000
Flat or rise less than 100mm per sq metre (1:3) Arch or Dome with less than 1/8 of span	2	1.5	1.2
Rise 100mm per metre (1:3) to less than 300mm per metre (1:1) Arch or dome with 1/8 of span or less than 3/8 of span	1.5	1.3	1.2
Rise 300mm per metre (1:1) and greater Arch or dome with 3/8 span or greater	1.2	1.2	1.2

Table 8.11 IMPORTANCE FACTOR [/] (I)

All buildings and structures not listed below	1.0
Buildings and structures where the primary occupancy is one in which more than 300 people congregate in one area	1.1
Buildings and structures designated as essential facilities, including but not limited to: 1. Hospital and other medical facilities having surgery or emergency treatment areas 2. Fire or rescue and police stations 3. Primary communication facilities and disaster operation centers 4. Power stations and other utilities required in an emergency 5. Structures having critical national defense capabilities	1.2
Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities	0.8

8.8.11.6 Roof slope factor for curved roofs: The point at which the slope exceeds 70 degrees (1.22 rad) shall be considered the “eave” for such roofs. For curved roofs, the slope factor shall be determined by basing the slope on the vertical angle from the “eave” to the crown.

8.8.11.7 Roof slope factor for multiple roofs: For multiple folded-plate, sawtooth and barrel vault roofs with parallel ridge lines, the roof slope factor shall be considered to be equal to 1.0 (Cs = 1.0) regardless of the slope of the roof.

8.8.12 WIND LOAD:

8.8.12.1 General: All exposed structures or structural components, cladding and roof coverings shall be designed to resist the pressures due to wind in any direction as provided herein.

8.8.12.1.1 Wind loads during erection and construction phases: Adequate temporary bracing shall be provided to resist wind loading on structural components and structural assemblages during the erection and construction phases.

8.8.12.1.2 Overturning and sliding: The overturning moment due to wind load shall not exceed

two-thirds of the dead load stabilising moment unless the building or structure is anchored to resist the excess moment. When the total resisting force due to friction is insufficient to prevent sliding, anchorage shall be provided to resist the excess sliding force.

8.8.12.1.3 Symbols, notations and definitions: The following symbols and notations apply to the provisions of this section.

Pd =Pz+Ph = design pressure to be used in determination of wind loads for the main wind force-resisting system

Pz = windward design pressure evaluated at height z above grade, in KN per cubic metre Ph = leeward or sidewall pressure evaluated at height z = h, in KN per cubic metre z = height above grade, in metres

h = the mean roof height of a building, the height of other structures, or the eave height for buildings with roof slope of less than 10 degrees (0.17 rad), in metres

Pe = effective velocity pressure, including gust effect as tabulated in Table 8.12.1 (1) for exposure B and Table 8.12.2 for exposure C

I = importance factor of the building or other structure as indicated in Tables 8.12.3 and 8.12.4

Cp = external pressure coefficient to be used in determination of wind loads for buildings or for any other structures (see Figure 8.12.1 and Tables 8.12.5 through 8.12.10)

8.8.12.1.4 Components and cladding: Structural elements that are either directly loaded by the wind or receive wind loads originating at relatively close locations and that transfer those loads to the main wind force-resisting system.

8.8.12.1.5 Main wind force-resisting system: An assemblage of major structural elements designed to provide support for secondary members and cladding. The system primarily receives wind loading from relatively remote locations.

8.8.12.1.6 Design: The design and wind pressure for the main wind force-resisting system shall be determined as follows:

Pd = Pe x I2 x Cp

8.8.12.1.7 Components and cladding: The design wind pressure for structural components and cladding supporting tributary areas greater than 100m^2 shall be designed using the provisions for main wind force-resisting systems. Structural components and cladding supporting tributary areas, 100m^2 and less shall be designed in accordance with relevant BS COP listed in Schedule 24.1.

TABLE 8.12.5

EXTERNAL PRESSURE COEFFICIENT FOR ARCHED ROOFS Cp

Condition	Rise-to-spa ratio (r)	Cpb		
		Windward quarter	Centre half	Leeward quarter
Roof on elevated structure	0<,<0.2	0.9	-0.7r	-.05
Roof	0.2<r<0.3	15r-0.3	-0.7r	-0.5
Springing from ground level	0.3<r<0.6	275r-07	-0.7r	-.05
	0<r<0.6	1.4r	-0.7r	-0.5

Note a. Values listed are for the determination of average loads on main wind force- resisting system.

Note b. Plus and minus signs signify pressures acting toward and away from the surfaces

respectively.

Note c. When the rise-to-span is 0.2<r<0.3 alternate coefficients given by 5r-2.1 shall also be used for the windward quarter.

TABLE 8.12.6

FORCE COEFFICIENTS FOR CHIMNEYS TANKS AND SIMILAR STRUCTURES

Cp a.c

Shape	Cp for h/Db values of:		
	1	7	25
Square (wind normal to a face)	1.3	1.4	2.0
Square (wind along diagonal)	1.0	1.1	1.5
Hexagonal or octagonal (D/p>2.5)	1.0	1.2	1.4
Round (D/P>2.5)	0.7	0.8	0.9
Round (D/P<2.5)	0.7	0.8	1.2

Note a. The design wind force shall be calculated based on the area of the structure protected on a plane normal to the wind direction. The force shall be assumed to act parallel to the wind direction.

Note b. Linear interpolation is permitted for h/D values other than shown

Note c. Notation

D - Diameter or least horizontal dimension in M

h - Height of structure M

TABLE 8.12.7 FORCE COEFFICIENTS FOR SOLID SIGNS ac pc.d

At ground level		Above ground level	
V	Cp	M/N	Cp
<3	1.2	<6	1.2
5	1.3	10	1.3
8	1.4	16	1.4
10	1.5	20	1.5
20	1.75	40	1.75
30	1.85	60	1.85
>40	2.0	>80	2.0

Note a. Signs with openings comprising less than 30 percent of the gross area shall be considered as solid signs.

Note b. Signs for which the distance from the ground to the bottom edge is less than 0.25 times the vertical dimension shall be considered to be at ground level.

Note c. To allow for both normal and oblique wind directions, two cases shall be considered:

1. Resultant force acts normal to sign at geometric center, and
2. Resultant force acts normal to sign at level of geometric center and at a distance from windward

Note d. Notation:

V: Ratio of height to width

M: Larger dimension of sign in M

N: Smaller dimension of sign in M

TABLE 8.12.8

FORCE COEFFICIENTS FOR TRUSSED TOWERS a.Cp

e	Cp	
	Square towers d	Triangular towers d
<0.025	4.0	3.6
0.025 to 0.44	4.1 - 5.2e	3.7 - 4.5e
0.45 to 0.69	1.8	1.7
0.7 to 1.0	1.3 - 0.7e	1.0+e

Note a. Force coefficients are given for towers with structural angles or similar that sided members

Note b. For towers with rounded members the design wind force shall be determined using the values in the above table multiplied by the following factors:

e<0.29 factor = 0.67

0. 3<e<0.79 factor=0.67 e+0.47

0. 8<e<1.0 factor=1.0

Note c. For triangular section towers, the design wind forces shall be assumed to act normal to a tower face.

Note d. For square section towers, the design wind forces shall be assumed to act normal to a tower face. To allow for the maximum horizontal wind load, which occurs when the wind is oblique to the faces the wind load acting normal to a tower wind face shall be multiplied by the factor 1.0+0.7 e<0.5 and shall be assumed to act along a diagonal.

Note e. Wind forces on tower appurtenances such as ladders, conduits, lights, conductors, elevators and the like shall be calculated using appropriate force coefficient for these elements.

Note f. For guyed towers the cantilever portion of the tower shall be designated for 125 percent of the design force.

Note g. A reduction of 25 percent of the design force in any span between guys shall be made for e Ratio of solid area to gross area of tower.

TABLE 8.12.9

FORCE COEFFICIENTS FOR MONOSLOPE ROOFS OVER UNENCLOSED BUILDINGS AND OTHER STRUCTURES. Cp. ab

0 (degrees)	Cp for L/B values of:						
	5	3	2	1	1/2	1/3	1/5
10	0.2	0.25	0.3	0.45	0.55	0.75	
15	0.35	0.45	0.5	0.7	0.85	0.85	
20	0.5	0.6	0.75	0.9	1.0	0.9	
25	0.7	0.8	0.95	1.15	1.1	0.95	
30	0.9	1.0	1.2	1.3	1.2	1.0	

TABLE 8.12.9

FORCE COEFFICIENTS FOR MONOSLOPE ROOFS OVER UNENCLOSED BUILDINGS AND OTHER STRUCTURES, Cp. ab

0 (degrees)	Location of center of pressure, X/L for L/B values of:		
	2 to 5	1	1/5 to 1/2
10 to 20	0.35	0.3	0.3
II 25	0.35	0.35	
II 30	0.35	0.4	0.45 II

Note a: wind force acts normal to the surface and shall be directed inward or outward. Note b: Notation.

B - dimension of roof measured normal to wind direction m L - dimension of roof measured parallel to wind direction m X - distance to center of pressure from windward edge of roof m

0 - Angle plane of roof from horizontal in degree m.

TABLE 8.12.10

FORCE COEFFICIENTS FOR OPEN SIGNS AND LATTICE FRAMEWORKS Cp. b.c

e	Cp		
	Flat-sided members	Rounded members	
		D/Pe<2.5	D/Pe>2.5
<0.1	2.0	1.2	0.8
0.1 to 0.29	1.8	1.3	0.9
0.3 to 0.7	1.6	1.5	1.1

Note a. Signs with openings comprising 30 percent of the gross area are classified as open signs.

Note b. The calculation of the design wind forces shall be based on the area of all exposed members and elements protected on a plane normal to the wind direction. Forces shall be assumed to act parallel to the wind direction.

Note c. Notation.

Note e. Ratio of solid area to gross area.

Note d. Diameter of a typical round member in m.

8.8.12.1.8 Basic wind speed: The basic wind speed, in m/sec to be used for the location of the building or other structure shall be determined by Figure 24.12.1

8.8.12.1.9 Exposure classification: The effective velocity pressure, Pe, shall be as specified in Table 24.12.1 for exposure B and Table 24.12.2 exposure C where exposures B and C are defined as follows:

8.8.12.1.9.1 Exposure B: Urban and suburban areas, wooded areas, other terrain with numerous closely spaced obstructions having the size of single-family dwelling or larger. Use of this exposure category shall be limited to those areas for which terrain representative of Exposure B prevails in the upwind direction for a distance of at least (500m or 10 times the height of the building or structure, whichever is greater.

8.8.12.1.9.2 Exposure C: Open terrain with scattered obstructions having heights generally less than 30 feet (9.0m). This category includes flat, open country and grasslands.

TABLE 8.12.1
EFFECTIVE VELOCITY PRESSURES P (P/M^2) FOR BUILDINGS AND STRUCTURES
(EXPOSURE B)

TABLE 8.12.2

Height above grade (m)	Basic wind meter/sec (m/s)				
	31	36	40	45	49
Height above grade (m)	Basic wind speed (mph)				
	31	36	40	45	49
0-6	73	98	122	151	181
6-12	78	103	132	161	195
12-18	93	122	151	186	230
18-30	98	127	161	200	244
30-45	112	147	181	225	274
45-60	117	151	191	240	288
60-90	122	161	205	250	303
90-120	137	176	225	274	332
>120					

EFFECTIVE VELOCITY PRESSURES PE (P/M^2) FOR BUILDINGS AND STRUCTURES
(EXPOSURE C)

8.8.12.1.9 Special wind conditions: Special wind conditions shall be provided for in accordance with Section 8.12.2.4.1 and 8.12.2.4.2.

8.8.12.1.9.1 Increased loads: For structures located on flat, unobstructed coastal areas directly exposed to wind flowing over large bodies of water, within 500m of the shoreline; the increased wind loads of exposure D shall be used in accordance with relevant B.S.COP listed in the Schedule 24.1.

8.8.12.1.9.2 Decreased loads: For structures located in centres of large cities with at

least 50 percent of the building having a height in excess of 21m, the decreased wind loads of exposure A shall be used in accordance with B.S.COP listed in the Schedule 24.1.

8.8.12.1.10 Slender buildings and structures: Buildings and other structures having a height exceeding 5 times the least horizontal dimension or having a fundamental natural frequency less than 1 cycle per second shall be designed for wind loads which include a gust response factor which has been determined by a rational analysis that incorporates the dynamic properties of the main wind force-resisting system.

8.8.12.1.11 Wall openings: The main wind force-resisting system for buildings with all openings where the percentage of total wall area occupied by openings in one wall exceeds that of all other walls by 10 percent or more, and openings in all other walls do not exceed 20 percent of respective wall area, shall be designed for internal pressure in accordance with relevant B.S.COP in Schedule 24.1.

TABLE 8.12.3 IMPORTANCE FACTOR,/[WIND LOADS]

Category	IMPORTANCE F ACTOR,/b	
	161 km from hurricane oceanline, and in other areas	At hurricane oceanlinec
I	1.00	1.05
II	1. 07	1.11
III	1.07	1.11
IV	0.95	1.00

Note a For building and structure classification categories, see Table 24.12.2b. Note b For regions between the hurricane oceanline and 161 km inland the importance factor1 shall be determined by linear interpolation.

Note c Hurricane oceanlines are the Atlantic and Gulf of Mexico coastal areas.

TABLE 8.12.3A WALL PRESSURE COEFFICIENT

Surface	L/B	Cp	For use with
Windward wall	All values	0.8	Pz
Leeward wall	0 to 1	-0.5	Ph
	2	-0.3	
	>4	-0.2	
Side walls	All values	-0.7	Ph

TABLE 8.12.3B

ROOF PRESSURE COEFFICIENTS. Cp FOR USE WITH Ph

Wide Direction		Windward							Leeward
	h/L	Angle, 0 (degrees)							
		0	10-15	20	30	40	50	>60	
Normal to ridge	< 0.3	-0.7	0.2e -0.9e	0.2	0.3	0.4	0.5	0.01.0	-0.7 for all values of h/L and 0
	0.5	-0.7	-0.9	-0.75	-0.2	0.3	0.5	0.01.0	
	1.0	-0.7	-0.9	-0.75	-0.2	0.3	0.5	0.01.0	
	>1.5	-0.7	-0.9	-0.9	-0.9	-0.35	0.2	0.01.0	
Parallel to ridge	h/B or h/L < 2.5	-0.7							-0.7
	h/B or h/L > 2.5	-0.8							-0.8

Note a Refer to Table 24.12c for arched roofs.

Note b Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.

Note c Linear interpolation is permitted for values of 0. h/L, and L/B ratios other than shown.

Note d Notation:

z: Height above ground in metres.

h: Mean roof height, in metres or the eave height is permitted to 0 < 10 degrees.

B: Horizontal dimension of building, in metres, measured normal to wind direction. L: Horizontal dimension of building, in metres, measured parallel to wind direction. 0: Roof slope from horizontal, in degrees.

Note e Both values of Cp shall be used in assessing load effects.

TABLE 8.12.4

CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES FOR WIND LOADS

Nature of occupancy	Category
All buildings except those listed below	I

Buildings and structures where the primary occupancy is one in which more than 300 people congregate in one area	II
Buildings and structures designated as essential facilities, including, but not limited to: 1. Hospitals and other medical facilities having surgery or emergency treatment areas 2. Fire or rescue and police stations 3. Primary communication facilities and disaster operation centers 4. Power stations and other utilities required in an emergency 5. Structures having critical national defense capabilities.	III
Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities.	IV

8.8.13 EARTHQUAKE LOADS

8.8.13.1 General: Every building and structure and portion thereof shall be designed and constructed to resist the earthquake effects determined in accordance with the requirements of this section. Seismic zones shall be determined by location. Where wind load requirements as in Section 8.12.0, would produce higher stresses, such stresses shall be used in lieu of the stresses resulting from earthquake forces. Except for unreinforced masonry, the determination of forces in this section depends on the ability of a structure to remain stable when members are strained into the inelastic range during a major earthquake. Structural concepts other than those set forth in this section shall be permitted when evidence is submitted showing that equivalent ductility and energy dissipation are provided. While the requirements in this section refer primarily to an equivalent static force method, other procedures used to establish the seismic forces and their distribution shall be permitted if the correspondent internal forces and deformation in the members are determined using a model consistent with the procedure adopted. Principles governing the use of dynamic analysis are given in Section 8.13.8.

8.8.13.1.1 Additions: Where applicable, every addition to an existing building or structure shall be designed and constructed to resist the forces provided for herein.

8.8.13.1.2 Alterations: Where applicable, an existing building or structure shall not be altered or reconstructed in such a manner that the seismic forces resisting system is not capable of resisting the forces provided for herein.

8.8.13.1.3 Plans and design data: Where earthquake loads are applicable a brief statement of the items indicated in Section 8.13.1.3.1 shall be included with each set of plans filed.

8.8.13.1.3.1 Dead and live loads: A summation of the dead and, where applicable, live loads of the building; floor by floor, which was used in determining the shear for which the building is designed shall be included with the set of drawings submitted.

8.8.13.1.3.2 Bracing: A brief description of the bracing system used, the manner in which the designer expects such system to act and a clear statement of any assumption used. Assumptions as to location of all points of contra-flexure in members shall be stated.

8.8.13.1.3.3 Sample calculations: Sample calculations of a typical bend or equivalent shall be included.

8.8.13.1.4 Stress increases: The requirements of this section presume that allowable stresses are increased by one-third for earthquake loadings. However, this increase shall not be permitted in conjunction with any decrease in total load effect taken in accordance with

Section 8.14.0

8.8.13.1.5 Combined vertical and horizontal forces: In computing the effect of seismic forces in combination with vertical loads, gravity load stresses induced in members by dead load plus design live load, except roof live load, shall be considered. Consideration shall also be given to minimum gravity loads acting in combination with lateral forces.

TABLE 8.13.1 OCCUPANCY IMPORTANCE FACTOR,]

Nature of Occupancy/Factor	
All buildings and structures except those listed below	1.0
Buildings and structures of Use Group A with a total occupant load of more than 300	1.25
Buildings and structures designated as essential facilities, including, but not limited to:	
1. 1-2 Uses having surgery or emergency treatment areas	
2. Fire or rescue and police stations	
3. Primary communication facilities and disaster operation centers	
4. Power stations and other utilities required in an emergency.	
5. Structures having critical national defense capabilities.	1.5

8.8.13.2 Definitions: The definitions listed below apply only to the provisions of this section.

Base: The level at which the earthquake motions are considered to be imparted to the structure or the level at which the structure as a dynamic vibrator is supported.

Braced frame: A truss system or its equivalent which is provided to resist lateral forces in the frame system and in which the members are subjected primarily to axial stresses.

Diaphram: A horizontal or nearly horizontal system designed to transmit seismic forces to the vertical elements of the lateral force-resisting system.

Essential facilities: As listed in Table 8.13.1.

Lateral force-resisting system: That part of the structural system to which the lateral forces prescribed in Section 8.13.4.

Shear wall: A wall designed to resist lateral forces parallel to the wall.

Space frame: A three-dimensional structural system without bearing walls, composed of interconnected members, laterally supported so as to function as a complete self contained unit with or without the aid of horizontal diaphragms or floor bracing systems.

Moment-resisting space frame: A vertical load-carrying space frame in which the members and joints are capable of resisting forces primarily by flexure.

Special moment-resisting space frame: A moment-resisting frame complying with the requirements for a ductile moment-resisting space frame as given in Section 8.13.9.3.3.

Semi-ductile moment-resisting space frame: A moment-resisting frame complying with the requirements for a semi-ductile moment-resisting space frame as given in Section 8.13.9.3.4

Vertical load-carrying space frame: A space frame designed to carry all vertical loads.

8.8.13.3 Symbols and notation: The following symbols and notations apply only to the provisions of the section.

C = Numerical coefficient as defined in Section 8.13.4.4.

Cp = Numerical coefficient as defined in Section 8.13.10 and set forth in Table 8.13.10.

D = The dimension of the structure, in meters, in a direction parallel to the applied forces. (see

also Section 8.13.5.1)
Ds = The longest dimension of a shear wall or braced frame in the direction parallel to the applied forces, in metre.

Fi, Fn, Fx = Lateral forces applied to level i, n, or x respectively.

Fp = Lateral force on a part of the structure, and in the direction under consideration.

Fpx = Force on floor diaphragms and collectors.
Ft = That portion of V considered concentrated at the top of the structure in addition to Fn.
fi = Distributed portion of a total lateral force at level i for use in the equation in Section 8.13.4.5.1.

g = Acceleration due to gravity.

hi, hn, hx = The height in metre above the base to level i, n, or x respectively.

I = Occupancy importance factor (see Table 8.13.1).

K = Numerical coefficient as set forth in Table 8.13.4.3.

k = Numerical coefficient for reduction of the overturning moment in tall buildings.

Level i = Level of the structure referred to by the subscript.

i, = 1 designates the first level above the base.

Level n = That level which is uppermost in the main portion of the structure.
Level x = That level which is under design consideration; x = 1 designates the first level above the base.
S = Soil factor (see Table 8.13.4.6).

T = Fundamental elastic period of vibration of the building or structure in the direction under consideration, in seconds.
V = The total lateral force or shear at the base.

W = The total dead load as defined in Section 8.4.0, including partition loading, plus 25 percent of the floor live load.
wi wx = That portion of W which is located at or is assigned to level i or x, respectively.

wpx = The weight of the floor or roof diaphragms and collectors and elements tributary thereto at level x plus 25 percent of the floor live load.
Wp = The weight of a portion of a structure or nonstructural component.
Z = Numerical coefficient (see table 8.13.4.1) dependent upon the zone as determined by the maps in Figure 8.13.1.

Qi = Deflection at level i relative to the base, due to applied lateral forces, <fi, for use in the equation in Section 8.13.4.5.1.

8.8.13.4 Minimum earthquake forces for structures: Except as provided in Section.13.8 and 8.13.10, every structure shall be designed and constructed to resist minimum total 24 lateral seismic forces assumed to act non-concurrently in the direction of each of the main axes of the structure in accordance with the following formula:

V = ZIKCSW
8.8.13.4.1 Factor: The factor Z shall be as shown in Table 8.13.4.1.

TABLE 8.13.4.1 SEISMIC ZONE COEFFICIENT Z

Seismic	Z	
Severe earthquakes	4	1
Mild earthquakes	3	%
Movement due to tremor	2	%
Earth tremors	1	3/16
Sign of natural opening (in soils)	0	1/8

8.8.13.4.1.1 I Factor: The factor I shall be as shown in Table 8.13.1.
8.8.13.4.2 K Factor: The value of K shall not be less than set forth in Table 8.13.4.3.

TABLE 8.13.4.3

HORIZONTAL FORCE FACTOR, K, FOR BUILDINGS OR OTHER STRUCTURES

Arrangement of lateral force-resisting elements	Value of K
Building framing system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by shear walls or braced frames in accordance with Section 24.13.9.2	1.00
Moment-resisting frame system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by a moment-resisting frame system in conformance with:	
Requirements for ordinary concrete frames	1.50
Sections 24.13.9.3.1 and 24.13.9.32.2 for ordinary steel frames	1.00
Section 24.13.3.4 for semi-ductile concrete frames	1.00
Sections 24.13.9.3.1 and 24.13.9.3.3 for special frames	0.67
Dual system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by a	
combination of:	0.80
A special moment-resisting frame system and shear walls or braced frames in accordance with Section 24.13.9.4.1 or a semi-ductile moment-resisting frame system and shear walls or braced frames in accordance with 24.13.9.4.2	1.00
Elevated tanks: Tanks plus full contents, where tanks are supported on four or more cross-braced legs and not supported by a building.	2.50a
Structures other than buildings: Structures other than buildings and other than those set forth in Table 24.13.10	2.00

Note a. The minimum value of Kc shall be 0.12 and the maximum value KCs need not exceed 0.29 or 0.23 for Soil Profile 3 in Seismic Zones 3 and 4. The tower shall be designated for an accidental torsion of 5 percent as specified in Section 24.13.5.5. Elevated tanks that are supported by buildings or do not conform to the type or arrangement of supporting elements as described above shall be designed in accordance with Section 24.13.10 using Cp = 0.3.

8.8.13.4.3 Factor: The value of C shall be as indicated in the equation in this subsection. The product CS (see Section 24.13.4.6 for S values) need not exceed 0.14, or, for Soil Profile 3 in Seismic Zones 3 and 4, the product need not exceed 0.11.
The value of C shall be determined in accordance with the following formula:

C = I

15/-T

The value of C need not exceed 0.12.
8.8.13.4.4 T- Factor: The value of T shall be determined using the methods described in Sections 24.13.4.5.1 and 24.13.4.5.2.
8.8.13.4.4.1 T Formula: T is the fundamental period which shall be established using the structural properties and deformational characteristics of the resisting elements using the following formula or the appropriate in Section 24.13.4.5.2. where the values of fi represent any lateral force distributed approximately in accordance with the principles of the equations in section 24.13.5.1 other rational distribution. The elastic deflections Qi shall be calculated using the applied lateral forces fi. The value of C when calculated using the period T as determined by the equation in this section shall not be less than 80 percent of the value of C based on the period T estimated using the appropriate equation in Section 24.13.4.5.2.
8.8.13.4.4.2 Alternative T formulas: In the absence of a determination of the value of T in accordance with Section 24.13.4.5.1, the value of T for buildings shall be determined by the following appropriate formula:
8.8.13.4.4.2.1 For shear walls or exterior concrete frames utilizing deep beams or wide piers, or both:

T = 0.05 hn

/--Ds

8.8.13.4.4.2.2 For isolated shear walls not interconnected by frames or for braced frames:

$$T = \frac{0.05hn}{\sqrt{Ds}}$$

8.8.13.4.4.2.3 In buildings in which the lateral force-resisting system consists of moment-resisting space frames capable of resisting 100 percent of the required lateral forces and such system is not enclosed by or adjoined by more rigid elements tending to prevent the frame from resisting lateral forces.

T = Crhn %

Where Cr = 0.035 for steel frames and 0.030 for concrete frames.
8.8.13.4.5 S Factor: The value of S shall be determined from Table 24.13.4.6, the soil profile types are defined as follows:
8.8.13.4.6 1. Soil profile type Si is a profile with:

a. Rock of any characteristic, which is either scale like or crystalline in nature. Such material is characterised by a shear wave velocity greater than 750m/s; or
b. Stiff soil conditions where the soil depth is less than 61 m and the soil types overlying rock are stable deposits of sands, gravels, or stiff clays.

8.8.13.4.7 2. Soil profile type S2 is a profile with deep cohesionless deposits or stiff clay conditions, including sites where soil depth exceeds 61 m and the soil types overlying rock are stable deposits of sands, gavels, or stiff clays.
8.8.13.4.8 3. Soil profile type S3 is a profile with soft-to medium-stiff clays and sand, characterized by 10m or more of soft to medium-stiff clays without intervening

layers of sand or other cohesionless soils.

In locations where the soil properties are not known in sufficient detail to determine the soil profile type or the profile does not fit any of the three types, soil profile S2 or soil profile S3 shall be used, whichever gives the larger value of CS.

TABLE 24.13.4.6 SOIL PROFILE COEFFICIENTS

Soil profile type	S
S1	1.0
S2	1.2
S3	1.5

8.8.13.5 Distribution of lateral forces: The imposed lateral forces shall be applied in accordance with Section 24.13.5.1 through to 24.13.5.6.

8.8.13.5.1 Structures having regular shapes or framing systems: The total lateral force V shall be distributed over the height of the structure in accordance with the following formula=Ft+n/i-IFt Where the concentrated force at the top Ft shall be determined according to the formula: Ft=Ft=0.07TV

The maximum required value of Ft shall be 0.25V. When T is 0.7 second or less, the minimum required value of Ft shall be zero. The remaining portion of the total base shear

V shall be distributed over the height of the structure, including level n, according to the formula: Fx =(V-Ft)Wxhx/n/i=I Wihi

At each level designation as x, the forces Fx shall be applied over the area of the building in accordance with the mass distribution on the level.

8.8.13.5.2 Setbacks: Buildings having setbacks wherein the plan dimension of the tower in each direction is at least 75 percent of the corresponding plan dimension of the lower part shall be considered as uniform buildings without setbacks, provided that other irregularities as defined in this section do not exist.

8.8.13.5.3 Structures having irregular shapes or framing systems: The distribution of the lateral forces in structures that have highly irregular shapes, large differences in lateral resistance or stiffness between adjacent stories, or other unusual structural features shall be determined considering the dynamic characteristics of the structure.

8.8.13.5.4 Distribution of horizontal shear: Total shear in any horizontal plane shall be distributed to the various elements of the lateral force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements incorporated into the building that are not assumed to be part of the lateral force-resisting system shall be permitted if their effect on the action of the system is considered and provided for in the design.

8.8.13.5.5 Horizontal torsional moments: The design shall provide for the torsional moment resulting from the location of the building masses plus the torsional moments caused by assumed displacement of the mass each way from its actual location by a distance equal to 5 percent of the dimension of the building perpendicular to the direction of the applied forces.

8.8.13.5.6 Diaphragms: Floor and roof diaphragms and collectors shall be designed to resist the forces determined in accordance with the formula:

Fpx = (n/i = x Fi/n/i = Wi) Wpx

The force Fpx need not exceed 0.30ZIwpx

When the diaphragm is required to transfer lateral forces from the vertical resisting elements

above the diaphragm to other vertical resisting elements below the diaphragm, due to either offsets in the placement of the elements or to changes in stiffness in the vertical elements, these forces shall be added to the value determined for Fpx. However, the lateral force on the diaphragm shall not be less than 0.14ZIwpx.

Diaphragms providing lateral support to concrete or masonry walls shall have continuous ties between diaphragm chords to distribute into the diaphragm the anchorage forces specified in this section. Chords added to form subdiaphragms to transmit the anchorage forces to the main crossties shall be permitted. Diaphragm deformations shall be considered in the design of the supported walls.

8.8.13.6 Overturning: Every building or structure shall be designed to resist the overturning effects caused by the earthquake forces specified in this section. The overturning moment at each storey x shall be calculated as follows:

Mx = Ft (hn - hx) + n/i = x Fi (hi-hx)

The increment of overturning moment at each storey shall be distributed to the resisting elements in the same proportion as the distribution of the horizontal shears. In tall buildings, the maximum overturning moment in any element shall be determined by multiplying Mx by a factor k depending on the location of the element, as follows:

K = 1.0 for the top 10 storyes.

K = 0.8 for the 20th storey from the top and those below.

K = A value between 1.0 and 0.8 determined by straight line interpolation for storeys between the 10th and 20th storeys below the top.

8.8.13.6.1 Overturning moment distribution: Where other vertical members are provided which are capable of partially resisting the overturning moments, redistribution to these members shall be permitted if framing members of sufficient strength and stiffness to transmit the required loads are provided. Where a vertical resisting element is discontinuous, the overturning moment carried by the lowest storey of that element shall be carried down as a load to the foundation.

8.8.13.7 Drift and building separation: Lateral deflections or drift of a storey relative to adjacent storeys, including any portions thereof caused by deflection of horizontal resisting elements, shall not exceed 0.005 times the storey height (0.0025 in buildings with unreinforced masonry), unless it can be demonstrated that greater deformation can be tolerated. The horizontal displacement calculated from the application of the lateral forces shall be multiplied by 1/K to obtain the drift. The ratio 1/K shall be not less than 1.0. All portions of structures shall be designed and constructed to act as an integral unit in resisting horizontal forces unless separated structurally by a distance sufficient to avoid contact under deflection from seismic action.

8.8.13.8 Alternative determination and distribution of seismic forces: Nothing in Section 24.13.0 shall be deemed to prohibit the submission of properly substantiated technical data for establishing the lateral forces and their distribution by elastic or inelastic dynamic analysis. In such analyses, the dynamic characteristics of the structure shall be considered, and the following principles shall be observed:

1. The base shear shall be not less than 90 percent of that computed in Section 24.13.8.
2. Values of base shear consistent with K = 0.67 to 2.5 are applicable only if the structure is designed and detailed to be consistent with the requirements in Section 24.13.9. Otherwise, the structure shall be designed for a base shear consistent with its ability to dissipate energy by inelastic cyclic straining, which will generally mean a value of K from 2.5 to 4.0 or greater.
3. The requirements of Section 24.13.7 shall be satisfied using the forces prescribed in

Section 24.13.4.

4. The input to the dynamic analysis shall be either a smoothed response spectrum or a suit of ground-motion-time histories that reflect the characteristics of the structure and site and are approved by the code enforcement officer. In either case, the input shall be scaled in accordance with the above three principles.

8.8.13.9 Structural systems: The design of structural systems shall comply with the applicable provisions of Section 24.13.9.1 through 24.13.9.6. Reinforced concrete members shall comply with the applicable provisions of relevant B.S.COP.

8.8.13.9.1 Bearing wall systems: Bearing wall systems shall use walls or braced frames as vertical elements for resistance to lateral seismic force. Horizontal elements of the seismic force-resisting system shall be diaphragms or trusses. The factor K depends on the type of wall, as shown in Table 24.13.4.3. Where the framing systems along two orthogonal axes are different, the factor K for both directions shall be taken as 1.0, 1.33 or 4.0 as appropriate.

8.8.13.9.2 Building-frame systems: Building-frame systems designed using a factor K = 1.0 shall have an essentially complete frame conforming to the requirements of the relevant B.S.COP. for the design, fabrication and erection of structural steel for buildings supporting all gravity loads, and shall have shear walls or vertical bracing trusses to resist the earthquake lateral force.

8.8.13.9.3 Moment-resisting frame systems: Moment-resisting frame systems shall be designed in accordance with the applicable provisions of Section 8.8.13.9.3.1 through 8.8.13.9.3.4.

8.8.13.9.3.1 Connections in steel frames: Beam-to-column connections in steel moment-resisting frames shall develop the joint capacity determined by the strength of members framing into the joint unless it can be shown that adequate rotation can be obtained by deformations of the connection materials that the added drift is taken into account.

8.8.13.9.3.2 Ordinary steel frames: Moment-resisting steel frame systems designed using a factor K = 1.0 shall have a frame conforming to the requirements of the relevant B.S.COP. for the design, fabrication and erection of structural steel for buildings.

8.8.13.9.3.3 Special frames: Systems designed using a factor K = 0.67 shall have special moment-resisting space frames conforming to the requirements of relevant B.S.COP. for the design, fabrication and erection of structural steel for buildings. Steel members in special moment-resisting frame systems shall be composed of (Grades 42 through 55) structural steel.

8.8.13.9.4 Semi-ductile concrete frames: Buildings in Seismic Zone 2, and buildings in Seismic Zone 1 with an importance factor I = 1.5, using a semi-ductile concrete moment-resisting space frame conforming to the relevant B.S COP. requirements shall use a K of not less than 1.0.

8.8.13.9.4.1 Dual Systems: Dual systems shall be designed in accordance with the applicable frames using a factor K = 0.8 shall have special moment-resisting space frames conforming to Section 24.13.9.3.4 that are capable of supporting seismic forces. The total seismic force shall be distributed to the various resisting systems and elements in proportion to their relative rigidities.

8.8.13.9.4.2 Dual systems with semi-ductile concrete frames: In Seismic Zone 2, and for buildings having an importance factor I of 1.5 in Seismic Zone 1, dual systems designed using a factor K = 1.0 shall have semi-ductile moment-resisting concrete space frames conforming to the requirements of Section 8.8.13.9.3.4 that are capable of supporting seismic forces. The total seismic force shall be distributed to the various resisting systems and elements in proportion to their relative rigidities.

8.8.13.9.5 Braced frames: In Seismic Zones 2 and 4, and for buildings having an importance

factor I greater than 1.0 and located in Seismic Zone 2, all members in braced frames shall be designed for 1.25 times the force determined in accordance with Section

8.8.13.4. Steel members in braced frames shall be limited to those grades listed in Section 8.8.13.9.3.3. Reinforced concrete members in braced frames shall be provided with the transverse confinement reinforcement required in Section 8.8.13.9.3.3.

8.8.13.9.6 Substructures: In structures where K = 0.67 or 0.80, the special ductility requirements for structural steel or reinforced concrete specified in Section 8.8.13.9.3.3. shall apply to all structural elements at the base level and in the first story below the base which are required to transmit to the foundation the forces resulting from lateral loads.

In structures containing semi-ductile concrete frames where K = 1.0, the ductility requirements specified in Section 8.8.13.9.3.4 shall apply to all frame elements at the base level and in the first storey below the base which are required to transmit to the foundation the forces resulting from lateral loads.

8.8.13.10 Lateral forces on elements of structures and nonstructural components:

Parts or portions of buildings or structures, nonstructural components, and their anchorage to the main structural system shall be designed for lateral forces in accordance with the following formula:

$$Fp = ZICpWp$$

The values of Cp are in Table 24.13.10. The value of I shall be as given in Table 24.13.1. The value of I for anchorage of machinery and equipment required for life safety systems shall be 1.5 for all buildings.

The distribution of these forces shall be according to the gravity loads pertaining thereto.

TABLE 24.13.10

HORIZONTAL FORCE FACTOR, CP, FOR ELEMENTS OF STRUCTURES AND NONSTRUCTURAL COMPONENTS

Part or portion of building	Direction of horizontal force	Value of Cp
Exterior bearing and nonbearing walls, interior bearing walls and partitions, interior nonbearing walls and partitions, masonry or concrete fences over 1.85m in height	Normal to flat surface	0.3a
Cantilever elements:	Normal to flat surface	0.8
Parapets	Any direction	0.8
Chimneys or stacks	Any direction	0.8
Exterior and interior ornamentations and appendages	Any direction	
When connected to part of, or housed within, a building:	Any direction	0.3 b,c
Penthouses, anchorage and supports for chimneys, and stacks and tanks, including contents	Any direction	
Storage racks with upper storage level at more than 2.4m in height, plus contents	Any direction	0.3 b,c
All equipment machinery	Any direction	0.3 b , c, 1
Supports and equipment bracing racks and piping for HPM use facilities		0.45

Suspended ceiling framing systems (applies to Seismic Zones 2,3 and 4 only)	Any direction	0.3 d
Connections for prefabricated structural elements other than walls, with force applied at center of gravity of assembly.		0.3e

Note a Cp required for elements laterally self-supported only at the ground level shall be two-thirds of value shown.

Note b Wp for storage racks shall be the weight of the racks plus contents. The value of Cp for racks over two storage support levels in height shall be 0.24 for the levels below the top two levels.

Where a number storage rack units are interconnected so that there are a minimum of four vertical elements in each direction on each column line designated to resist horizontal forces, the minimum design coefficients shall be the same as for a building with K values from Table 24.13.4.3; CS = 0.2 for use in the formula, V = ZIKCSW; and W equal to the total dead load plus 50 percent of the rack-rated capacity.

Note c For flexible and flexibly-mounted equipment and machinery, the appropriate values of Cp shall be determined with consideration given to both the dynamic properties of the equipment and machinery and to the building or structure in which it is placed but shall be not less than the listed values. The design of the anchorage of the equipment and machinery is an integral part of the design and specification of such equipment and machinery.

For essential facilities described in Table 24.13.1 and life safety systems, the design and detailing of equipment that must remain in place and be functional following a major earthquake shall consider drifts in accordance with Section 8.8.13.14.

Note d Ceiling weight shall include all light fixtures and other equipment that is laterally supported by the ceiling. For purposes of determining the lateral force, a ceiling weight of not less than 0.2NK/m^2 shall be used.

Note e. The force shall be resisted by positive anchorage and not by friction.

Note f Seismic restraints shall not be required for the following installations:

1. Gas piping less than 25mm inside diameter.
2. Piping in boiler and mechanical rooms less than 32mm inside diameter.
3. All other piping less than 62mm inside diameter.
4. All other electrical conduit less than 62mm inside diameter.
5. All rectangular air-handling ducts less than 0.6m^2 in cross-sectional area.
6. All round air-handling ducts less than 700mm in diameter.
7. All piping suspended by individual hangers 300mm or less in length from the top of the pipe to the bottom of the support for the hanger.
8. All ducts suspended by hangers 300mm or less in length from the top of the duct to the bottom of the support for the hanger.

8.8.13.11 Connections: Connections shall comply with the requirements of Section 8.8.13.11.1 through to 8.8.13.11.5.

8.8.13.11.1 Anchorage of concrete or masonry walls: Concrete or masonry walls shall be anchored to all floors and roofs that provide lateral support for the wall. Such anchorage shall provide a positive direct connection capable of resisting the horizontal forces specified in Section 8.8.13.10.

8.8.13.11.2 Load paths: All parts of the building or structure that transmit seismic force shall

be connected through a continuous path to the resisting element. At a minimum, the connection and the elements along the path to the resisting element shall be capable of resisting force equal to 0.51 ZI or 0.05, whichever is greater, times the weight of the portion being connected.

8.8.13.11.3 Exterior panels: Precast or prefabricated nonbearing, nonshear wall panels or similar elements that are attached to or enclose the exterior shall be designed to resist the forces determined in Section 8.8.13.10, and shall accommodate movements of the structure resulting from lateral forces or temperature changes. The concrete panels or other similar elements shall be supported by means of cast-in-place concrete or mechanical connections and fasteners in accordance with the following provisions:

8.8.13.11.3.1 Connections and panel joints shall allow for a relative movement between storeys of not less than 3.0/K times the calculated elastic storey displacement caused by required seismic forces or 13mm, whichever is greater. Connections that permit movement by using slotted or oversized holes or connections that permit movement by bending of steel or other connections providing equivalent sliding or ductility capacity, or both.

8.8.13.11.3.2 Bodies of connectors shall have sufficient ductility and rotation capacity so as to preclude fracture of the concrete or brittle failures at or near welds.

8.8.13.11.3.3 The body of the connector shall be designed for one and one-third times the force determined in Section 8.8.13.10. Fasteners attaching the connector to the panel or the structure, such as bolts, inserts, welds, dowels, and similar fasteners, shall be designed to ensure ductile behaviour of the connector or shall be designed for four times the load determined in Section 8.8.13.10.

8.8.13.11.3.4. Fasteners embedded in concrete shall be attached to or hooked around reinforcing steel or otherwise terminated so as to effectively transfer forces to the reinforcing steel.

8.8.13.11.3.5. The value of the factor I for the entire connector assembly shall be 1.0 when applying the requirements of Section 8.8.13.10.

8.8.13.11.4 Foundation ties: Individual pile caps and caissons of every building or structure in Seismic Zones 2, 3, and 4 shall be interconnected by ties at approximately right angles, unless it can be demonstrated that equivalent restraint can be provided by frictional and passive soil resistance or other approved methods. The design of the piles or ties shall carry the induced lateral forces, with a minimum horizontal force equal to

0. 10ZI times the vertical loading on the pile cap or caisson.

8.8.13.11.5 Braced frames: In braced frames, connections shall be designed to develop the full capacity of the members or shall be based on the forces specified in Section 8.8.13.9.5 without the one-third increase usually permitted for stresses resulting from earthquake forces.

8.8.13.12 Nonseismic-resisting structural members: In Seismic Zones 3 and 4, and for buildings with an importance factor I greater than 1.0 located in Seismic Zone 2, all framing elements not required by design to be part of the lateral force-resisting system shall be investigated and shown to be adequate for vertical load-carrying capacity and induced moment due to 3/K times the distortions resulting from the code-required lateral forces. The rigidity of other elements shall be considered in accordance with Section 8.8.13.5.4.

8.8.13.13 Moment-resisting frames: Where ordinary and special moment-resisting space frames are enclosed by, or adjoining by, more rigid elements that would tend to prevent the space frame from resisting lateral forces, substantiating information shall be submitted to show that the action or failure of the more rigid elements will not impair the vertical and lateral load-

resisting ability of the space frame.

8.8.13.14 Essential facilities: The design and detailing of equipment that must remain in place and be functional following a major earthquake shall be based on the requirements of Section 8.8.13.10 and Table 24.13.10. In addition, their design and detailing shall consider effects induced by structure drifts of not less than 2.0/K times the storey drift caused by required seismic forces. Special consideration shall also be given to relative movements at separation joints.

8.8.14 COMBINATION OF LOADS

8.8.14.1 General: Combinations of structural loads shall be considered in accordance with this section, or in accordance with part 3 loading of the NCPI 1973. Loads listed herein shall be considered to act in the following combinations, whichever produce the most unfavourable effects in the building, foundation, or structural member concerned, reduced when appropriate according to Section 8.8.15.0.

i. Dead plus floor live plus roof live

ii. Dead plus floor live plus wind

iii. Dead plus floor live plus seismic.

8.8.14.2 Counteracting load: When the effects of design loads counteract one another in a structural member or joint, special care shall be exercised by the designer to ensure adequate safety for possible stress reversals.

8.8.14.3 Stress increases: All minimum allowable stresses and soil bearing values specified in this code for working stress design shall be increased one-third when considering wind or earthquake forces either acting alone or when combined with vertical loads. An increase will not be allowed for vertical loads acting alone.

8.8.15 LIVE LOAD REDUCTION:

8.8.15.1 Permissible reduction: Except as otherwise indicated in Section 8.8.15.2, the minimum required design live load for members having an influence area of 37.20m^2 or more shall be reduced in accordance with the following equations:

$L = Lo\ (0.25 + \frac{15}{\sqrt{Ai}})$ where:

L = reduced design live load in KN/M^2.

Lo = unreduced design live load in KN/M^2 from Table 24.6.1.

Ai = influence area in square metres, taken as four times the tributary area for a column, two times the tributary area for a beam, and the panel area for a two-way slab.

8.8.15.2 Limitations: The provisions of Section 8.8.15.2.1 through to 8.8.15.2.3 shall limit the applications of live load reductions permitted by this section.

8.8.15.2.1 Maximum reduction: The reduced design live load permitted by Section 8.8.15.0 shall not be less than 50 percent of the unreduced live load for members supporting one floor and not less than 40 percent of the unreduced live load for members supporting more than one floor.

8.8.14.2.2 Live loads 5 KN/m^2 or less: For live loads of 5 KN/m^2 or less, reduction shall not be made for buildings or portions thereof of Use Groups A and E, for public garages or open parking structures (except as indicated in Section 24.15.2.3), for one-way slabs or for roofs (except as indicated in Section 24.10.01).

8.8.15.2.3 Live loads greater than 5 KN/m^2: For live loads which exceed 5 KN/m^2 and for Group 2 public garages and open parking structures, minimum design live loads on members

supporting more than one floor shall be reduced by 20 percent.

8.9 FOUNDATION SYSTEMS AND RETAINING WALLS:

8.9.1 Scope: The provisions of this article shall control the foundation design and construction of all buildings and construction of all buildings and structures hereafter erected to ensure adequate strength of all parts thereof for the safe support of all superimposed live and special loads, in addition to their own dead load, without exceeding the allowable stresses or design capabilities.

8.9.2 BEARING VALUES OF SOILS

8.9.2.1 Soil analysis: All applications for permits for the construction of new buildings or structures and for the alteration of permanent structures which require changes in foundation loads and distribution shall be accompanied by a statement describing the soil in the ultimate bearing strata, including sufficient records and data to establish its character, nature and load bearing capacity. Such records shall be certified by a registered structural engineer.

8.9.2.2 Satisfactory foundation materials: Satisfactory bearing materials for spread footings shall include ledge rock on its natural bed; natural deposits of sand, gravel or firm clay, or a combination of such materials, provided they do not provide an appreciable amount of peat, organic silt, soft clay or other objectional materials.

8.9.2.3 Presumptive bearing values: The maximum allowable pressure on supporting soils under spread footings at or near the surface shall not exceed the values specified in Table 25.1 or the maximum allowable pressure shall be determined by field loading tests or as otherwise provided herein. Presumptive bearing values shall apply to all materials of similar physical characteristics and deposition. Surface values shall be adjusted for deep footings, and for the bearing strata under piles, as provided in this code. Where foundation piles are driven to penetrate into sound rock, the maximum allowable bearing values in Table 25.1 shall be increased as prescribed in Section 25.21.0.

8.9.2.4 Lightweight structures: Mud, organic silt, or unprepared fill shall be assumed not to have presumptive bearing capacity unless approved by test, except where the bearing capacity is deemed adequate by the Code Enforcement Division/Section/Unit for the support of lightweight and temporary structures.

TABLE 25.1 PRESUMPTIVE SURFACE BEARING VALUES OF FOUNDATION MATERIALS

	Class of material	KN/m^2
1.	Massive crystalline bedrock including granite, diorite, gneiss, traprock, hard limestone and dolomite	900
2.	Foliated rock including bedded limestone, schist and slate in sound condition	3600
3.	Sedimentary rock including hard shales, sandstones, and thoroughly- cemented conglomerates	2250
4.	Soft or broken bedrock (excluding shale), and soft limestone	900
5.	Compacted, partially-cemented gravels, and sand and hardpan overlying rock	900
6.	Gravel and sand-gravel mixtures	540
7.	Loose gravel, hard dry clay, compact coarse sand, and soft shales	360
8.	Loose, coarse sand and sand-gravel mixtures and compact fine sand (confined)	270
9.	Loose medium sand (confined)	180
10.	Soft broken shale, soft clay	135

11. Loose sharp sand fill (confined) 180

12. Loose sand in Swamping terrain 60

Note a: 1 ton per square foot = 9765kg/m^2.

8.9.3 FOUNDATION INVESTIGATIONS

8.9.3.1 When required: In the absence of satisfactory data from immediate adjacent areas, the owner or applicant shall make borings, test pits, or other soil investigations at such locations and to sufficient depths of the bearing materials to the satisfaction of the Code official. For all buildings which are more than one storey or 6m in height, and whenever it is proposed to use raft or any type of deep foundation, there shall be at least one exploratory boring to rock or to an adequate depth below the load bearing strata for every 200m^2 of built-over area. If or any such additional test as the code enforcement officer requires sustaining power of the soil is in doubt, or superior bearing value than specified in this code is claimed, the code official shall direct that the necessary borings or tests be made.

8.9.3.2 Soil samples: Samples of the strata penetrated in tests boring or test pits, representing the natural disposition and conditions at the site, shall be available for examination by the code official. Wash or bucket samples shall not be approved.

8.9.3.3 Varying soil values: When test borings indicate non-uniformity of bearing materials, a sufficient number of additional borings shall be made to establish strata levels of equal bearing capacity.

8.9.3.4 Cost of tests: Costs of soil investigations shall be at the expense of the owner.

8.9.4 SOIL TEST PROCEDURE

8.9.4.1 Soil test method: The test procedure and testing apparatus shall be approved by the Code official before they are used; and a complete record of tests, together with a record of the soil profile, shall be filed by a registered structural engineer.

8.9.4.2 Loaded areas: For spread footings, the soil shall be loaded at one or more places and at the required levels. The loaded area shall be approximately 0.37m^2 for all bearing materials; except that when the footing overlies wet clay or other soft materials, the test load shall be applied to an area of not less than 0.93m^2.

8.9.4.3 Recorded settlements: Loads shall be applied in continuous increments of not more than one-fourth of when the proposed safe loads has been reached, it shall remain undisturbed and readings shall be recorded to determine the rate of settlement until the settlement in eight consecutive hours is less than 0.25mm. A 50 percent excess load shall then be applied and allowed to remain in place until the rate of settlement is less than 0.25mm in 24 hours.

8.9.4.4 Accuracy of loading: Test loads applied by mechanical devices shall be automatically controlled so as to ensure not more than 5 percent variation in applied load. Such devices shall be calibrated prior to the test.

8.9.4.5 Test acceptance: The load settlement shall be represented diagrammatically, and a test shall not be deemed satisfactory if the net settlement after removal of the test load exceeds 0.00028mm/kg of gross load applied.

8.9.5 ALLOWABLE FOUNDATION LOADS:

8.9.5.1 General: The maximum allowable loads under all types of foundations shall be provided herein.

8.9.5.2 Rock foundations: Where sub-surface explorations at the project site indicate

variations of doubtful characteristics in the structure of the rock upon which it is proposed to construct foundations, a sufficient number of borings shall be made to a depth of not less than below the level of the footings to provide assurance of the soundness of the foundation bed and its bearing capacity.

8.9.5.3 Increased rock capacity: The maximum presumptive bearing capacity of Class 1 or 2 rock shall be increased when the surface is leveled or benched; provided such increased safe capacity is determined by load tests on an area of not less than 0.093m^2 in accordance with the provisions of Section 12.3 but such loads shall not be increased to exceed the unit compressive stress permitted on reinforced concrete footings under the provisions of this Code.

8.9.6 DEPTH OF FOOTINGS

8.9.6.1 Frost protection: Exception when erected upon solid rock or otherwise protected from frost, foundation walls piers and other permanent supports of all buildings and structures larger than 9.30m^2 in area or 3048mm in height shall extend below the frost line of the locality, and spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing value of the soil. Or such structures shall be supported on piles or ranging timbers when solid earth to rock is not available. Footings shall not be founded on frozen soils unless such frozen condition is of a permanent character.

8.9.6.2 Isolated footings: Footings on granular soil of Classes 5 to 10 inclusive in Table 25.1 shall be so located that the line drawn between the lower edges of adjoining footings shall not have a steeper slope than 30 degrees (0.52rad.) with the horizontal, unless the material supporting the higher footing is braced or retained or otherwise laterally supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner or a greater slope has been properly established by engineering analysis.

8.9.6.3 RAFT FOUNDATION: Raft Foundation shall be located on undisturbed soil of inadequate bearing capacity. The Building Code Enforcement Division/Section/Unit shall approve a continuous foundation of raft which is located directly on the ground when adequate subsoil drainage and a rat proof apron are provided where subject to freezing, the footings shall be designed to resist frost action.

8.9.7 FOOTING DESIGN

8.9.7.1 Design loads: The full dead load including the weight of foundations, footings, and overlying fill, and a rat proof apron as specified in Section 1114.0, shall be used in designing footings.

8.9.7.2 Pressure due to lateral loads: If the increased pressure on any footings due to wind, earthquake or other lateral loads does not exceed one-third of the dead and live load pressures alone, such loads are not required to be considered in the design. When such increased pressure is more than one-third, the lateral loads shall be considered in the design with a one-third increase in allowable soil pressure under the combined load.

8.9.7.3 Earthquake loads: In localities subject to seismic disturbances, special provision shall be made in the foundation design to comply with the provisions of Section 24.13.0.

8.9.7.4 Vibration loads: Where machinery operation or other vibrations are transmitted through the foundation, consideration shall be given in the footing design to prevent detrimental disturbances of the soil.

8.9.7.5 Varying unit pressure: Footings shall be so designed that the unit soil pressure under the dead load shall be as uniform as possible under all parts of the building or structure. When necessary for stability in the structure due to settlement or varying soil conditions, approved

variations are permitted in the unit pressure under different footings.

8.9.8 TIMBER FOOTINGS AND WOOD FOUNDATIONS

8.9.8.1 Timber footings: Timber footings are permitted for buildings of Type 5 construction and as otherwise approved. Such footings shall be treated in accordance with AWPA C2 or C3 listed in Schedule A. Treated timbers are not required when placed entirely below permanent water level, or when used as capping for wood piles which project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the NFoPA National Design Specification for Wood Construction listed in Schedule A.

8.9.8.2 Pole building: Pole-type buildings shall be designed and erected in accordance with AWPI Pole Building Design listed in Schedule A. The poles shall be treated in accordance with AWPA C2 or C4 listed in Schedule A.

8.9.8.3 Wood foundations: Wood foundation systems shall be designed and installed in accordance with NFoPA TR7 listed in Schedule A. All lumber and plywood shall be treated in accordance with AWPB-FDN listed in Schedule A and shall be identified as to conformance with such standards by an approved agency.

8.9.9 STEEL GRILLAGES

8.9.9.1 General: All steel grillage beams shall be separated with approved steel spacers and shall be entirely encased in at least 75mm of concrete and the spaces between the beams shall be completely filled with concrete or cement grout. When used on yielding soils, steel grillages shall rest on approved concrete beds not less than 150mm thick.

8.9.10 CONCRETE FOOTINGS

8.9.10.1 Concrete strength: Concrete in footings shall have a specified compressive strength of not less than 1.76 kg/mm^2 at 28 days.

8.9.10.2 Design: Concrete footings shall comply with BS8110 (1985) listed in Schedule A.

8.9.10.3 Thickness: The thickness of concrete footings shall comply with Section 8.9.9.3.1 and 8.9.9.3.2.

8.9.10.3.1 Plain concrete: In plain concrete footings, the edge thickness shall be not less than 200mm for footings on soil; except that for buildings of Use Group H-3 and buildings less than two stories in height of Type 5 construction, the required edge thickness shall be reduced to 150mm provided the footing does not extend beyond 100mm on either side of the supported wall.

8.9.10.3.2 Reinforced concrete: In reinforced concrete footings, the thickness above the bottom reinforcement shall not be less than 150mm for footings on soil, nor less than 300mm for footings on piles. The clear cover on reinforcement where the concrete is cast against the earth shall not be less than 75mm. Where concrete is exposed to soil after it has been cast, the clear cover shall not be less than 38mm for reinforcement of No.5 bars or 16mm diameter wire or smaller, nor less than 50mm for larger reinforcement.

8.9.10.4 Deposition: Concrete footings shall not be poured through water unless otherwise approved. When poured under or in the presence of water, the concrete shall be deposited by approved means which ensure minimum segregation of the mix and negligible turbulence of the water.

8.9.10.5 Protection of concrete: Concrete footings shall be protected from freezing during depositing and for a period of not less than 5 days thereafter. Water shall not be allowed to flow through the deposited concrete.

8.9.10.6 Forming of concrete: Concrete footings shall not be cast against the earth where, in the opinion of the Code Enforcement Division/Section/Unit, soil conditions warrant forming. When form work is required, it shall be in accordance with BS8110 318 listed in Schedule A.

8.9.11 MASONRY UNIT FOOTINGS

8.9.11.1 Dimensions: Masonry unit footings shall be laid in accordance with BS 5628, and the depth shall be not less than twice the projection beyond the wall, pier or column. The width shall be not less than 200mm wider than the wall supported thereon.

8.9.11.2 Offsets: The maximum offset of each course in brick foundations walls stepped up from the footings shall be 38mm if laid in single courses, and 75mm if laid in double courses.

8.9.12 MAT, RAFT AND FLOAT FOUNDATIONS

8.9.12.1 General: Mat, raft and float foundations shall be used only when the applied loads of the building or structure are so arranged as to result in practically uniformly balanced loading, and the soil immediately below the mat is of uniform bearing capacity. The characteristics of the soil under the mat or raft shall be considered in the analysis of loading on mats and other continuous footings, and due allowance shall be made for possible concentrated soil pressures under heavily loaded columns.

8.9.13 PIER FOUNDATIONS

8.9.13.1 Lateral dimensions and height: Except for buildings of Use Group H-3 and other light structures, the minimum dimension of isolated piers used as foundations shall be 600mm, and the height shall not exceed 12 times the least horizontal dimension, unless constructed of reinforced concrete or structural steel, or when entirely encased in steel shell at least 6mm thick. Approved heights greater than herein specified are permitted when surrounding foundation materials furnish adequate lateral support.

8.9.13.2 Belled bottoms: Where pier foundations are belled at the bottom, the edge thickness of the bell shall be not less than that required for the edge of footings. If the sides of the bells slope at an angle less than 60 degrees (1.05 Rad.) from the horizontal, the effects of vertical shear shall be considered.

8.9.13.3 Plain concrete: Where the unsupported height of foundations piers exceeds six times the least dimension, the allowable working stress on piers of unit masonry or plain concrete shall be reduced in accordance with BS 8110 listed in Schedule A.

8.9.13.4 Reinforced concrete: Where constructed of reinforced concrete, spiral or vertical reinforcement in foundation piers shall conform to BS 8110 listed in Schedule A. When adequate lateral supports is furnished by the surrounding materials as defined in Section 25.13.0 requirements for long columns shall be waived.

8.9.13.5 Steel shell: Where concrete piers are entirely encased with a circular steel shell, and the area of the shell steel is considered as reinforcing steel, the steel shall be protected under the conditions specified in Section 25.13.0. All horizontal joints in the shell shall be spliced to comply with Section 25.13.0.

8.9.13.6 Dewatering: Where piers are carried to depths below water level, the piers shall be constructed by a method which will insure accurate preparation and inspection of the bottom, and the depositing or construction of sound concrete or other masonry in the dry.

8.9.14 PILE FOUNDATIONS

8.9.14.1 Investigations: Pile foundations shall be designed and installed on the basis of a foundation investigation and report which shall include borings, test pits or other sub surface exploration at locations and depths sufficient to determine the position and adequacy of the bearing soils, except where sufficient data upon which to base the design and installation is

available. The investigation and report shall include, but not be limited to, the following:

1. Recommended pile types and installed capacities.
2. Driving criteria.
3. Installation and field inspection procedures.
4. Pile load test requirements.
5. Durability of pile materials.
6. Designation of bearing stratum or strata.

8.9.14.2 Special types of piles: The use of types of piles not specifically mentioned herein is permitted, subject to approval, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such piles. The allowable stresses shall not in any case exceed the limitations specified herein.

8.9.14.3 Protection of pile materials: Where boring records or site conditions indicate possible deleterious action on pile materials because of soil constituents, changing water levels or other factors, the pile materials shall be adequately protected by approved materials, methods or processes. Protective materials shall be applied to the piles so as not to be rendered ineffective by driving.

8.9.14.4 Lateral support: Any soil other than fluid soil shall be deemed to afford sufficient lateral support to the pile to prevent buckling and to permit the design of the pile in accordance with the applicable provisions of this code. All piles standing unbraced in air, water or soils not capable of providing lateral support shall be designed as columns in accordance with the provisions of this code.

8.9.14.5 Group action: In cohesive soils, the compressive load capacity of a group of friction piles shall be analyzed by an approved, relational method and, where such analysis indicates, the individual allowable pile loading shall be reduced accordingly.

8.9.14.6 Stability: All piles shall be braced to provide lateral stability in all directions. Three or more piles connected by a rigid cap shall be considered as being braced, provided that the piles are located in a radial direction from the centroid of the group, not less than 60 degrees (1.5 Rad.) apart. A two-pile group in a rigid cap shall be considered to be braced along the axis connecting the two piles. Methods used to brace piles shall be subject to approval of a registered structural engineer.

Piles supporting walls shall be driven alternately in lines at least 30mm apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and lateral forces, or the wall piles are adequately braced to provide for lateral stability. Where a single row of piles without lateral bracing is used for buildings of Use Group H-3 or for lightweight construction not exceeding two storeys or 105mm in height, the centers of the piles shall be located within the width of the foundation wall.

8.9.14.7 Structural integrity: Piles shall be installed in such a manner and sequences as to prevent distortion or damage to piles being installed or already in place, to extent that such distortion or damage affects the structural integrity of the piles.

8.9.14.8 Spacing: The minimum center-to-center spacing of piles shall be not less than twice the average diameter of a round pile, nor less than one and three-quarters times the diagonal dimension of a rectangular pile. When driven to or penetrating in to rock, the spacing shall be not less than 600mm. When receiving principal support from end bearing on materials other than rock, through friction resistance, the spacing shall be not less than 750mm except that for piles having enlarged bases formed either by compacting concrete or driving a precast base the minimum center-to-center spacing shall be 1372mm. The spacing of piles shall be such that the average load on the supporting strata will not exceed the safe bearing value of those

strata as determined by test borings or other approved methods.

8.9.14.9 Splices: Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the pile during installation and subsequent thereto and shall be of adequate strength to transmit the vertical and lateral loads and moments occurring at the location of the splice during driving and under service loading. Splices shall develop not less than 50 percent of the least value of the pile in bending. In addition, all pile splices occurring in the upper 3000mm of the embedded portion of the pile shall be capable of resisting at allowable working stresses the moment and shear that would result from an assumed eccentricity of the pile load of 75mm or the pile shall be braced in accordance with Section 25.13.6 to other piles that do not have splices in the upper 3000mm of embedment.

8.9.14.10 Pile caps: Pile caps shall be of reinforced concrete. The soil immediately below the pile cap shall not be considered as carrying any vertical load. The tops of all piles shall be embedded not less than (75mm) into pile caps and the caps shall extend at least 100mm beyond the edges of all piles. The tops of all piles shall be cut back to sound materials and allowance for reinforcement anchorage made before capping.

8.9.14.11 Pre-excavation: The use of jetting, auguring or other methods of preexcavation shall be subject to approval by a registered structural engineer. Where approved, pre-excavation shall be carried out in the same manner as used or for piles subject to load tests and in such a manner that will not impair the carrying capacity of the piles already in place or damage adjacent structures. Pile tips shall be driven below the pre-excavated depth until the required resistance or penetration is obtained.

8.9.14.12 Inspection: An approved, qualified inspector shall be present when pile foundations are being installed or during a test. The inspector shall make and submit to the code official detailed records of the installation of each pile and the results of load tests. Records shall include the cut off and tip elevation of each pile relative to a permanent reference.

8.9.14.13 Identification: All pile materials shall be identified for conformity to the specified grade with this identification maintained continuously from the point of manufacture to the point of installation or shall be tested by an approved agency to determine conformity to the specified grade and the approved agency shall furnish an affidavit of compliance to the code enforcement officer.

8.9.14.14 Pile location plan: A plan showing the location and designation of all piles by an identification system shall be filed with the code official prior to installation of such piles. All detailed records for individual piles shall bear an identification corresponding to that shown on the plan.

8.9.14.15 Use of existing piles: Piles left in place where a structure has been demolished shall not be used for the support of new construction unless satisfactory evidence is submitted to the code official indicating that the piles are sound and meet all the requirements of this code. Such piles shall be loaded and tested or redriven to verify their capacities. The design load applied to such piles shall be the lowest allowable load as determined by tests or redriving data.

8.9.14.16 Pile driveability: Pile cross sections shall be of sufficient size and strength to withstand driving stresses without damage to the pile, and to provide sufficient stiffness to transmit the required driving forces.

8.9.14.17 Heaved piles: All piles that have heaved during the driving of adjacent piles shall be redriven as necessary to develop the required capacity and penetration, or the capacity of the pile shall be verified by load tests in accordance with Section 25.14.4.

8.9.14.18 Settlement analysis: The settlement of individual piles or groups of piles shall be

estimated based upon approved methods of analysis. The predicted settlement shall not cause harmful distortion of, or instability in, the structure, nor shall it lead to any stresses exceeding allowable values.

8.9.14.19 Use of vibratory drivers: Vibratory drivers shall only be used to install piles where the pile load capacity is verified by load tests in accordance with Section 25.14.4. The installation of production piles shall be controlled according to power consumption and rate of penetration, or other approved means that assure pile capacities equal or exceeding that of test piles.

8.9.14.20 Installation sequence: Piles shall be installed in such a sequence to avoid compacting the surroundings soil to the extent that other piles cannot be installed properly, and to prevent ground movements that could damage adjacent structures.

8.9.15 ALLOWABLE PILE LOADS

8.9.15.1 Determination of allowable loads: The allowable axial and lateral loads on piles shall be determined by an approved formula, test or method of analysis.

8.9.15.2 Piles in subsiding areas: Where piles are driven through subsiding fills or other subsiding strata and drive support from underlying firmer materials, the downward friction forces which are imposed on the piles by the subsiding upper strata shall be included in the design.

8.9.15.3 Driving formula: The allowable compressive load on any pile when determined by the application of an approved driving formula shall not exceed 36287kg. The formula load shall be determined for gravity drop or power-actuated hammer energy used shall be the maximum consistent with the size, strength and weight of the driven piles. The use of a follower shall be permitted only when approved. The introduction of fresh hammer cushion or pile cushion material just prior to final penetration shall not be permitted.

8.9.15.4 Load tests: When greater compressive loads per pile than permitted by Section 25.14.3 are desired or when the design load for any pile foundation is in doubt, control test piles shall be tested in accordance with ASTMD1143 listed in Schedule A. At least one pile shall be test loaded in each area of uniform subsoil conditions. When required by the code official, additional piles shall be load tested if necessary to establish the safe design capacity. The resulting allowable loads shall be not more than one-half of that test load which produces a permanent net settlement of not more than 0.000028mm/kg of test load, and not more than 19mm. In subsequent driving of the balance of foundation piles, all piles shall be deemed to have a supporting capacity equal to the control pile when such piles are of same or comparable methods and equipment as the test pile, are installed in similar subsoil conditions as the test pile, and when the rate of penetration of such piles is equal to or less than that of the test pile through a comparable driving distance.

8.9.15.5 Use of higher allowable stresses: Allowable stresses greater than those specified for each pile type in this article shall be permitted when supporting data justifying such higher stresses are filed with the code official. Such substantiating data shall include a foundation investigation in accordance with Section 25.13.1 and pile load tests in accordance with Section 25.14.4, regardless of the load supported by the pile.

The design and installation of the pile foundation shall be under the direct supervision of a registered professional engineer knowledgeable in the field of soil mechanics and pile foundations, who shall certify to the code official that the piles as installed satisfy the design criteria.

8.9.15.6 Allowable lateral load: When required by the design, the lateral load capacity of a single pile or a pile group shall be determined by an approved method of analysis or by lateral

load tests to at least twice the proposed design working load. The resulting allowable load shall be not more than one-half of that test load which produces a gross lateral movement of 25mm at the ground surface.

8.9.15.7 Uplift capacity: When required by the design, the uplift capacity of a single pile shall be determined in accordance with relevant BS COP listed in Schedule B or an approved method of analysis based upon a minimum safety factor of three. The maximum allowable uplift load shall be one-half that load which produces an upward movement of the pile but equal to the gross elastic extension of the pile plus 3mm. For pile groups subjected to uplift, the allowable working uplift load for the group shall be the lesser of the proposed individual pile uplift working load times the number of piles in the group, or two-thirds of the effective weight of the pile group and the soil contained within a block defined by the perimeter of the group and the length of the pile.

8.9.15.8 Bearing capacity: Individual piles and groups of piles shall develop ultimate load capacities of at least twice the design working loads in the designated bearing layers. Analysis shall show that the soil layer underlying the designated bearing layers does not cause the bearing capacity safety factor to be less than two.

8.9.15.9 Bent piles: The load carrying capacity of piles discovered to have a shaft or sweeping bend shall be determined by an approved method of analysis or by load testing a representative pile.

8.9.15.10 Overloads on piles: The maximum compressive load on any pile due to mislocation shall not exceed 110 percent of the allowable design load

8.9.16 STRUCTURAL STEEL PILES

8.9.16.1 Materials: Structural steel piles, steel pipe and fully-welded steel piles fabricated from plates shall conform to ASTM A36, A252, A283, A572 or A588 listed in Schedule A.

8.9.16.2 Allowable stresses: The allowable design compressive stresses shall not exceed 0.33 of the minimum specified yield strength of the steel, except that maximum allowable design stresses shall be 0.50 of the minimum specified yield strength of steel where substantiated by Section 25.14.5.

8.9.16.3 Dimensions of H-piles: Sections of H-piles shall comply with the criteria of Section 25.15.3.3.

8.9.16.3.1 Flanges: The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web, and the flange widths shall be not less than 80 percent of the depth of the section.

8.9.16.3.2 Depth: The nominal depth of the direction of the web shall be not less than 100mm.

8.9.16.3.3 Thickness: Flanges and web shall have a minimum nominal thickness of 10mm.

8.9.16.3.4 Dimensions of steel pipe piles: Steel pipe piles driven open-ended shall have a nominal outside diameter of not less than 250mm and a minimum wall thickness of not less than 6mm for diameters less than 356mm, and not less than 10mm for diameters 356mm and over. Where pipe of less wall thickness is driven open-ended, a suitable cutting shoe shall be provided.

8.9.17 CONCRETE-FILLED STEEL PIPE AND TUBE PILES

8.9.17.1 Materials: Steel pipe and tube piles shall conform to ASTM A252 or A282 listed in Schedule A. Concrete shall conform to Section 8.9.17.1.1 maximum size coarse aggregate shall be 19mm.

8.9.17.2 Allowable stresses: The allowable design compressive stresses in the concrete shall not exceed 0.33 of the 28-day specified compressive strength (fcu). The allowable design compressive stress in the steel shall not exceed 0.35 of the minimum specified yield strength of the steel, except that the maximum allowable design compressive stress shall be 0.50 of the

minimum specified yield strength of the steel where substantiated by Section 8.9.14.5.

8.9.17.3 Minimum dimensions: Piles shall have a nominal outside diameter of not less than 100mm and a minimum wall thickness in accordance with Section 8.9.15.4. For mandrel-driven pipe piles, the minimum wall thickness shall be 3mm.

8.9.17.4 Reinforcement: Reinforcement steel shall conform to Section 8.9.17.1.2 Reinforcement shall not be placed within 25mm of the steel casing.

8.9.17.5 Placing concrete: Placing of concrete shall conform to Section 8.9.17.1.3.

8.9.18 CAST-IN-PLACE CONCRETE PILES

8.9.18.1 General: The materials, The materials, reinforcement and installation of cash-in-place concrete piles shall conform to Sections 8.9.17.1.1 through to 8.9.17.1.3.

8.9.18.1.1 Material: All concrete shall have a 28-day specified compressive strength (fcu) of not less than 21NKmm^2. When concrete is placed through a funnel hopper at the top of the pile, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 102mm and not more than 150mm. If concrete is to be pumped, the mix design including slump shall be adjusted to produce a pumpable concrete.

8.9.18.1.2 Reinforcement: Except for steel dowels embedded 1500mm or less in the pile and as provided in Section 25.17.2 reinforcement when required shall assembled and tied together and shall be placed in the pile as a unit before the reinforced portion of the pile is filled with concrete.

8.9.18.1.3 Installation: Concrete shall be placed in such a manner as to insure the exclusion of any foreign matter and to secure a full-sized shaft. Concrete shall not be placed through water except when tremie methods are approved. When depositing concrete from the top of the pile, the concrete shall not be chuted directly into the pile but shall be poured in a rapid and continuous operation through a funnel hopper centered at the top of the pile.

8.9.18.2 Drilled or augured uncased piles: Drilling or augured uncased piles shall conform to Section 8.9.17.2.1 through to 8.9.17.2.4.

8.9.18.2.1 Allowable stresses: The allowable design stress in the concrete of drilled uncased piles shall not exceed 33 percent of the 28-day specified compressive strength (cu). The allowable design stress in the concrete of augured cast in place piles shall not exceed 25 percent of the 28-day specified compressive strength (fcu).

8.9.18.2.2 Dimensions: The pile length shall not exceed 30 times the average diameter. The minimum diameter shall be 300mm.

8.9.18.2.3 Installation: If pile shafts are formed through unstable soils and concrete is placed in an open drilled hole, a steel liner, shall be inserted in the hole prior to placing concrete. If the steel liner is withdrawn during concreting, the level of concrete shall be maintained above the bottom of the liner at a sufficient height of any hydrostatic or lateral soil pressure.

If concrete is placed by pumping through a hollow-stem auger, the auger shall not be permitted to rotate during withdrawal and shall be withdrawn in a steady continuous motion. Concreting pumping pressures shall be measured and shall be maintained high enough at all times to offset hydrostatic and lateral earth pressures. Concrete volumes shall be measured to ensure that the volume of concrete placed in each pile is equal to or greater than the theoretical volume of the hole created by the auger. If the installation process of any pile is interrupted or a loss of concreting pressure occurs, the pile shall be redrilled to original depth and reformed. Augured cast-in-place piles shall not be installed within six pile diameters center-to-center of a pile filled with concrete less than 24 hours old unless approved. If the concrete level in any

completed pile drops, the pile shall be rejected and replaced.

8.9.18.2.4 Reinforcement: For piles installed with a hollow-stemauger, where longitudinal steel reinforcement is placed without lateral ties, the reinforcement shall be placed through ducts in the auger prior to filling the pile with concrete.

All pile reinforcement shall have a concrete cover of not less than 64mm.

8.9.18.3 Driven uncased piles: Driven uncased piles shall conform to Section 8.9.17.3.1 through to 8.9.17.3.4.

8.9.18.3.1 Allowable stress: The allowable design stress in the concrete shall not exceed 25 percent of the 28-day specified compressive strength (fcu) applied to a crosssectional area not greater than the inside area of the drive casing or mandrel.

8.9.18.3.2 Dimensions: The pile length shall not exceed 30 times the average diameter. The minimum diameter shall be 300mm.

8.9.18.3.3 Installation: Piles shall not be driven within six pile diameters center-to-center in granular soils or within one-half the pile length in cohesive soils of a pile filled within concrete less than 48 hours old, unless approved. If the concrete surface in any complete pile ties or drops, the pile shall be rejected and replaced. Piles shall not he installed in soils which could cause pile heave.

8.9.18.3.4 Concrete cover: All pile reinforcement shall have a concrete cover of not less than 64mm, measured from the inside face of the drive casing of mandrel.

8.9.18.3.5 Enlarged base piles: Enlarged base piles shall conform to Section 8.9.17.4.1 through 8.9.17.4.5.

8.9.18.3.6 Materials: The maximum size for coarse aggregate for all concrete shall be 19mm compacted concrete shall have a zero slump.

8.9.18.3.7 Allowable stress: The maximum allowable design compressive stress for concrete not placed in permanent steel casing shall be 25 percent of the 28-day specified compressive strength (fcu) where the concrete is placed in a permanent steel casing all the maximum allowable concrete stress shall be 33 percent of the 28-day specified compressive strength (fcu).

8.9.18.3.8 Installation: Enlarged bases formed either by compacting concrete or driving a precast base shall be formed in a driven into granular soils. All piles shall be constructed in the same manner as successful prototype test piles driven for the project. Pile shafts extending through peat or other organic soil shall be encased in a permanent steel casing. If a cased shaft is used, it shall be adequately reinforced to resist column action or the annular space around the pile shaft shall be filled sufficiently to restable the lateral support of the soil. If pile heave occurs, the pile shall be rejected unless it can be demonstrated that the pile is undamaged and capable of carrying twice its design load.

8.9.18.3.9 Bearing capacity: Pile bearing capacity shall be verified by load tests in accordance with Section 8.9.14.4.

8.9.18.3.10 Concrete cover: The minimum concrete cover shall be 64mm for uncased shafts and 25mm for case shafts.

8.9.18.4 Steel cased piles: Steel cased piles shall comply with Section 25.17.5.1 through 8.9.17.5.4.

8.9.18.4.1 Material: Pile shells or casings shall be made of steel and shall be sufficiently strong to resist collapse and sufficiently water-tight to exclude any foreign materials during the placing of concrete. Steel shells shall have a sealed tip with a diameter of not less that 203mm.

8.9.18.4.2 Allowable stress: The allowable design compressive stress in the concrete shall not exceed 33 percent of the 28-day specified compressive strength (fcu). The allowable concrete compressive stress shall be 0.40 (fcu) for that portion of the pile meeting the conditions specified in Section 8.9.17.5.2.1 through 8.9.17.5.2.4.

8.9.18.4.2.1 Thickness: The thickness of the steel shell is not less than No. 14 gauge (0.17mm) minimum.
8.9.18.4.2.2 Shell type: The shell is seamless or is provided with seams of strength equal to the basic material and is of a configuration which will provide confinement to the cast in place concrete.
8.9.18.4.2.3 Strength: The ratio of steel yield strength (fcu) to design shall be not less than 6.
8.9.18.4.2.4 Diameter: The nominal pile diameter is not greater than 16 inches.

8.9.18.4.3 Installation: Piles shall have steel shells, mandrel-driven their full length in contact with the surrounding soil, left permanently in place and filled with concrete. A pile shall not be driven within four and one-half average pile diameters of a pile filled with concrete less than 24 hours old unless approved. Concrete shall not be placed in steel shells within heave range of driving.
8.9.18.4.4 Reinforcement: Reinforcement shall not be placed within 25mm of the steel shell. Reinforcing shall be considered necessary only for unsupported pile lengths or when the pile is designed to resist uplift or unbalanced lateral loads.

8.9.19 PRECAST CONCRETE PILES
8.9.19.1 Design and manufacture: All piles shall be designed and manufactured in accordance with accepted practice, and to resist all stresses induced by handling, driving and service loads. The minimum lateral dimension shall be 250mm. All corners of square piles shall be chamfered. Longitudinal steel shall be arranged in a symmetrical pattern and shall be laterally tied with steel ties or wire spiral spaced not more than 75mm apart, center-to-center, for a distance of 600mm from the ends of the pile; and not more than 150mm elsewhere except that at the ends of each pile the first five ties or spirals shall be spaced 25mm center-to-center.

8.9.19.1.1 Installation: All piles shall be handled and driven so as not to cause injury or overstressing which will affect their durability or strength.

8.9.19.2 Reinforced piles: Reinforced precast concrete piles shall conform to Section 8.9.18.2.1 through to 8.9.18.2.5.
8.9.19.2.1 Design: The minimum amount of longitudinal reinforcement shall be 2 percent of the concrete section and shall consist of at least four bars.

8.9.19.2.2 Material: All concrete shall have a 28-day specified compressive strength (fcu) of not less than 2.81 kg/mm^2.

8.9.19.2.3 Allowable stress: The allowable compressive stress in the concrete shall not exceed 33 percent of the 28-day specified compressive strength (fcu) applied to the gross cross-sectional area of the pile.

8.9.19.2.4 Concrete cover: All pile reinforcement shall have a concrete cover of not less than 50mm except that piles exposed to sea water shall have a minimum protective concrete cover of 75mm.

8.9.19.2.5 Installation: A precast concrete pile shall not be driven before the concrete has attained a compressive strength of at least 2.11 kg/mm^2, but not less than such strength sufficient to withstand handling and driving forces.

8.9.19.3 Pre-stressed piles: Pre-stressed concrete piles shall conform to Section 8.9.18.3.1 through 8.9.18.3.4.
8.9.19.3.1 Design: The effective pre-stress in the pile shall be not less than 5N/mm^2.
8.9.19.3.2 Material: Pre-stressing steel shall conform to ASTM A416 listed in Schedule A. All-concrete shall have a 28-day specified compressive strength (fcu) of not less than 40N/mm^2.

8.9.19.3.3 Allowable stress: The maximum allowable design compressive stress (fcu) in concrete shall be determined as follows: 0.33fcu-0.27fpc where fpc is the effective prestress on the gross area of pile section.

8.9.19.3.4 Installation: A prestressed pile shall not be driven before the concrete has attained a compressive strength of at least 2.81kg/mm^2 but not less than such strength sufficient to withstand handling and driving forces.

8.9.20 TIMBER PILES

8.9.20.1 Materials: Timber piles shall conform to ASTM D25 listed in Schedule A.

8.9.20.2 Preservative treatment: Timber piles used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of untreated timber piles will be below lowest ground water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with

AWPA C3 listed in Schedule A. When timber piles are used in salt water, the treatment shall conform to AWPB MP1, MP2 or MP4 listed in Schedule A. Pile cutoffs shall be treated in accordance with AWPA M4 listed in Schedule A.

8.9.20.3 Allowable stresses: The allowable stresses for treated round timber piles shall not exceed those set forth in Table 25.18.3 and as approved for in Sections 8.9.18.3.1 and 8.9.18.3.2.

8.9.20.3.1 Stress increase: The allowable unit stresses in compression parallel to grain shall be increased by 0.2 percent for each 300mm of length from the tip of the pile to the critical section. The increase shall not exceed 10 percent for any pile. The stress increase is cumulative with increase in section properties due to pile taper.

8.9.20.3.2 Dried or untreated piles: The working stresses in Table 25.19.3 have been adjusted to compensate for strength reductions due to conditioning prior to treatment. Where piles are air-dried or kiln-dried prior to pressure treatment, or where untreated piles are to be used, the compression, bending and shear stresses shall be increased by multiplying the tabulated values by a factor of 1.5:

TABLE 25.2

GRADE STRESSES FOR TROPICAL HARDWOODS FOR THE DRY EXPOSURE CONDITION

Standard Name	Bending parallel to grain N/mm^2	Tension parallel to grain N/mm^2	Compression		Shear parallel to grain N/mm^2	Modulus of elasticity mean
			Parallel to grain N/mm^2	Perpendicular to grain N/mm^2		
Iroko	12.6	7.5	2.6	2.8	1.6	10600
Opepe	17.0	10.2	17.6	3.8	2.1	14500
Teak	13.7	8.2	13.4	3.1	1.7	10700
White wood	7.5	4.5	7.9	2.1	0.82	10500

ALLOWABLE UNIT STRESSES a FOR TREATED ROUND TIMBER PILES, NORMAL LOAD DURATION - VALUES AT TIP OF PILE (see Section 25.19.3.2)

Species	Compression parallel to grain psi	Bending psi	Shear horiz. psi	Comp. perp. to grain psi	Modulus of elasticity
Pacific coast Douglas fir (see Section 25.19.3.1)	1,250	2,450	115	230	1,500,000

TABLE 25.19.3

Red oak - northan and southern	1,100	2,450	135	350	1,250,000
Red pine (grown in the United States)	900	1,900	85	155	1,280,000
Southern pine — longleave, slash, loblolly and short leave (see Section 25.19.3.1	1,200	2,400	110	250	1,500,000

Note a. 1 psi = 0.000703kg/mm^2.

8.9.20.4 End bearing piles: Any sudden decrease in driving resistance of an end bearing timber pile shall be investigated with regard to the possibility of damage. If the sudden decrease in driving resistance cannot be correlated to bearing data, the pile shall be removed for inspection or rejected.

8.9.21 COMPOSITE PILES

8.9.21.1 Design: Composite piles consisting of two or more approved pile types shall be designed to meet the conditions of installation.

8.9.21.2 Limitation of load: The maximum allowable load shall be limited by the capacity of the weakest section incorporated in the pile.

8.9.21.3 Splices: Splices between concrete and steel or wood sections shall be designed to prevent separation both before and after the concrete portion has set, and to ensure the alignment and transmission of the total pile load. Splices shall be designed to resist uplift due to upheaval during driving of adjacent piles, and shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section.

8.9.22 CAISSON PILES

8.9.22.1 Construction: Caisson piles shall consist of a shaft section of concrete-filled pipe extending to bedrock with an uncased socket drilled into the bedrock and filled with concrete. The caisson pile shall have a full-length structural steel core or a stub core installed in the rock socket and extending into the pipe portion a distance equal to the socket depth.

8.9.22.2 Design: The depth of the rock socket shall be sufficient to develop the full load bearing capacity of the caisson pile with a minimum safety factor of two, but the depth shall be not less than the outside diameter of the pipe. The design of the rock socket is permitted to be predicated on the sum of the allowable bearing pressure on the bottom of the socket plus bond along the sides of the socket. The minimum outside diameter of the caisson pile shall be 45mm, and the diameter of the rock socket shall be approximately equal to the inside diameter of the pile.

8.9.22.3 Material: Pipe and steel cores shall conform to the material requirements in Section 8.9.15.0. Pipe shall have a minimum wall thickness of 10mm and shall be fitted with a suitable steel driving shoe welded to the bottom of the pipe. All concrete shall have a 28-day specified compressive strength (pc) of not less than 30N/mm^2. The concrete mix shall be designed and proportioned so as to produce a cohesive workable mix with a slump of from 100mm to 150mm.

8.9.22.4 Structural core: The gross cross-sectional area of the structural steel core shall not exceed 25 percent of the gross caisson section. The minimum clearance between the structural core and the pipe shall be 50mm. If cores are to be spliced, the ends shall be milled

or ground to provide full contact and shall be full-depth welded.

8.9.22.5 Allowable stresses: The allowable design compressive stresses shall not exceed the following: concrete, 0.33fc, steel pipe, 0.35fy; structural steel core, 0.50fy.

8.9.22.6 Installation: The rock socket and pile shall be thoroughly cleaned of all foreign materials before filling with concrete. Steel cores shall be bedded in cement grout at the base of the rock socket. Concrete shall not be placed through water except when tremie methods are approved.

8.9.23 FOUNDATION WALLS

8.9.23.1 Design: Foundation walls shall be designed to resist forecast action and to support safely all vertical and lateral loads as provided in Chapter 11. The maximum stresses due to combined loads shall be within the values specified for the materials used in the construction. Unless properly reinforced, tensile stresses shall not exceed those permitted in plain masonry.

8.9.23.2 Minimum thickness: The thickness of foundation walls shall be not less than the wall supported, and the minimum thickness shall be limited for the various materials of construction as herein specified. 200mm foundation walls shall be permitted under brick veneered frame and under 250mm cavity walls when the total height of the wall supported, including gables, is not more than 6000 mm.

8.9.23.2.1 Reinforced concrete: When reinforced concrete is required to resist all stresses, foundation walls shall be not less than 200mm thick.

8.9.23.2.2 Hollow and solid non-reinforced masonry and plain concrete: The thickness of non-reinforced masonry foundation walls shall not be less than shown in Table 8.9.22.2.2 for the type of foundation and superstructure construction used. The maximum depth below grade shall be increased up to that indicated in parenthesis in Table 25.22.2.2 where such increase is warranted by soil conditions and local experience, and is approved. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds 2134mm, foundation wall thickness shall be determined by structural analysis as required in Section 25.23.2.

TABLE 25.22.2.2 THICKNESS OF FOUNDATION WALLS

Foundation wall construction		Maximum depth below ground level (see Section 25.22.2.2) Supported wall construction)		
Type	Thickness (mm) (see Section 25.22.2.2)	Frame	Masonry veneer	Masonry
Hollow masonry	200	1.2 (1.B)	4.5 (6)	1.5 (2.1)
(unreinforced)	250	1.5 (2.1)	5.5 (7)	1.8 (2.1)
	300	2.1	7	2.1
Solid masonry	200	1.5 (2.1)	5.5 (7)	1.8 (2.1)
(unreinforced)	250	1.8 (2.1)	6(7)	1.95 (2.1)
Plain concrete	300	2.1	2.1	2.1
	200	2.1	2.1	2.1

Note a. foot = 304.8mm.

8.9.23.2.3 Hollow unit walls: Foundation walls approved hollow masonry units shall be provided with not less than 102mm of solid masonry at girder bearings, or shall be strengthen with buttresses.

8.9.23.2.4 Rubble stone: Foundation walls of rough or random rubble stone shall not be less than 400mm thick.

8.9.23.2.5 Bonding: All foundation walls shall be bonded as required for superstructure walls in Section 8.9.1.8.4

8.9.23.3 Increase thickness with depth: When any foundation wall, other than a wall that is designed as a retaining wall, extends more than 3.5m below the top of the first floor beams, the thickness of the wall shall be increased 100mm for each additional 3.5m or fraction thereof in depth.

8.9.23.4 Corbels on 225mm walls: Where a 225mm wall is corbelled, the top corbel shall be a full course of headers at least 100mm in length, extending, not higher than the bottom of the floor framing. The maximum projection of one unit shall neither one-half the depth of the unit nor one-third its width at right angles to the face which is offset.

8.9.23.5 Lateral stability: Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of Section 25.23.0, and shall be strengthened with buttresses or additional wall thickness to resist lateral soil and hydrostatic pressure when subjected thereto.

8.9.24 RETAINING WALLS

8.9.24.1 General: Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within the allowable stresses specified in this Code.

8.9.24.2 Design: Retaining walls shall be designed to resist the pressure of the retained material, including both dead and live load surcharges to which they are subjected, and to ensure stability against overturning, sliding, excessive foundation pressure and water uplift.

8.9.24.3 Hydrostatic pressure: Unless drainage is provided, the hydrostatic head of water pressure shall be assumed equal to the height of the wall.

8.9.24.4 Coping: All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

8.9.24.5 Guardrails: Where retaining walls with a difference in grade level on either side of the wall in excess of 1200mm are located closer than 600mm to a walk, path, parking lot or driveway on the high side, such retaining walls shall be provided with a guardrail constructed in accordance with Section 10.27.17 or other approved protective measures.

8.9.25 WATERPROOFING AND DAMP-PROOFING

8.9.25.1 Where required: Walls or portions thereof, retaining earth and enclosing interior spaces and floors below grade shall be waterproofed and damp-proofed according to this section except those spaces containing uses other than residential and institutional where such omission is not detrimental to the building or occupancy.

8.9.25.1.1 Storey above ground level: Where a basement is considered a storey above ground level and the ground level adjacent to the basement wall is below the floor elevation for not less than 25 percent of the perimeter, the floor and walls shall be damproofed in accordance with Section 25.24.3 and a foundation drain shall be installed in accordance with

Section 25.24.3. The foundation drain shall be installed around the portion of the perimeter where the basement floor is below ground level. The provisions of Section 25.24.2, 25.24.4 and 25.24.5.1 shall not apply in this case.

8.9.25.1.2 Underfloor space: The finished ground level of an underfloor space such as a crawl space shall not be located below the bottom of the footings. Where there is evidence that the ground water table can rise to within 150mm of the ground level at the outside building perimeter or where there is evidence that the surface water does not readily drain from the building site, the ground level of the underfloor space shall be as high as the outside finished ground level, unless an approved drainage system is provided. The provisions of Section 8.9.24.2, 8.9.24.3, 8.9.24.4, 8.9.24.5, and 8.9.24.6. shall not apply in this case.

8.9.25.2 Ground water table investigation: The owner or applicant shall perform a subsurface soil investigation to determine the possibility of the ground water table rising above the proposed elevation of the floor or floors below grade.

Exception: A subsurface soil investigation shall not be required when:

1. Waterproofing is to be provided.
2. Satisfactory data from adjacent areas is available which demonstrates that ground water has not been a problem.
3. Floodproofing is to be provided in accordance with Section.

8.9.25.2.1 Ground water control: Where the ground water table is lowered and maintained at an elevation not less than 150mm below the bottom of the lowest floor, the floor and walls shall be damp-proofed in accordance with Section 25.24.3. The design of the system to lower the ground water table shall be based upon accepted principles of engineering which shall consider, but not necessarily be limited to: permeability of the soil, rate at which water enters the drainage system, rated capacity of pumps, head against which pumps are to pump and the rated capacity of the disposal area of the system.

8.9.25.3 Damproofing required: Where hydrostatic pressure will not occur as determined by Section 25.24.2, floors and walls for other than wood foundation systems shall be damp-proofed in accordance with this section. Wood foundation systems shall be constructed in accordance with NFoPA TR7 listed in the Schedule.

8.9.25.3.1 Floor applications: The required damp-proofing materials shall be installed between the floor and the base as provided by Section 8.9.14.5.1 except where floor is provided above a concrete slab.

8.9.25.3.2 Floor damp-proofing materials: Where installed beneath the slab, damp- proofing shall consist of not less than 6-mil(.006 inch; 152mm) polyethylene with joints lapped not less than 150mm, or other approved methods or materials. Where permitted to be installed on top of the slab, damp-proofing shall consist of mopped-on bitumen, not less than 4-mil (.004 inch; 102mm) polyethylene, or other approved methods or materials. Joints in the membrane shall be lapped and sealed in accordance with the manufacturers' recommendations.

8.9.25.3.2.1 Walls: Damp-proofing materials shall be installed on the exterior surface of walls, and shall extend from the top of the footing to above ground level.

8.9.25.3.2.2 Surface preparation of walls: Prior to application of damproofing materials on concrete walls, all holes and recesses resulting from the removal of form ties shall be sealed with a bituminous material or other approved methods or materials. Unit masonry walls shall be parged on the exterior surface below ground level with not less than 10mm of Portland cement mortar. The parging shall be coved at the footing.

Exception: Parging of unit masonry walls is not required where a material is approved for direct

application to the masonry.

8.9.25.3.2.3 Wall damp-proofing materials: Damp-proofing shall consist of a bituminous material, any of the materials permitted for waterproofing by Section 25.24.4.2.2, or other approved methods or materials.

8.9.25.4 Waterproofing required: Where the ground water investigation required by Section 8.9.24.2 indicates that a hydrostatic pressure condition exits walls and floors shall be waterproofed in accordance with the pressure to which they will be subjected.

8.9.25.4.1 Floors: Floors required to be waterproofed shall be of concrete, designed and constructed to withstand the hydrostatic pressure of which they will be subjected.

8.9.25.4.1.1 Floor waterproofing materials: Waterproofing shall be accomplished by placing a membrane of rubberised asphalt, butyl rubber, neoprene, or not less than 6-mil (0.006 inch; 152mm) polyvinyl chloride or polyethylene with joints lapped not less than 150mm, or other approved materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturers' recommendations.

8.9.25.4.2 Walls: Walls required to be waterproofed shall be of concrete or masonry designed and constructed to withstand the hydrostatic pressure and other lateral loads to which they will be subjected.

8.9.25.4.2.1 Surface preparation of walls: Prior to the application of waterproofing materials on concrete or masonry walls, the walls shall be prepared in accordance with Section 8.9.24.3.2.1.

8.9.25.4.2.2 Wall waterproofing materials: Waterproofing shall be applied from the bottom of the wall to not less than 300mm above the maximum elevation of the ground water table. The remainder of the wall shall be damp-proofed in accordance with Section 8.9.24.3.2.2. Waterproofing shall consist of two-ply hot mopped felts, not less than 6-mil (006 inch; 152mm) polyvinyl chloride or other approved methods or materials capable of bridging nonstructural cracks. Joints in the membrane shall be lapped and sealed in accordance with the manufacturers' recommendations.

8.9.25.4.3 Joints and penetrations: Joints in walls and floors, and between the wall and floor, and penetrations of the wall and floor, shall be made water-tight utilising approved methods and materials.

8.9.25.5 Subsoil drainage system: Where a hydrostatic pressure condition does not exist, damp-proofing shall be provided and a base shall be installed under the floor and a drain installed around the foundation perimeter. A subsoil drainage system designed and constructed in accordance with Section 8.9.24.2.1 shall be deemed adequate for lowering the ground water table.

8.9.25.5.1 Floor base: Floors of basements except as provided in Section 8.9.24.4.1.1 shall be placed over a base course not less than 100mm in thickness consisting of gravel or crushed stone containing not more than 10 percent of material that passes a No. 4 sieve.

8.9.25.5.2 Foundation drain: A drain shall be placed around the perimeter of a foundation consisting of gravel or crushed stone containing not more than 10 percent material that passes a No. 4 sieve. The drain shall extend a minimum of 102mm beyond the outside edge of the footing. The thickness shall be such that the invert level of the drain is not higher than the invert level of the base under the floor, and the top of the drain is not less than 150mm above the top of the footing. The top of the drain shall be covered with an approved filter membrane material. Where a drain tile or perforated pipe is used, the invert of the pipe or tile shall be not higher than the floor elevation. The top of joints or the top of perforations shall be protected

with an approved filter membrane material. The pipe or tile shall be placed on not less than 50mm of gravel or crushed stone complying with Section 8.9.24.5.1 and covered with not less than 150mm of the same material.

8.9.25.5.3 Drainage disposal: The floor base and foundation perimeter drain shall discharge by gravity or mechanical means into an approved drainage system complying with the plumbing code listed in the Schedule.

EXCEPTION: Where a site is located in well-drained gravely or sand-gravel mixture soils, a dedicated drainage system is not required.

8.9.25.6 Placement of backfill: The excavation outside the foundation shall be backfilled with soil which is free of organic material, construction debris, and large rocks. The backfill shall be placed in lifts and compacted in a manner which does not damage the waterproofing or damp-proofing material.

8.9.25.7 Site grading: The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in twelve units horizontal (1:12) for a minimum distance of 2400mm measured perpendicular to the face of the wall or an approved alternate method of diverting water away from the foundation shall be used. Consideration shall be given to possible additional settlement of the backfill when establishing the final ground level adjacent to the foundation.

8.9.25.8 Erosion protection: Where water impacts the ground from the edge of the roof, downspout, scupper, or other rain water collection or diversion device, provisions shall be made to prevent soil erosion and direct the water away from the foundation.

SECTION 9 SERVICE ENGINEERING DESIGN REQUIREMENTS

Sections ***Page***

SECTION 9 SERVICE ENGINEERING DESIGN REQUIREMENTS

9.1 MECHANICAL ENGINEERING DESIGN REQUIREMENTS

9.1.1 BUILDING DESIGN REQUIREMENTS

9.1.2 SPECIAL BUILDING DESIGN REQUIREMENTS

9.1.3 SIGNAGE

9.1.4 REPAIRS, ALTERATIONS

9.1.5 PRECAUTIONS DURING

The provisions of Sections 7.1, 7.2, 7.4, 7.5 and 7.6 of this Code shall apply to these sub-sections.

9.1.6 MATERIALS and COMPONENTS

The provisions of Section 10.1 of this Code shall apply to this sub-section.

9.1.7 FIRE

The provisions of Section 12.1 of this Code shall apply to this sub-section.

9.1.8 MECHANICAL SYSTEMS, ELEVATORS, CONVEYOR EQUIPMENT AND DUMBWAITERS

9.1.8.1 General

9.1.8.1.1 Scope: The provisions of this Section shall control the design installation, construction, inspection and maintenance of all mechanical equipment and systems in respect to structural strength, fire safety and operation.

9.1.8.1.2 Mechanical code: All mechanical equipment and systems shall be con structed, installed and maintained in accordance with the mechanical code.

9.1.8.2 PLANS AND SPECIFICATIONS

9.1.8.2.1 General: Plans and specifications for the installation repair, extension or removal of any mechanical equipment or system shall be submitted in accordance with the mechanical code listed in the Schedule, and a permit shall be secured prior to the commencement of any work.

9.1.8.2.2 Matter covered: The plans and specifications shall show in sufficient detail all pertinent features and clearances of the appliances and systems, including: size and type of apparatus; construction of flue, stack or chimney; stack connections; type of fuel; method of operation; and the method of compliance with all regulations for the class and type of equipment installed.

9.1.8.2.3 Details: An application for permit shall be accompanied by specifications and diagrammatic mechanical drawings in sufficient detail, and complying with the provisions of the mechanical code listed in the Schedule, before a permit shall be issued for the mechanical equipment or system. The plans shall be drawn to a scale of not less than 1:100, and shall show the location and arrangement of all equipment and distribution elements including safety and pressure-controlling devices.

9.1.8.3 INSPECTIONS AND TESTS

9.1.8.3.1 Inspection: All mechanical equipment and systems requiring a permit shall be inspected in accordance with the mechanical code and shall not be placed in operation until having been tested and approved.

9.1.8.3.2 Concealment: It shall be unlawful for owners, contractors or workers to any way

to conceal any piping, outlet boxes or other parts of the mechanical equipment or system requiring a permit until an inspection has been made thereof and due notice given that the work has been approved.

9.1.8.3.3 Defects and repairs: Upon inspection or reinspection of a mechanical system, any defects or deficiencies which require repair to ensure safe operation shall be rectified before the system is placed in use.

9.1.8.3.4 Power to deem unsafe: When a system or any part thereof is found unsafe to life or property, it is shall be deemed unsafe and such system shall not be restored to use until it has been made safe and approved.

9.1.8.4 EXISTING BUILDINGS

9.1.8.4.1 Unsafe orders: All existing mechanical equipment and systems shall be maintained and operated in accordance with the requirements of this Code. Any such equipment which does not comply with the requirements, and the operation of which is deemed unsafe to the building occupants, shall be altered as ordered by the code enforcement officer to secure safety.

9.1.8.5 FEES

9.1.8.5.1 General: A permit to begin work for new construction or alteration shall not be issued until the prescribed application and permit fees have been paid, nor shall an amendment to a permit necessitating an additional fee because of the additional work involved be issued until the additional fee has been paid.

9.1.8.6 DRYING ROOMS

9.1.8.6.1 General: A dry room or dry kiln installed within a building shall be constructed entirely of approved non-combustible materials or assemblies of such materials with the required fire-resistance rating based on the fire hazard of the contents and the process, as regulated by the approved rules or as required in Chapter 8 for special uses.

9.1.8.6.2 Piping clearance: All overhead heating pipes shall have a clearance of not less than 50mm from combustible contents of the dryer.

9.1.8.6.3 Insulation: When the operating temperature of the dryer is 79 degrees C or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 300mm of air space, or the metal walls shall be lined with 6mm asbestos mill board or other approved equal insulation.

9.1.8.6.4 Fire protection: Drying rooms designed for high hazard materials and processes, including special uses provided for in Section 8, shall be protected by an approved automatic fire suppression system conforming to the provisions of Section 12.1.

9.1.8.7 WASTE AND LINEN HANDLING SYSTEMS

9.1.8.7.1 General: Waste and linen handling systems shall be installed in accordance with the relevant standards as listed in the Schedule.

9.1.8.8 REFUSE VAULTS

9.1.8.8.1 Refuse vault enclosures: A vault for receiving combustible refuse from an exhaust system shall be constructed of not less than 3-hour fire resistance rated assemblies.

9.1.8.8.2 Openings to boiler rooms: The opening between a vault and a boiler room shall not exceed 0.84m^2 in area and shall be located at least 2.4 meters from the firing door of the boiler, and the bottom of the opening shall be not less than 150mm above the boiler room floor. All openings shall be equipped with fire doors of not less than 1 ***Vi*** hour fire resistance rating complying with Section 29.18.

9.1.8.8.3 Location: When located within a building, a refuse vault shall extend above the roof or shall be directly vented to the outer air with ducts complying with the mechanical code listed in the Schedule.

9.1.8.8.4 Fire protection: A vault for combustible refuse which exceeds 125m^3 in volume shall be protected by an approved automatic fire suppression system conforming to Section 12.1.

9.1.8.9 DUCT, STOCK AND REFUSE CONVEYOR SYSTEMS

9.1.8.9.1 Power transmission: Power for fans located in rooms from which flammable dust is being removed shall be transmitted by means of a shaft passing through a bushed hole, or by a belt, chain or similar driving mechanism which is encased in a metal or other noncombustible dust-tight enclosure, both within and without the room.

9.1.8.9.2 Collectors and separators: Cyclone collectors and separators and their supports shall be constructed of noncombustible materials and shall be located whenever possible on the exterior of the building or structure. A collector or separator shall not be located nearer than 3 meters to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe which extends above the highest part or any roof within a distance of 9 meters.

9.1.8.9.3 Discharge pipes: Discharge pipes shall conform to all the requirements for ducts, including clearances required for high appliances, as contained in the mechanical code listed in the Schedule. A delivery pipe from a cyclone collector shall not convey refuse directly into the firebox of a boiler, furnace, dutch oven, refuse burner, incinerator or other appliance.

9.1.8.9.4 Vents for exhaust conveyor systems: An exhaust system shall be vented to the outside of the building either directly by flue, or indirectly through the separator, bin, or vault into which it discharges.

9.1.8.9.5 Spark protection: The outlet of an open air vent shall be protected with an approved metal or other non-combustible screen or by other equally efficient means to prevent the entry of sparks.

9.1.8.9.6 Explosion relief vents: A safety or explosion relief vent shall be provided on all systems which convey combustible refuse or stock of an explosive nature, in accordance with the requirements of Section 8.20.

9.1.8.9.7 Screens: When a screen is used in a safety relief vent, it shall be so attached as to permit ready release under emergency pressure.

9.1.8.9.8 Hoods: The relief vent shall be provided with an approved non-combustible cowl or hood, or with a counterbalanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.

9.1.8.10 ELEVATOR, DUMB-WAITER AND CONVEYOR EQUIPMENT, INSTALLATION AND MAINTENANCE

9.1.8.10.1 Scope: Except as otherwise provided by statute, the provisions of this Chapter shall control the design, construction, installation, maintenance and operation of all elevator, dumbwaiters, escalators, moving walks and special hoisting and conveying equipment hereafter operated, installed, relocated or altered in all buildings and structures. The design, construction, installation, maintenance and operation of all miscellaneous hoisting and elevating equipment and amusement devices shall be subject to such special requirements as are deemed necessary by the code enforcement officer to secure their safe operation. The provisions of the chapter shall not apply to portable elevating within one storey. The construction, alteration, maintenance, operation, inspection and tests of manlifts shall comply with the relevant standards (see ASME A 90).

9.1.8.10.2 Referenced standard: Except as otherwise provided in this Code, and except where more restrictive provisions govern, the construction, alteration, maintenance,

operation, inspections and tests of elevators, dumbwaiters, moving walks and escalators shall conform to ASME A17.1 listed in the Schedule.

9.1.8.10.3 Purpose and exceptions: The purpose of this code is to provide safety for life and property. In case of practical difficulty or unnecessary hardship, the code enforcement officer shall grant exceptions from the literal requirements or permit the use of other methods, but only when it is clearly evident that reasonable safety is thereby secured.

9.1.8.11 PLANS, SPECIFICATIONS AND PERMITS

9.1.8.11.1 Application: The person responsible for the installation, relocation, or alteration covered by this Chapter shall file an application for permit with the code enforcement officer, accompanied by governing specifications and scaled or fully- dimensioned drawings with sufficient clarity and detail showing: the location of the installation in relation to the plans and elevation of the building; the location of the machinery room and equipment to be installed, relocated or altered, and all structural supporting members thereof, including foundations. Such plans and specifications shall specify all materials to be employed and all loads to be supported or conveyed and shall be sufficiently complete to illustrate all details of construction and design.

9.1.8.11.2 Permits: Equipment or devices subject to the provisions of this code shall not be constructed, installed, relocated or altered unless a permit has been received from the code enforcement officer before the work is commenced. A copy of such permit shall be kept at the constructions site at all times while the work is in progress.

9.1.8.11.3 Identification of equipment: In buildings containing more than one elevator or device and where such devices are subject to periodic inspections, each such elevator or device shall be identified by a serial number, in figures not less than 25mm high, attached to, painted, stenciled or otherwise registered on the crosshead of the elevators, on the motor or machine. After such devices have been so designated, their numbers shall not be changed, except by permission of the code enforcement officer, and all correspondence in regard to such device shall refer to said number.

9.1.8.12 TESTS AND INSPECTIONS

9.1.8.12.1 General: All equipment and devices covered by the provisions of this code shall be subjected to acceptance and maintenance tests and periodic inspections as required herein.

9.1.8.12.2 Acceptance tests: Acceptance tests and inspections shall be required on all new, relocated and altered equipment subject to the provisions of this Chapter. Tests and inspections shall be of such nature as to determine whether the entire installation is designed, constructed and installed in compliance with this code, and shall include all parts of the equipment and machinery. All such tests shall be made in conformance with the requirements of the relevant Mechanical Code and in the presence of the code enforcement officer, by the person installing such equipment.

9.1.8.12.3 Periodic tests and periodic inspections: Periodic tests shall be required on all new and existing power elevators, and periodic inspections shall be made of all new and existing equipment subject to the provisions of this Chapter.

9.1.8.12.4 Periodic tests and Inspections: Periodic tests and inspections shall be made by the code enforcement officer, or by an approved agency, and shall be made at the expense and responsibility of the owner. Where such test and inspections are not made by the code enforcement officer, the approved agency shall submit a detailed report of the tests and inspections to the code enforcement officer, the approved agency shall submit a detailed

report of the test and inspections to the code enforcement officer on approved forms not more than 30 days following the completion of the tests.

9.1.8.12.5 Frequency of tests and inspections: Tests and inspections shall be conducted at frequencies specified in Section 9.1.8.14.6 and 9.1.8.14.7

9.1.8.12.6 Periodic inspection intervals: Periodic inspections shall hereafter be made at intervals of not more than six months for all manlifts, and at intervals not exceeding that set forth in relevant Mechanical Codes' for elevators, escalators, dumbwaiters and moving walks miscellaneous hoisting, and elevating equipment, conveyors and amusement devices shall be inspected at such intervals as are deemed necessary by the code enforcement officer to ensure safety of operation.

9.1.8.12.7 Periodic test intervals: Periodic tests shall be done at intervals not exceeding those set forth in the relevant Mechanical Code.

9.1.8.12.8 Elevators, dumbwaiters and escalators: The equipment and machinery of elevators, dumbwaiters and escalators shall be inspected and tested to the requirements of ASME A17, listed in the Schedule.

9.1.8.13 Freight lifts Conveyors and amusement devices: Freight lifts, conveyors and amusement devices shall be inspected and subjected to tests to ensure the load capacity and safety of operation. The tests shall cover all operating protective and safety devices, structural adequacy of the supports, and anchorage to floors, walls ceiling and foundations.

9.1.8.13.1 Manlifts: All equipments and machinery of manlifts shall be inspected and tested to ensure reasonable safety of operation and shall include tests of the brake, terminal and emergency stopping devices and belt tension. Acceptance tests shall also include a load capacity test as provided in the relevant in the Mechanical Code.

9.1.8.13.2 Miscellaneous hoisting and elevating equipment: All miscellaneous hoisting and elevating equipment shall be subjected to such test and inspection as required by the code enforcement officer to ensure safe operation.

9.1.8.14 CERTIFICATE OF COMPLIANCE

9.1.8.14.1 General: The operation of all equipment governed by the provisions of this Section and hereafter installed, relocated or altered shall be unlawful by persons other than the installer thereof until such equipment has been inspected and tested as herein required and a final or limited certificate of compliance has been issued thereof by the code enforcement officer.

9.1.8.14.2 Final certificate of compliance: The code enforcement officer shall issue a final certificate of compliance for each unit of equipment which has satisfactorily met all the inspections and tests required by this Section. Such final certificate shall bear the signature of the person who made the inspection and tests, and shall designate the rated load and speed, the date of acceptance tests and inspections, and the name of the code enforcement officer who made or witnessed such tests and inspections.

The final certificate shall also include the necessary space for inserting the name of the periodic inspection and the maintenance test.

9.1.8.14.3 Limited certificate of compliance: The code enforcement officer is authorised to issue a limited certificate of compliance for any equipment covered by this Chapter, which is hereafter being installed, relocated or altered, to permit its limited use by the person designated therein during the period of such installation, relocation or alteration. Such certificate shall be signed by the code enforcement officers, shall bear the dates of issue, renewal and expiration, and shall designate the class of service allowed.

9.1.8.14.4 Test and minimum safeguard required: A limited certificate shall not be issued for an elevator until such elevator has satisfactorily passed tests for rated, load, car and counterweight safety, and terminal stopping devices. Permanent or temporary guards and enclosures shall be installed on the car, around the hoistway and at the landing entrances. Equipment other than elevators shall be tested and protective safeguards provided as deemed necessary by the code enforcement officer to ensure safe operation for the limited service specified.

9.1.8.14.5 Special conditions: Automatic and continuous-pressure operation elevators shall not be placed in temporary operation from the landing push-buttons unless the door locking device and interlocks required by the relevant Mechanical Code are installed and operative. When the car can be operated only from the inside, landing entrance guards shall be provided with locks that can be released from the hoistway side only.

9.1.8.14.6 Time limitation: Limited certificate of operation shall be issued for periods of not more than 30 days. The code enforcement officer is authorised to renew the limited certificates of operation for additional periods of not more than 3o days each.

9.1.8.14.7 Posting certificates of compliance: The owner or lessee shall post the last-issued certificate of compliance in a conspicuous place available to the code enforcement officer.

9.1.8.15 MAINTENANCE AND ACCIDENTS

9.1.8.15.1 Owner responsibility: The owner or the owners' legal agent for the building in which the equipment is located shall be responsible for the care, maintenance and safe operation of all equipment covered by this Chapter after the installation thereof and its acceptance by such owner or agent. The owner or legal agent shall make or cause to be made all periodic tests and inspections, and shall maintain all equipment in a safe operating condition, as required by this Chapter.

9.1.8.15.2 Contractor responsibility: The person installing any device covered by this Section shall make all acceptance tests and be responsible for the care and safe operation of such equipment during its construction and until temporarily or finally accepted by the building owner or the owners' legal agent.

9.1.8.15.3 Maintenance items: All operating and electrical parts and accessory equipment or devices subject to this Section shall be maintained in a safe operating condition. The maintenance of elevators, dumbwaiter and escalators shall conform to the relevant Mechanical Code.

9.1.8.15.4 Unsafe conditions: If upon inspection any equipment covered in this Section is found in an unsafe condition, or not in accordance with the provisions of this code, the code enforcement officer shall thereupon serve a written notice of such finding upon the building owner or lessee, stating the time when recommended repairs or changes shall be completed. After the service of such notice, it shall be the duty of the owner to proceed within the time allowed to make such repairs or changes as necessary to place the equipment in a safe condition. It shall be unlawful to operate such equipment after the date stated in the notice unless such recommended repairs or changes have been made and the equipment has been approved, or unless an extension of time has been secured from the code enforcement officer in writing.

9.1.8.15.5 Power to seal equipment: The code enforcement office, in addition to any other penalties herein provided, shall have the power to seal out of service any device or equipment covered by this Section when in case of emergency in the opinion of the code enforcement officer, such device is in a condition to render it unsafe for operation; or for

wilful failure to comply with recommendations and orders.

9.1.8.15.6 Notice of sealing out of service: Before sealing any device out of service, the code enforcement officer, except in case of emergency shall serve written notice upon the building owner or lessee stating intention to seal the equipment out of service and the reasons thereof.

9.1.8.15.7 Unlawful removal of seal: Any device sealed out of service by the Code Enforcement Division/Section/Unit shall be plainly marked with a sign or tag indicating the reason for such sealing. Any tampering with, defacing or removal of the sign, tag or seal without approval shall constitute a violation of this Code.

9.1.8.15.8 Accidents reported and recorded: The owner of the building shall immediately notify the code enforcement officer of every accident involving personal injury or damage to apparatus on, about, or in connection with any equipment covered by this Chapter, and shall afford the code enforcement officer all facilities for investigating such accident. When an accident involve the failure, breakage, damage or destruction of any part of the apparatus or mechanism, it shall be unlawful to use such device until after an examination by the code enforcement officer is made and approval of equipment for continued use is granted. It shall be the duty of the code enforcement officer to conduct a prompt examination into the cause of the accident and to enter a full and complete report thereof in the records of the building department, within 21 days of the reported accident. Such reports shall be open for public inspection at all reasonable hours.

9.1.8.15.9 Removal of damaged parts: It shall be unlawful to remove from the premises any part of the damage construction or operating mechanism of elevators, or other equipment subject to the provisions of this Chapter until permission to do so has been granted by the code enforcement officer.

9.1.8.16 EXISTING INSTALLATIONS

9.1.8.16.1 Retroactive provisions: The provisions of this Section are not retroactive except as specifically provided hereunder, and except further that if, upon inspection of any device covered by this code, the equipment is found in a dangerous condition, or there is an immediate hazard to those riding on or using such equipment, or if the design or the method of operation in combination with devices used, is considered inherently dangerous in the opinion of the code enforcement officer, the code enforcement officer shall notify the owner or lessee in writing of the existing condition and shall recommend such alterations or additions as are deemed necessary to eliminate the dangerous situation.

9.1.8.16.2 Projections into hoistway: All ledges, floor beams, saddles, timbers and other projections that project more than 50mm from the inside of the general surface of the hoistway enclosure shall be fitted with smooth bevelled guards set directly over the entire length of the projection, except door interlocks and contacts, door closers, door tracks and hangers, and door operating or signal devices in front of car openings, landing sills and separator beams between adjacent elevators. The angle of the bevels or guard plates shall not be less than 60 degrees (1.50rad) from the horizontal.

9.1.8.16.3 Emergency interlock release switch: Emergency interlock release switches are prohibited.

9.1.8.16.4 Lighting: The cars and entrances of all elevators shall be properly lighted at all times when in service. Minimum illumination shall not be less than 53.82lux at the landing edge of the platform.

9.1.8.16.5 Belt and chain-driven machines: Single-belt and chain-driven machines are permitted only on freight elevators, and only when equipped with electrical-released spring-applied brakes and with terminal stopping and electrical safety devices required for new electric elevators. The brakes shall be applied directly to the hoisting machine and shall be arranged to belted elevator machines and permitted only on freight elevators and when driven by a line shafting which is used to apply power for other purposes.

9.1.8.16.6 Replacement or relocation of gate switches on interlocks: The code enforcement officer shall require the replacement or relocation of car gate electric contacts, safety cut-out switches or interlocks where such devices are found to be tied or blocked so as to render them inoperative.

9.1.8.16.7 Removal of pipes from hoistway: The code enforcement officer shall order the removal from existing elevator hoistways of any pipe conveying gases, vapours on liquids which would endanger life if discharged into the hoistway or ignited.

9.1.8.16.8 Existing passenger elevators: In addition to other provisions of this section, existing passenger elevators shall comply with Section 9.1.8.18.9 through to 9.1.8.18.12

9.1.8.16.9 Hoistway enclosure: All existing passenger hoistways shall be fully enclosed from floor to ceiling on all floors to comply with Section 9.1.8.20.

9.1.8.16.10 Hoistway doors and interlocks: All existing electric and electrically controlled and operated hydraulic passenger elevators equipped with mechanical locks and electrical contacts in good operating condition are not required to be removed or altered. If not so equipped, such passenger elevators shall be provided with hoistway landing doors equipped with approved interlocks conforming to the requirements for new elevators; except that where approved interlock switches are installed in connection with existing hoistway door closers, the combination door closer and interlocks shall require tests. The use of service and emergency keys for opening hoistway doors from the landing shall conform to the requirements of the relevant Mechanical Code.

9.1.8.16.11 Hydraulic passenger elevators: Hydraulic passenger elevators, except those equipped with electric control and operating devices, shall be provided with selfclosing hoistway doors arranged to lock automatically when closed in lieu of interlocks. Car doors or gates on electric or electricity controlled and operated hydraulic elevators shall be equipped with car door or gate electric contacts conforming to the requirements for new elevators.

9.1.8.16.12 Emergency signal or telephone: Existing power passenger and freight elevators shall be provided with emergency signal devices conforming to the requirements of ASME A17.1 listed in the Schedule.

9.1.8.16.13 Existing freight elevators: In addition to other provisions, existing freight elevators shall comply with Section 9.1.8.18.14 through to 9.1.8.18.18.

9.1.8.16.14 Hoistway enclosure: If not now enclosed, enclosures shall be required on existing freight elevators as required for existing passenger elevators in Section 27.18.8, except as provided in Section 9.1.8.18.16.

9.1.8.16.15 Hoistway doors: All landing openings in existing electric or electricity controlled and operated hydraulic freight elevator hoistways which are enclosed in fire- resistance rated partitions shall be provided with fire doors equipped either with approved hoistway door interlocks, or approved hoistway door electric contacts and mechanical locks conforming to ASME A17.1 listed in the Schedule, or with fusible mechanical locks conforming to ASME A17.1 listed in the Schedule, or with fusible links and automatic self-closing devices.

9.1.8.16.16 Landing gates: Where automatic self-closing landing doors with fusible links

are used, or where fire-resistance rated hoistway enclosures are not required, the landing openings of electric or electricity controlled and operated hydraulic elevators shall be equipped with landing gates not less than 1650mm high and provided with either hoistway gate interlocks or hoistway gate electric contacts and mechanical locks conforming to ASME A17.1 listed in the Schedule.

9.1.8.16.17 Hydraulic freight elevators: Interlocks or electric contacts shall not be used on hydraulic elevator landing doors or gates, except where such elevators are provided with electric control and operating devices, and provided further that the landing openings of such elevators shall be equipped with self-closing gates at least 1650mm high with approved mechanical locks. Fully automatic gates shall be prohibited. Semi-automatic shall be prohibited, except on hydraulic elevators with mechanical control and operating devices.

9.1.8.16.18 Gates on cars: All openings on existing electric or electro-hydraulic freight elevator cars, except the opening immediately adjacent to the operating device, shall be provided by the side of the landing door adjacent contacts when the distance between the hoistway side of the landing door adjacent to such opening and the hoistway edge of the landing threshold is more than 100mm. All such elevators using lever, wheel or cable operating devices shall have gate contacts installed at all car openings. All openings on existing continuous-pressure or automatic operation freight elevator cars shall be operated from the landings and shall be provided with car gates and car gate electric contacts. Existing sidewalk elevators shall not be subject to the provisions of this section. Car gate electric contacts shall be of an approved type conforming to ASME A17.1 listed in the Schedule.

9.1.8.17 POWER ELEVATOR OPERATION

9.1.8.17.1 Designated operator: Every power elevator, except automatic and continuous-pressure operation types and sidewalk elevators, shall be in the change of a competent designated operator.

9.1.8.17.2 Emergency operation of elevators: In all structures where elevators are to be installed, elevator emergency operation shall be provided in accordance with the requirements of the Mechanical Code and Section 27.20.1 through 27.20.5.

9.1.8.17.3 Buildings with elevator service: In all buildings and structures serviced by an elevator, at least one elevator shall be provided with a minimum clear distance between walls, or between wall and door excluding return panels, not less than 1727mm by 1372mm, and a minimum distance from wall to return panel not less than 1295mm. The minimum clear width of the door shall be 813mm.

9.1.8.17.4 Elevators for fire department use: In all structures where elevator service required for fire department use (see Section 602.8), at least one elevator shall be provided with a minimum distance between walls, or between wall and door excluding return panel, not less than 1772mm by 1372mm and a minimum distance from wall to return panel not less than 1295mm, with a 1067mm side-slide door to allow for turning a wheelchair or accommodating an ambulance stretcher in its horizontal position.

9.1.8.17.5 Elevator operator: In every structure over 45 meters in height, a competent elevator operator shall be available at all times to assist the fire department in obtaining access to any floor in the building or structure served by elevators except where an automatic or continuous pressure operation elevator is available.

9.1.8.17.6 Passenger restriction: Freight elevators shall be in accordance with the passenger restrictions as specified in the manufacturer's manual.

9.1.8.17.7 Freight operators: Except as provided in Section 27.20.8 it shall be unlawful for any person other than the operator or those individuals necessary to handle freight to ride on any elevator other than a passenger elevator. It shall be unlawful for the owner or other responsible person to permit any individual other than above specified to ride on any

elevator other than a passenger elevator.

9.1.8.17.8 Other employees: Employees of the owner shall not ride on a freight elevator, unless approved and in conformance with the requirements of the relevant standards (See ANSI A17).

9.1.8.17.9 Use by handicapped persons: If interior access in multi-storey buildings are provided by elevator(s), they shall conform to the special requirement for use by handicapped persons as provided in the relevant Mechanical Code listed in the Schedule.

9.1.8.18 HOISTWAY ENCLOSURES AND VENTING

9.1.8.18.1 Hoistway enclosures: Hoistway enclosures shall be constructed in accordance with Section 27.21.2 through 27.21.4.

9.1.8.18.2 Elevator enclosures: All elevator and other hoistway enclosures other than dumbwaiter shafts shall be constructed to afford at least the fire-resistance rating specified in Table 6.1 with approved opening protective conforming to Section 27.24, Chapter 29.

9.1.8.18.3 Dumbwaiter enclosures: Shaft enclosures and dumbwaiters having a car area of more than 0.28m^2 which travel through more than one storey and serve more than two adjacent floors shall be of 1-hour fire-resistance rated construction with approved %- hour opening protective or the approved labeled equivalent complying with Chapter 29 except that when the load capacity exceeds 488.2kg/m^2, the enclosure and opening protective shall comply with the requirements of Section 27.21.1 for fire-resistance rating.

9.1.8.18.4 Special dumbwaiter enclosures: The enclosure of dumbwaiters not more than 0.28m^2 in area with a load capacity of not more than 11.35kg, and all dumbwaiters serving not more than two adjacent levels, shall be enclosed with approved noncombustible materials.

9.1.8.18.5 Number of elevators permitted in hoistway: Where four or more elevators serve all or the same portion of a building, they shall be located in not less than two hoistways, and more than four elevators shall not be located in any one hoistway.

9.1.8.18.6 Vents required: Hoistway of elevators and dumbwaiters serving more than three storeys shall be equipped with means for venting smoke and hot gases to the outer air in case of fire, except as listed in Section 27.21.8 and 27.21.9.

9.1.8.18.7 Exception: Venting of hoistway is not required in a building equipped with a smoke control system conforming to Section 23.20.11.

9.1.8.18.8 Fire suppression alternative: In buildings other than Use Groups H-1, H-2, F-1 and F-2 and similar buildings with overnight sleeping quarters, hoistways not extending into the top storey shall be vented as herein required or shall be equipped with an approved automatic fire suppression system connected to the building water supply system or conforming to Section 30.5.

9.1.8.18.9 Sidewalk elevator hoistways: Sidewalk elevator hoistways are not required to be vented.

9.1.8.18.10 Location of vents: Vents shall be located on the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open either directly to the outer air or through non-combustible ducts to the outer air. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extended to not less than 300mm below the shaft vent to inhibit the passage of smoke into the machine room.

9.1.8.18.11 Area of vents: Except as herein provided, the area of the vents shall be not less than 3 $^1/_2$ percent of the area of the hoistway nor less than 0.28m^2 for each elevator car, and shall be of the permanently open type. Where mechanical ventilation conforming to the current Engineering Code of Practice provides equivalent venting, the required vent area shall be reduced provided the conditions of Section 9.2.4 and 9.2.7.3 are met.

9.1.8.18.12 Restricted use: The building is not of Use Group H-1, H-2, F-1 or F-2 or a similar building with overnight sleeping quarters.

9.1.8.18.13 Vent location: The required vents in Section 27.21.10 are so located that they do not have outside exposure.

9.1.8.18.14 Closed vents: Closed portions of the required vent area shall consist of windows or duct openings glazed with plain glass not more than 3mm thick.

9.1.8.18.15 Windows: Windows used as required vents shall conform to Section 29.19 and they shall be glazed with 3mm plain glass.

9.1.8.18.16 Plumbing and mechanical systems: Plumbing and mechanical systems, other than floor drains, sumps and sump pumps at the base of the of the shaft, shall not be located in an elevator shaft.

9.1.8.19 ELEVATOR AND DUMBWAITER MACHINERY AND EQUIPMENT

9.1.8.19.1 General: The construction of machine rooms and related construction for passenger and freight elevators and dumbwaiters shall conform to ASME A17.1 listed in the Schedule.

9.1.8.20 MACHINE ROOMS AND RELATED CONSTRUCTION FOR PASSENGER AND FREIGHT ELEVATORS AND DUMBWAITER

9.1.8.20.1 General: The construction of machine rooms and related construction for passenger and freight elevators and dumbwaiters shall conform to ASME A17.1 listed in the Schedule.

9.1.8.21 ELEVATOR OPENING PROTECTION

9.1.8.21.1 General: All hoistway enclosure doors for elevators, dumbwaiters and other hoisting equipment shall be constructed with materials of adequate fire-resistance in accordance with the provisions of Chapter 29 and as herein required.

9.1.8.21.2 Hoistway doors: Door openings of elevator hoistway enclosures shall be equipped with protective assemblies having a fire-resistance rating of not less than V>-hours or their approved labeled equivalent. However, when the shaft opens into a vestibule enclosed with not less than 2-hour fire-resistance rated construction in which all vestibule openings are protected with assemblies having a fire-resistance rating of not less than 1 hour, the required fire-resistance rating of the hoistway doors shall be %-hour.

9.1.8.21.3 Hardware: All hardware on opening protective shall be of an approved type installed as tested, except that interlocks, mechanical elevator door locks and electric contacts and door operating mechanism of approved types shall be exempt from the fire test requirements.

9.1.8.21.4 Emergency Door operation: In every structure where elevator emergency operation is provided in accordance with Section 27.21.1, each elevator lobby and associated elevator machine rooms shall be provided with a smoke detector installed in accordance with the relevant standards (See NFiPA 72E). A designated level, which shall be the main floor level that best serves the needs of emergency personnel for fire fighting or rescue purposes, shall be approved by the Code Enforcement Division/Section/Unit and the fire safety Code Enforcement Division/Section/Unit. The activation of a smoke detector in any elevator machine room to return non-stop to the designated level. If a smoke detector at the designated level is activated, the cars shall return to an approved level. Manual control to override the smoke detectors shall be provided at the designated level in accordance with the current Engineering Code of Practice. The smoke detectors shall operate before the optical density exceeds 0.098 per m. The detector is permitted to serve to close the lobby doors.

9.1.8.21.5 Exception: Freight elevators located in or at openings into industrial areas.

9.1.8.22 ELEVATOR CAR EMERGENCY SIGNALS SIGNS

9.1.8.22.1 Emergency signs: Elevator car shall be provided with car emergency signals conforming to the requirements of ASME A17.1 listed in the Schedule.

9.1.8.22.2 Emergency signs: A pictograph sign, of an approved standardized type, shall be posted over each elevator call station on all floors, indicating that in case of fire, occupants shall not use elevators and that stairways are the approved method of exit.

9.1.8.23 MANLIFTS

9.1.8.23.1 Restricted use: Manlifts shall be accessible and their use shall be restricted to employees only. They shall comply with the applicable requirements of this Chapter and shall be installed only when permitted by the code enforcement officer in feed, flour and cereal mills, gain elevators and in similar buildings of other use groups.

9.1.8.23.2 Enclosures: When the clear vertical distance between mounting platform and ceiling guard is less than 2286mm, the manlift shall be completely enclosed without access openings.

9.1.8.23.3 Accessibility: Entrances to manlifts shall not be provided from any floor or level with a clear ceiling height of less than 2783mm and the minimum clearance between the head pulley and the roof or other overhead obstruction shall be not less than 1500mm.

9.1.8.23.4 Speed: The speed of manlifts shall not exceed 0.046m/s except by special approval.

9.1.8.23.5 Manlift safeties: Manlift safeties shall conform to Section 27.26.6 through to 27.26.8.

9.1.8.23.6 Manlift manual stops: An approved manually-operated stopping device shall be provided to permit passengers riding on a manlift to control the operation of the lift at all floors and at any level in the travel of the device.

9.1.8.23.7 Manlift automatic stops: An approved safety device shall be provided which will automatically stop the lift in the event that a rider fails to alight at the top landing but such automatic device shall not be capable of restoring the operating circuit of adequate strength to support a load of 90.8kg on each step of one run without loss of traction.

9.1.8.23.8 Handholds: Manlift handholds shall be located not less than 1200mm nor more than 1422mm above each step tread on both runs of the manlift with a 50mm clearance from the belt. Such handholds shall be not less than 225mm in length in the clear.

9.1.8.23.9 Final acceptance: All manlifts shall be subject to approval and periodic tests and inspections as provided in Section 27.14.2

9.1.8.23.10 Manlift instruction signs: Manlifts shall be subject to approval and periodic tests and inspections as provided in Section 27.14.2.

9.1.8.23.11 Landing signs: Approved signs shall be provided on each landing and stenciled on the belt at approximately eye level above each step giving the following instructions:

For Employees Only. Face the Belt, Use the Handhold. To Stop, Pull Rope.

9.1.8.23.12 Terminal sign: The top landing shall be provided with an illuminated warning sign in block letters not less than 50mm high which shall be located within easy view of ascending passengers at a level of not more than 60cm above the top landing reading: Top Floor, Get Off.

9.1.8.24 INDUSTRIAL LIFTS AND LOADING RAMPS

9.1.8.24.1 General: Except as exempted by Section 27.12 or as otherwise by statute, the provisions of this section shall control the design, construction, installation, maintenance and operation of all automotive lifts, industrial lifts and loading dock ramps hereafter installed, relocated or altered in all buildings or structures. The purpose of this code is to provide safety for life and property. In case of practical difficulty or unnecessary hardships,

the code enforcement officer shall grant exceptions from the literal requirements or permit the use of other methods, but only when it is evident that safety is hereby secured.

9.1.8.24.2 General requirements: Industrial lifts and loading ramps shall be marked with the name of manufacturer, model number, serial number, and rated capacity. Such markings shall be legibly stamped or etched on a metal plate which shall be permanently secured in a convenient place for inspection. Such data plates shall not be obscured, obliterated or changed.

9.1.8.24.3 Controls: The controls shall be so located that the operator has a full and unobstructed view of the lift area at all times. All control devices shall be accessible to the operator without exposing him to danger. Alterations or changes shall not be made in the control device, or its manner of use, which will render its normal functioning inoperative.

9.1.8.24.4 Lift control: When the device used for controlling the travel of the lift in either direction is not continuous-pressure or deadpan type, an emergency stop button shall be provided and so located as to be readily accessible to the operator at all times.

9.1.8.24.5 Maintenance: Maintenance of industrial lifts and loading ramps shall be provided in accordance with manufacturer's maintenance manual and design specifications.

9.1.8.24.6 Owner responsibility: The owner or the owners' agent shall be responsible for the care, maintenance, and safe operation of all equipment covered by this chapter after the installation thereof and its acceptance by such owner or agent or its approval.

The owner or agent shall not permit the equipment to be used unless it is, to the best of such owners' or agents' knowledge, in safe operating condition.

9.1.8.24.7 Housekeeping: The spaces around or beneath the equipment shall be kept clean. Rubbish or oil shall not be allowed to accumulate therein, nor shall any part of this space be used for storage of materials or equipment. All parts, except those requiring freedom of movement, shall be kept tight at all times. All mechanical working parts shall be kept free of rust, and properly lubricated and adjusted. The owner, or the owners' agent, shall be responsible for inspecting the oil level in all hydraulic systems to ensure that it is at or above the manufacturers' prescribed minimum level.

9.1.8.24.8 Lighting: The entire operating area shall be illuminated to provide a distributed intensity of not less than 32.29lux over the area of operating floor and platform.

9.1.8.24.9 Pressure tanks: All separate tanks for liquids storage under pressure, not an integral part of the cylinder assembly, shall conform to the provisions of the standards (See ASME Code for Unfired Pressure Vessels and shall be marked with a securely attached metal label to indicate the approved operating pressure. For hydroneumatic systems, the storage capacity shall be such that with the lift in fully elevated position there shall remain not less than 75mm of usable oil in the storage tank. Adequate means shall be provided to determine that the oil level in reservoir, with lift in the lowest position, is at or above the safe minimum operating level as prescribed by the manufacturer.

9.1.8.24.10 Design and construction: The construction and installation of all power industrial lifts and loading ramps shall comply with the provisions of this section and other relevant standards (see ANSI A10.5)

9.1.8.24.11 Rated load: The lifting capacity shall be not less than 244kg/m^2 for gross platform area.

9.1.8.24.12 Platform construction: The platform and its supports shall be designed for the loads to be transmitted within strength and deflection limitations such that when one- half the capacity loading is applied to an edge, the lift platform shall not deflect more than 13mm at any edge point.

9.1.8.24.13 Platform and hoist protection: Platform and hoist protection shall be provided in accordance with Section 27.27.15 through to 27.27.25

9.1.8.24.14 Unprotected space not more than 1.5m: When the lift rise is such that the unprotected vertical distance from the landing to the botton edge of the vertical side of the platform is not more than 1500mm, protection shall be provided as described in Section 27.27.1 through to 27.27.6.

9.1.8.24.15 Toe guards: A toe guard plate not less than 200mm in height shall be provided on all unprotected sides. It shall be made of steel, nor less than 3mm nominal thickness, attached to flush with the vertical edge or the platform, and slanted inwardly at an angle or approximately 30 degrees (0.52rad) from the vertical. Toe guards are not required where skirts are used.

9.1.8.24.16 Skirts: For automatic operation, the unprotected sides of the platform shall be provided with metal or wood sheathing or skirts attached to the platform to protect the exposed vertical openings.

9.1.8.24.17 Enclosures: When toe guard or skirt protection is not provided, the unprotected sides shall be provided with solid or mesh enclosures to the full height of the lift rise. Mesh enclosure shall, by test, reject a 50m ball.

9.1.8.24.18 Unprotected space more than 1.5m: When the unprotected space exceeds that set forth in Section 27.27.15 protection shall be provided as described in Section 27.27.3.

9.1.8.24.19 Loading or unloading side: Sides used for loading or unloading at the lower level shall be protected with skirts as described in Section 27.27.15, or by a landing gate with electrical contact, or an automatic landing gate.

9.1.8.24.20 Other sides: Sides not used for loading or unloading shall be protected with skirts or enclosures as described in Section 27.27.15

9.1.8.24.21 Lift rise more than 1.65m: When the lift rise exceeds 1650mm above the lowest level, additional protection shall be provided as described in Sections 27.27.23 and 27.27.24.

9.1.8.24.22 Landing gate: The upper landing shall be provided a landing gate equipped with mechanical lock and electrical contact.

9.1.8.24.23 Enclosure: The sides of the platform not used for loading or unloading shall be provided with railing, mesh, or solid enclosures not less than 105mm.

9.1.8.24.24 Surface installations: When the lift is surface mounted, toe clearance space shall be provided on all unprotected sides. Such toe clearance shall be not less than 75mm vertical and 100mm horizontal clearance when the platform is at its lowest position.

9.1.8.24.25 Platform protection, loading ramps: The sides or edges of loading ramps which rise above the surrounding platform shall be provided with skirts or toe guards protecting the opening under the sides of the ramp.

9.1.8.24.26 Overload protection: Overload protection shall be provided in accordance with Sections 27.26.28 and 27.26.29.

9.1.8.24.27 Hydraulic Operation: Hydraulic overload protection shall be provided by means of a relief valve that will prevent raising of the elevating device when it is loaded to 125 percent of rated capacity. The relief valve shall be so designed that its operation will not cause the platform, to lower.

9.1.8.24.28 Electric operation: Electric overload protection shall be provided by means of a thermal cut out or other suitable device.

9.1.8.25 AUTOMOTIVE LIFTS

9.1.8.25.1 General: All electric, hydraulic and hydropneumatic automotive lifts shall comply with the requirements of Section 27.19 and other relevant standards (see ANSI B153).

9.1.8.25.2 Types: Lifts shall be classifed as semi-hydraulic, full hydraulic or Mechanical lifts

according to their operation as described in Section 27.25.3 through to 27.25.5.

9.1.8.25.3 Semi-hydraulic/hydropneumatic: A semi-hydraulic lift is an automotive lift of the plunger type which employs compressed air as primary lifting and load-sustaining effort, such compressed air acts continuously against a column of liquid to provide the lifting and load-sustaining effort.

9.1.8.25.4 Full hydraulic: A full hydraulic lift is an automotive lift of the plunger type that employs a liquid under pressure as the direct lifting and load-sustaining agent. Such a lift is so designed and constructed that the full weight of the load and lifting assembly rests on a continuous column of liquid which extends from the cylinder to the liquid control valve.

9.1.8.25.5 Mechanical lifts: A mechanical lift is an automotive lift so designed that the motive power is transmitted to the lifting frame by mechanical means. There are three principal types: cable and drum; rack and pinion; and screw type.

9.1.8.25.6 Safeties: All mechanical automotive lifts shall be equipped with approved safeties as specified in Section 27.25.7 through to 27.25.9.

9.1.8.25.7 Limit stop: Every mechanical automotive lift shall be equipped with an automatic overtravel device to stop the motor or drive machine before the lifting frame reaches safe limits of travel.

9.1.8.25.8 Holding brake: When the friction of the gear train of the driving mechanism is insufficient to hold the load, the mechanical automatic lift shall be equipped with a brake or other locking device to automatically hold the lift at any level immediately on failure of the lifting power for any cause.

9.1.8.25.9 Stopping brake: When the structural members of the lifting frame are so designed that they interfere with open doors or other projections from the vehicle, the automotive lift shall be provided with a quick-acting automatic brake to stop the ascent of the lift in case of emergency.

9.1.8.25.10 Control: Controls shall be provided in accordance with Sections 9.1.8.25.11 and 9.1.8.25.12.

9.1.8.25.11 Automatic release: The direct control device shall be of a type that will automatically return itself to the neutral or off position upon release by the operator.

9.1.8.25.12 Speed control: A speed control device shall be provided to control the descent of the lift at a speed of not more than 0.10m/s under rated load.

9.1.8.26 CONVEYORS

9.1.8.26.1 Enclosures: All package elevators, boosters or lifts connecting successive floors or levels shall be enclosed in fire-resistance rated construction in conformance with the requirements of Sections 27.18 and 27.20 and Chapter 29.

9.1.8.26.2 Opening protective: Opening protective shall be provided in accordance with Section 9.1.8.26.3 through to 9.1.8.26.5.

9.1.8.26.3 Plans and specifications: Whenever conveyor or other material handling devices are designed to pass through floors, ceilings, partitions or walls, the plans and specifications shall give the necessary details of the opening protective in respect to location, structural strength and fire-resistance rating.

9.1.8.26.4 Fire curtains: Openings in partitions and walls through which conveyors pass shall have automatic fire dampers or curtains to prevent the spread of fire when, in the opinion of the code enforcement officer, such protection is necessary due to the hazard of operation of the conveyors.

9.1.8.26.5 Fire doors: All opening protective shall meet the fire-resistance rating requirements of Chapter 29 for the location, type of construction and use of the building or structure.

9 .1.8.26.6 Machinery guards: All conveying devices shall be manufactured, installed, and

guarded in accordance with the relevant standards (see ASME B20).

9 .1.8.26.7 Chute enclosures: All slides and chutes shall be enclosed with fire- resistance rated construction, or protected with approved automatic shutters of noncombustible construction, to ensure a full firestop between floors of the building or structure.

9 .1.8.26.8 Conveyor safeties: All power-operated conveyors, belts and other material moving devices shall be equipped with automatic limit switches which will shut off the power in an emergency and automatically stop all operation of the device.

9.1.8.27 ESCALATORS

9.1.8.27.1 General: All escalators and their enclosures shall comply with the provisions of this Section and other current Engineering Code and manufacturers' manuals.

9.1.8.27.2 Construction materials: Escalator construction materials shall comply with the provisions of current Engineering Code.

9.1.8.27.3 Machine room enclosure: The stairwell is not required to be enclosed when protected with an exhaust system or ventilation and water curtains as provided in Section 8.7.3, or with a power-operated shutter conforming to Section 9.12.5 except that the machine room shall be enclosed with 1-hour fire-resistance rated construction and shall be properly lighted and ventilated.

9.1.8.27.4 Non-combustible materials: The escalator shall be constructed entirely of non-combustible and fire-retardant materials except electrical equipment, wiring, wheel, handrails and the use of 1mm wood veneers on balustrades backed up with noncombustible materials.

9.1.8.27.5 Automatic fire shutter: Unenclosed escalators, which are not protected as specified in Section 8.7.3, shall be equipped with a power-operated automatic shutter at every floor pierced thereby, constructed of non-combustible materials with a fire- resistance rating of not less than 2 hours.

9.1.8.27.6 Construction: The shutter shall close immediately upon the automatic detection of fire or smoke by an approved device and shall completely shut off the well opening. The shutter shall operate at a speed of not more than 0.15m/s and shall be equipped with a sensitive leading edge to arrest its progress when in contact with any obstacle, and to continue its progress on release there-from.

9.1.8.28 PLUMBING SYSTEMS

9.1.8.28.1 General

9.1.8.28.1.1 Scope: The design and installation of plumbing systems, including sanitary and storm drainage, sanitary facilities, water supply, and storm water and sewage disposal in buildings shall comply with the requirements of this part and the Plumbing Code listed in the Schedule.

9.1.8.28.2 Plans and specifications:

9.1.8.28.2.1 When required: Prior to the issuance of any permit, plumbing plans and specifications for the installation, alteration or addition to the plumbing system of any building, structure or premises shall be submitted to the code enforcement officer for approval. The plans and specifications shall show in sufficient detail the layout and spacing of fixtures; the size, material and location of all building and storm sewers and drains; and the soil, waste, vent, and water supply piping.

9.1.8.28.2.2 Plans: Legible plans drawn to a scale of not less than 1:100 of each floor and of a typical floor shall be filed in quadruplicate and show the complete plumbing system, all plumbing fixtures and all water supply piping, together with building sections showing

vertical and diagrammatic elevations of the soil, waste, vent and water supply lines with traps and valves, and the location and size of the public sewer or other disposal system.

9.1.8.28.2.3 Exceptions: The filing of plans and specifications shall not be required for minor repairs as defined in the Plumbing Code listed in the Schedule, or for the installation or alteration of plumbing and drainage systems in buildings or structures herein specifically exempted, such as open sheds for storage purposes, isolated private garages without sanitary fixtures, temporary sanitary installations required under the provisions of Part 18 for construction operations, and temporary installations for exhibition purposes when not designed for sanitary use and not directly connected to a sewage system.

9.1.8.29 SEWER AND WATER SUPPLY DATA

9.1.8.29.1 Public sewer: Plans for new plumbing systems or alterations to existing plumbing systems shall be accompanied by a diagram showing the relative elevation of the lowest fixture and the top of the public sewer referred to in the established datum of the jurisdiction when such public sewer is available. The plans shall show the size, number and location of all new sewer connections.

9.1.8.29.2 Public water mains: When the installation of a water distribution system or the replacement or alteration of an existing water supply system is contemplated, the plumbing plans shall show the location and size of all the water lines and branches involved, the fixtures, or other devices to be supplied, and the minimum water pressure in the main in front of the building or structure.

9.1.8.29.3 Identical structures: Where the same set of plumbing or water supply piping plans and specifications is used for two or more buildings or structures which are similar and are located on adjoining plots under the same ownership, the applications for permission to construct or alter shall be filed simultaneously.

9.1.8.30 PERMITS AND CERTIFICATIONS OF APPROVAL

9.1.8.30.1 Plans for approval: Before any work is commenced on plumbing installations which required the submission of plans, a permit shall be secured from the code enforcement officer and such permit with a stamped and approved copy of the plans shall be available at the constructions sites at all times.

9.1.8.30.2 Amended plans: All plumbing installations shall be installed in accordance with the plans as approved, and any changes made during construction which are not in conformance with the approved plans shall be resubmitted for approval on amended plans.

9.1.8.30.3 Certificate of approval: After the prescribed tests and final inspection indicate the work complies in all respects with the provisions of the plumbing code listed in the Schedule, a certificate of approval and acceptance shall be issued by the code enforcement officer.

9.1.8.30.4 Notice of commencement and completion: The code enforcement officer shall be notified of the commencement of any plumbing work and when such work is completed or ready for inspection, all such notices shall be confirmed in writing and shall be part of the official record of the application and permit.

9.1.8.30.5 Violation: If work is installed contrary to the approved plans in any essential details, the owner, general contractor, supervising engineer or architect and the master plumber shall jointly and separately be deemed to be in violation of this code and subject to the penalties provided in Section 3.8.2 until amended plans are filed and approved.

9.1.8.30.6 Owner performance: The provisions herein contained shall not prohibit the owner of a building or structure from personally installing the plumbing system in his own residence under the conditions specified in the following Section 9.15.7 through to 9.15.11

9.1.8.30.7 Approval of plans: Approval of plans and final approval shall be obtained.

9.1.8.30.8 Permit: A permit shall be secured as herein provided before the work is performed.

9.1.8.30.9 Statutory fees: All statutory fees shall be paid to the appropriate agencies.

9.1.8.30.10 Work: All work shall actually be performed by the owner in accordance with the provisions of this Code.

9.1.8.30.11 Tests: The owner shall make application for all required inspections and tests.

9.1.8.31 WATER SUPPLY SYSTEMS

9.1.8.31.1 General: Every building in which people live, work or congregate shall be provided with a supply of clean, cool and portable water in sufficient quantity to maintain all water supply and plumbing fixtures in a safe and sanitary manner, and such other water supplies as are required for fire protection, air conditioning and all other service equipment of the building or structure required by this Code.

9.1.8.31.2 Required capacity: Where the required capacity of portable water supply is available from public water mains at the site, every building or structure shall be supplied from such mains to provide for all service equipment.

9.1.8.31.3 Private water supply: When public water mains are not available and a private source of water supply is used, samples shall be submitted periodically to the health official for analysis and approval and the use of such source of supply shall be approved by the health official and the code enforcement officer.

9.1.8.31.4 Cross-connected supplies: Cross-connected water supplies shall be avoided in accordance with Sections 9.16.1 and 9.16.2.

9.1.8.31.5 Building service supply: It shall be unlawful to connect water piping supplied directly from city water mains or other approved sources with or to piping from underground storage tanks or other unapproved sources. Cross connection shall not be made between the portable water distribution system and any portion of waste or soil systems, or fixtures or devices that will contaminate, pollute or otherwise render the water unsafe.

9.1.8.31.6 Process water: Water from unapproved sources for industrial processing or for fire protection shall be identified at each outlet with an approved sign stating that the water is unfit and that its use is prohibited for drinking purposes. Piping carrying portable water shall be identified and distinguished from water piping from unapproved sources by distinctive painting and appropriate signs.

9.1.8.32 EXISTING BUILDINGS AND INSTALLATIONS

9.1.8.32.1 Compliance with code: When alterations are made in an existing building or structure requiring the addition of any two or more plumbing fixtures, or one or more Waterflush closets, or when a new bathroom is added, or a building is remodeled for an extension in size or change in use in which plumbing work is involved, the new work shall be made to conform to the current Engineering Code of Practice.

9.1.8.32.2 Unsafe installations: Any existing installation of plumbing systems deemed unsafe and dangerous to the public health, in whole or in part, shall comply with all the provisions of this Section of this Code.

9.1.8.32.3 Existing drainage nuisances: Any surface or roof drainage which creates a structural or health hazard, or any other nuisance to the owners or occupants of adjacent

premises, or to the public by reason of discharge into, onto or across any adjacent building, premises or public thoroughfare, shall be abated by the owner of the improperly drained area. The code enforcement officer shall require the drainage to be disposed of in accordance with the provisions of the plumbing code listed in the Schedule.

9.1.8.32.4 Soil and vent stacks: Soil and vent stacks in existing buildings shall comply with Section 9.1.8.32.5 through to 9.1.8.32.7.

9.1.8.32.5 Extension above new building: When a new building is erected higher than an existing building, windows or other wall openings shall not be located nearer than 3m to an existing soil or vent stack on the lower building unless the owner of the new building makes the necessary provision to extend such soil or vent stacks to a height of not less then 60cm above the topmost opening at his own expense with the approval of the adjoining owner.

9.1.8.32.6 Extension above existing buildings: When the existing adjoining building is of greater height than the new building, the owner of the structure of greater height shall not extend any new soil, waste or vent stacks which are located within 6m of the common lot line to a level above the higher existing roof without the consent of the owner of the new structure.

9.1.8.32.7 Exception: Approved fixed window assemblies of the required fire-resistance rated construction which comply with the provisions of Chapter 29, when permitted in lot line walls, shall not be deemed wall openings within the meaning of this section.

9.1.8.33 PLUMBING FIXTURE SURROUNDS

9.1.8.33.1 Surrounding material for urinals: Wall and floor space to a point of 30cm in front of a urinal lip and 1.2m above the floor, and at least 30cm to each side of the urinal, shall be finished with a smooth, waterproof, non-absorbent, cleanable material.

9.1.8.33.2 Surrounding materials for water closets: Floors within 30cm in any direction from the rim of a water closet shall be finished with a smooth, waterproof, nonabsorbent, readily-cleanable material.

9.1.8.33.3 Showers: The wall area above built-in tubs having installed shower heads and in shower compartments shall be constructed of smooth, non-corrosive and nonabsorbent waterproof materials to a height of not less than 1.8m above the room floor level. Such walls shall form a water-tight joint with each other and with the tub, receptor, or shower floor.

9.1.8.33.3.1 Shower floors or receptors: Floor surfaces shall be constructed of smooth, non-corrosive, non-absorbent and waterproof materials.

9.1.8.34 PRIVATE SEWAGE DISPOSAL

9.1.8.34.1 General: Private sewage disposal systems shall conform to the private sewage disposal requirements listed in the Schedules.

9.2.0 ELECTRICAL ENGINEERING DESIGN REQUIREMENTS

9.2.1 - 9.2.6 The provisions of Section 7.1, 7.2, 7.3, 7.4, 7.5 and 7.6 of this Code shall apply to these sub-sections.

9.2.7 MATERIALS AND COMPONENTS

The provisions of section 10 of this Code shall apply to this sub-section.

9.2.8 FIRE

The provisions of section 12 of this Code shall apply to this sub-section.

9.2.9 ELECTRICAL SYSTEMS, WIRING AND INSTALLATIONS

9.2.9.1 General

9.2.9.1.1 Scope: The provisions of this Part shall control the design and construction of all

new installations of electrical conductors, equipment and systems in buildings or structures; and all alterations to existing wiring systems therein to ensure safety. All such installations shall conform to the provisions of the Electrical Code.

9.2.9.1.2 Electrical Code:
The Electrical Code shall mean the latest Edition of Wiring Regulations in Nigeria (CAP. 106 LFN) PARTS 1 and 2, together with the Earthing Code by the Standards Organisations of Nigeria, and the latest Edition of Approved Specifications for Telephone Wiring in Public Buildings.

Special emphasis should be placed on the following areas:

(a) Use of conductors and cables of correct sizes

(b) Use of protective devices of appropriate capacity

(c) Use of cables and conductors with sufficient insulation resistance

(d) Use of earthing system with correct earthing resistance

(e) Protection against electrical shock

(f) Protection against thermal effect

(g) Protection against overcurrent

(h) Protection against short circuit current

(i) Protection against lightning

j Protection against malfunction of the entire electrical systems in a building.

EXCEPTIONS
Electrical wiring shall not be installed in a building or structure, nor shall an alteration of an existing electric wiring system be made, until a permit has been issued therefore as required in Section 9.2.9.5, except as provided in Section 9.2.9.1.3, 9.2.9.1.4, 9.2.9.1.5.

9.2.9.1.3 Public service agencies: The provisions of this Code shall not apply to installations for electric supply or communication agencies in the generation, transmission or distribution of electricity, or the operation of signals, or the transmission of intelligence, or to installations located within or on building or premises used exclusively by such agency, or on public thoroughfares.

9.2.9.1.4 Railway utilities: The provisions of this Code shall not apply to the installations or equipment employed by the Railway Corporation in the exercise of its functions as a public carrier, and located outdoors or in buildings used exclusively for that purpose.

9.2.9.1.5 Radio and television transmitting stations: The provisions of this Code shall not apply to electrical equipment used for radio and television transmission, except the equipment and wiring for power supply and the installations of towers and antennae, whether erected on buildings or on the ground.

9.2.9.1.6 Electric installation standards: Conformity with the installation of electric conductors and equipment to the provisions of the Electrical Code, shall be the ***prima facie*** evidence that such installations are reasonably safe for use in the service intended and in compliance with the provisions of this Code.

9.2.9.1.7 Electric equipment standards: The materials, appliances, and other equipment listed in published reports of inspected electrical equipment by the Standards Organisation of Nigeria, and other approved agencies and testing organisations, and installed in accordance with any instructions included as part of such listing, shall be approved as

meeting the requirements of this Code.

9.2.9.2 PLANS AND SPECIFICATIONS

9.2.9.2.1 General: Plans, specifications and schedules in sufficient detail shall be filed with the Code Enforcement Division/Section/Unit showing the location and capacity of all lighting facilities, electrically operated equipment and electrical circuits required for all service equipment of the building or structure.

9.2.9.2.2 Items covered: All electrically controlled devices, including signal, communicating and lighting systems and their wiring, whenever required under the provisions of this code shall be shown on the plans and elevations of the building or structure with respect to those uses covered by Section 9.2.9.2.3 through to 9.2.9.2.9.

9.2.9.2.3 Emergency/hazard use lighting: Places of public assembly and education and control of emergency lighting systems in accordance with Section 7.24 and hazardous uses in Section 7.2.

9.2.9.2.4 Exit and elevator lighting: Stairway and exit illumination in accordance with Chapter 10 and Section 10.25; “Exit” sign lighting circuits, Section 10.24, elevator car illumination, Section (refer to mechanical installations)

9.2.9.2.5 Service equipment: Electrical equipment and control of heating, refrigerating and ventilating machinery and devices, in accordance with the mechanical code.

9.2.9.2.6 Fire alarm and signal systems: Fire alarm signal systems, fire department communication and supervisory service in accordance with Sections 30.18, 30.19 and 30.21.

9.2.9.2.7 Construction operations: Temporary construction lighting requirements equivalent to 50 lux in accordance with Section 13.13.

9.2.9.2.8 Signs and towers: Wiring of display signs radio and television antennae, in accordance with the Electrical Code.

9.2.9.2.9 Toilets and bathrooms: Illumination of toilets and bathrooms equivalent to 50 lux in accordance with Section 9.2.1.1 (a).

9.2.9.3 INSPECTION AND TESTS

9.2.9.3.1 During installation: During the installation of electrical systems and equipment, the code enforcement officer shall make inspections to ensure compliance with the provisions of this Part, except as provided in Section 26.5.

9.2.9.3.2 Final inspection and test: On completion of the work, the code enforcement officer shall inspect the work and cause tests to be made of the operation of the entire system to ensure compliance with all requirements.

9.2.9.4 TEMPORARY USE

9.2.9.4.1 Permission: Permission for temporary electricity supply shall be obtained in accordance with the Electrical Code.

9.2.9.5 PERMIT AND CERTIFICATE OF INSPECTION

9.2.9.5.1 General: Electrical wiring or equipment shall not be installed within or on any building, structure or premises, nor shall any alteration be made in any such existing installations, without first securing approval and a permit as specified in the electrical code. It shall be unlawful to use or allow the use of, or to supply current for an electrical system in a building or structure, unless the required certificate of inspection and permit have been issued as specified in the Electrical Code.

9.2.9.5.2 Exception: A permit shall not be required for the execution and use of the classes of work specified in Section 26.5.3 through to 26.5.6.

9.2.9.5.3 Repairs and maintenance: Minor repair work, including the replacement of lamps or the connection of approved portable electrical equipment to approved permanently

installed receptacles.

9.2.9.5.4 Public service agencies: The installation, alteration or repair of electrical equipment for the operation of communications and signals or the transmission of intelligence by wire by a public service company for its use in the generation, transmission, distribution or metering of electricity.

9.2.9.5.5 Power companies: The installation, alteration or repair of electrical equipment of a power or public service company for its use in the generation, transmission, distribution or metering of electricity.

9.2.9.5.6 Temporary testing systems: The installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

9.2.9.6 EXISTING INSTALLATIONS

9.2.9.6.1 General: Alterations shall not be made to any existing installations of electric wiring or equipment for which a permit is required within or on any building, structure or premises, except as provided in Section 26.5, without first securing the approval and a permit from the code enforcement officer.

9.2.9.6.2 Defective wiring: If, upon inspection, an electric wiring system is found defective and unsafe, the code enforcement officer shall cause such defective wiring to be rectified.

9.2.9.6.3 Additional loads: When additional electrical loads are to be connected to existing service in buildings or structures the existing load shall be established. New loads shall be computed in accordance with the requirements of the provisions of the Electrical Code.

9.2.9.7 EMERGENCY ELECTRICAL SYSTEMS

9.2.9.7.1 General: Emergency electrical systems are those systems required to automatically supply power for illumination and equipment in the event of failure of the normal power supply. The emergency electrical system shall conform to the provisions of the Electrical Code. The systems shall pick up their connected loads within 10 seconds after failure of the normal power supply and shall operate under all weather conditions.

9.2.9.7.2 Capacity: The emergency systems shall have the capacity to operate equipment such as egress lighting, exit signs, door locks, and any other emergency equipment as required by other sections of this Code.

9.2.9.7.3 Power Source: The emergency electrical system shall not be connected to a standby power system and shall come on as priority load.

9.2.9.8 STANDBY POWER SYSTEMS

9.2.9.8.1 General: Standby power systems are those intended to automatically supply power to selected loads required by this Code, other than those classified as emergency systems, in the event of failure of the normal power source. Standby power systems shall conform to the provisions of the Electrical Code. The systems shall pick up their connected loads within 60 seconds of failure of the normal power supply and shall operate under all weather conditions.

9.2.9.8.2 Capacity: Standby power systems shall have the capacity and rating to operate equipment such as mechanical systems, fire pumps, signal, lighting, communication, elevators, and other standby equipment as required by other sections of this Cccode. The capacity and rating shall include the ability to start all rotating equipment from a standing start. The system capacity need not be sized to operate all the connected equipment simultaneously where loads can be manually controlled.

9.2.9.8.3 Connection of emergency systems: Where an emergency electrical system is connected to the standby power system as provided for in Section 26.7.3, the load pickup time for emergency equipment shall comply with Section 26.7.1 and the standby system shall be sized for the additional load.

SECTION 10 BUILDING MATERIALS AND COMPONENTS REQUIREMENTS

Sections

Sections

SECTION 10 BUILDING MATERIALS AND COMPONENTS REQUIREMENTS

10.1 GENERAL

The application of all materials and components used in the construction of buildings must be such that will achieve aesthetics, durability, functionality, character and affordability.

Locally available building materials should be integrated for their additional advantages of availability, identity, job creation and affordability.

10.1.1 HAZARDOUS MATERIALS

Any material adjudged as hazardous by the appropriate authority shall not be used in the building. The use of asbestos and other hazardous materials have been found to be hazardous to health. The use of, therefore their application in building construction, should be restricted and handled with great care.

10.1.2 COMPONENTS

All building components shall comply with the provisions of this Code.

10.2 STONES

10.2.1 Scope: This article specifies rock minerals and rock structures for use in buildings. It also specifies the strength, fire-resistances, and accepted processes for the use of natural and cast stones as well as the practice for cleaning and surface repair of stone construction.

10.2.2 Glossary of terms: The definition of terms for rocks, minerals and rock structures, and terms for Masonry tools, handling equipment, stone work construction, and operation in this Chapter shall be as stipulated and in accordance with BS 6100.5.2: 1984.

10.2.3 CLASSIFICATION OF STONES: Stones fall into one of three classes: Igneous, sedimentary, or metamorphic rocks; each with recognisable characteristics.

10.2.3.1 Igneous stones: Include granites, dolerites, basalts and pumice granites are extremely dense, hard and resistant to knock and abrasion and to attack by ordinary chemicals. Igneous stones can be used in masonry, facing, flooring, curbing, paving, cladding and damp-proofing.

10.2.3.2 Sedimentary stone: Include sand-stones and lime-stones. They are characterised by grains and bedding planes which make them potentially weaker than other stones. Sedimentary stones can be used as masonry, wall cladding, paving, flooring and in making stones.

10.2.3.3 Metamorphic stones: These include marbles, slates and quartzite. These are either sedimentary or igneous stones that have been subjected to immense heat and pressure resulting in structural changes. Metamorphic stones are used in masonry, coping, window-sills, flooring, external paving, wall cladding, as aggregates, tiling of walls.

10.2.3.4 Use of natural stone for masonry: Natural stone for masonry shall be sound and free from loose or friable inclusions. It should be hard and durable and without flaws and faults for the intended use. Stone shall be thoroughly wetted before laying and all masonry kept damp for at least 7 days. Stone shall pass a resistance to crushing of at least 10.5N/mm^2.

10.2.3.5 Clearing and surface repair of stone buildings: The provisions of BS 6270.1: 1982 shall govern the material, procedure and practice for cleaning and repairs.

10.2.3.6 Other use of stone: Stone can be used as:

Cut stone, rubble, ashlars facing, in addition to their common uses as masonry.

(i) Cut stone: Stone that is cut or machined to a given size, dimension shape, and produced in accordance to specifications.
(ii) Rubble: A natural cleft stone which may be limestone, sandstone or quartzite, used as veneer. Rubble may have a variety of colours and textures.
(iii) Ashlar facing: Exposed stone made from broken or cut stone. Ashlar facing can be provided in a variety of finishes such as: smooth finish, cabo-finish, rubbed finish, sawed finishes, tooled finishes and hard finishes

10.2.4 Marble

Marble is fully metamorphosed lime-stones which are very hard, dense and resistant to abrasion. Marble requires good polish. White and coloured varieties are common.

Marble can be attacked by acids and polluted atmosphere.

Marble can be classified into four groups: A, B, C and D.

A - Sound marble and stones with uniform and favourable working qualities.
B - Marble with some less favourable working qualities which may have occasional natural faults. These require limited sticking and waxing for use as finishes.
C - Marble with geological flaws, voids, veins, and lines of separation. These will need waxing, sticking and filling to improve their quality.
D - Highly coloured marble, prized for their decorative qualities.

10.2.4.1 Cast stone: Cast stone is defined as any product manufactured of aggregate and cement and intended, to resemble the appearance and be used in a similarly way as natural stone. The provisions of BS 1217: 1975 shall govern the requirements for construction, materials, colours, texture, tolerance, slenderness ratio, compressive strength and internal surface absorption and the methods for testing for compressive strength, drying shrinkage and initial surface.

10.2.4.2 The provisions of BS 4357: 1968 shall govern the requirements for pre-cast terrazzo granite units when used as floor slabs, paving staircase treads, risers and landing, partition and components, walling panels, skirting and window sills external cladding panels, shower trays and working top.

10.2.5 Aggregate for reinforced concrete:

Aggregate for reinforced concrete shall consist of sand, gravel, crushed or uncrushed natural stone in conformity with the appropriate provisions of NCP.1:1973 provided with: at least 95% of the coarse aggregate will pass a mesh of size at lest 7mm less than the minimum lateral distance between the reinforcing bars or 7mm less than the minimum cover, whichever is the smaller or in the case of solid slabs will pass a 20mm mesh.

10.2.6 Aggregate for concrete:

Shall consist of:-

(i) sand, gravel, crushed or uncrushed natural stone in compliance with the appropriate provisions of NCP-1: 1973.
(ii) Air-cooled blast furnace slag. The by-product produced simultaneously with pig iron magnesium silicates and aluminium - silicates in conformity with the appropriate provision of NIS: 158. 1982.

All aggregates shall be hard, reasonably clean and free from dust, clay or organic or other deleterious matter.

Must be strong and durable

Tables 4, 5 and 6 of NCP-1: 1973 are provided as a guide.

10.2.7 Sand for mortar, plaster, rendering or floor screeds

Shall be reasonably clean and free from clay or organic or other deleterious matter;

Shall be of such size as to pass a 5mm mesh;

Shall be well graded;

Sand for mortar, plain and reinforced brick-work, block walling and masonry, shall comply with BS 1200: 1976.

Sand for external rendering; internal plastering using mixes of cement and sand (with or without addition of lime) and for floor screeds shall comply with NCP-1: 1973.

TABLE 10.1 COARSE AGGREGATE

Sieve Sizes (mm)	Percentage by mass passing BS for nominal sizes (%)						
	Graded aggregate (mm)			Single-sized aggregate (mm)			
	40 to 5	20 to 5	14 to 5	40	20	14	10
50.0	100	-	-	100	-	-	-
37.5	90-100	100	-	85-100	100	-	-
20.0	35-70	90-100	100	0-25	85-100	100	-
14.0	-	-	90-100	-	-	85-100	100
10.0	10-40	30-60	50-85	0-5	0-25	0-50	85-100
5.0	0-5	0-10	0-10	-	0-5	0-10	0-25
2.36	-	-	-	-	-	-	0-5

(Table 10.1: BS 882: 1983)

TABLE 10.2 FINE AGGREGATE

Sieve Size	Percentage by mass passing BS sieve (%)			
	Additional limits for grading			
	Overall limits	C	M	F
10.0mm	100	-	-	-
5.00mm	89-100	-	-	-
2.36mm	60-100	60-100	65-100	80-100
1.18mm	30-100	30-90	45-100	70-100
600um	15-100	15-54	25-80	55-100
300um	5-70	5-40	5-70	5-70
150um	0-15	-	-	-

‘Increased to 20% for crushed rock fines, except when they are used for heavy-duty floors.

Note: Fine aggregate not complying with table 5 may also be used provided that the supplier can satisfy the purchaser that such materials can produce concrete of the required quality.

(Table 10.2: BS 882: 1983)

TABLE 10.3 ALL-IN AGGREGATE

Percentage by mass passing BS sieve (5)			
Sieve size	40mm nominal size	20mm nominal size	10mm nominal size
50.0mm	100	-	-
37.5mm	95-100	100	-
20.0mm	45-80	95-100	-
14.0mm	-	-	100
10.0mm	-	-	95-100
5.00mm	25-50	35-55	30-65
2.36mm	-	-	20-50
1.18mm	-	-	15-40
600um	8-30	10-35	10-30
300um	-	-	5-15
150um	0-8	0-8	0-8

'Increased to 10% for crushed rock fines. (Table 10.3: BS 882: 1983) recommended limits on the degree of polished-stone value of the aggregate when used for road surfacing.

BS 2451: 1963 chilled iron shot and grit

This standard specifies the sizes of particles of chilled iron shot and grit, and the method of testing for size. It also specifies material, form, designation and grading, and describes a hardness test.

10.3 CONCRETE

10.3.1 General

Structural members of concrete (reinforced, prestressed and plain concrete expressly certified to act as structural member) shall be designed and constructed in accordance with the provisions of NCP-1: 1973. The constituent materials of concrete shall conform with the provisions of NCP-1: 1973.

10.3.2 DEFINITIONS

For the purpose of this Code, the following definitions apply:-

10.3.2.1 Concrete: Concrete shall be composed of aggregates mixed with cement, provided that:

(1) The proportions of cement to fine aggregates to coarse aggregates or of cement to fine aggregates (as the case may be) shall be:

(a) The proportions specified in Table 16A;

(b) any proportions between those specified in Table 3A in which the ratio of the volume of coarse aggregate to the volume of fine aggregate is 2:1; or

(c) any proportions between those specified in Table 3A in which the ratio of the volume of coarse aggregates to the volume of fine aggregate is not lower than 1 /:1 and not greater than 3:1 provided that a denser and more workable concrete would be obtained. The sum of the volumes of coarse aggregates and fine aggregates, each measured separately should nevertheless equal the sum of the volumes of coarse and fine aggregate appropriate to the nominal mix (or

intermediate mix) in Table 16A.

In proportioning concrete, the quantity of cement should be determined by weight. The quantities of fine and coarse aggregates, should preferably be done by weight, but it may be determine by volume. The weight should be determined from the volume required by the Table and the weight per cubic meter of the aggregate.

The proportions given in this Table are based on the assumption that the aggregates are dry. If the fine aggregates is moist, due allowance must be made for bulking.

10.3.2.2 Lightweight concrete: Concrete containing lightweight aggregate and having unit weight not exceeding 1920kg/m^3.

10.3.3 MATERIALS USED FOR CONCRETE

(i) Cement: The cement used should be ordinary Portland cement (O.P.C).

Low heat cement may be used in the case of large mass structures like gravity dams. High alumina cement should not be used under any conditions.

Portland cement should comply with NIS 447 part 1 (2003), “Portland cement

(Ordinary and rapid hardening)".

Rapid-hardening cement shall conform to the requirements of BS 12 (1978).

(ii) Aggregates: Concrete aggregates shall conform to the provisions of section 2.2 of NCP-1: 1973.

(a) Special tests: Aggregates failing to meet the specifications listed in the preceding section shall not be used unless approved by the building official and shown by special test or actual service to produce concrete of adequate strength and durability.

(b) Nominal size: Nominal maximum size of coarse aggregates shall be no larger than:

(1) One fifth the narrowest dimension between sides of forms, or

(2) one-third the depth of slabs, or

(3) three-fourths the minimum clear spacing between individual reinforcing bars or wires, bundles or bars, or pre-stressing tendons or ducts.

(iii) Water: Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or reinforcement.

(iv) Chloride ions: Mixing water for pre-stressed concrete or for concrete that will contain aluminium embodiments, including that portion of mixing water contributed in the form of free moisture on aggregates, shall not contain deleterious amounts of chloride ion.

(v) Admixtures: Admixtures in concrete shall not be used without the approval of the supervising officer.

(a) Tests of materials: Tests of concrete and the materials used in concrete shall be in accordance with section 6 of NCP-1: 1973. Further information on the tests to be conducted on concrete are obtainable from NIS 12.

(vi) Nominal concrete mixes: Concrete may be specified on the basis of mix proportions particularly when high quality concrete is not desired. For further guidance on the proportions and strength requirements for nominal concrete mixes with cement and aggregates complying with NIS 13 or NIS 16, refer to Table 16A below:-

TABLE 10.4

PROPORTION AND STRENGTH REQUIREMENTS FOR NOMINAL CONCRETE MIXES WITH CEMENT AND AGGREGATES

(1)	(2)	(3)	(4)
Mix proportions	Cubic meters of aggregate per 50kg of cement	Cube strength within 7 days after mixing	Alternative cube strength within 3 days after mixing

	Fine	Coarse	Preliminary test	Works test	Preliminary test	Works test
			N/mm^2	N/mm^2	N/mm^2	N/mm^2
1:1:2	0.035	0.07	40	30	26.7	20
1: 1 -1 /2:3	0.05	0.10	34	25.5	22.7	17
1:2:4	0.07	0.07	28	21	18.7	14

(Table 10.4, NCP-1: 1973)

Concrete mix proportions, water cement ratio, and strength requirements shall conform to the requirements of section 2.8.1 and 2.8.2 of NCP-1:1973.

10.3.4 CONCRETE QUALITY

(i).....General:

Concrete shall be proportioned to provide an average compressive strength as prescribed in recommendation of SON on 162 (1).....MIS.

10.3.4.1 TESTS OF CONCRETE QUALITY: Tests on concrete quality shall be conducted in accordance with the specifications of section 2.9 of NCP-1: 1973.

10.3.5 DESIGNED CONCRETE MIXES:

Designed concrete mixes shall be in accordance with the requirements of Section 2.9 of NCP-1: 1973.

For guidance on the design of standard mixes, refer to Table 16B.

TABLE 10.5

STANDARD MIXES

Specified works cube strength at 7 days	Weight of dry sand per 50kg of cement	Weight of coarse aggregate per 50kg of cement											
Workability slump (mm) compacting factor		10mm maximum size			13mm maximum size			19mm maximum size			38mm maximum size		
		Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
		0-5	5-25	25-50	5-20	20-40	40-100	12-25	25-50	50-125	25-50	50-100	100-175

		80-86	81-93	81-87	81-87	87-93	93-97	82-88	88-94	94-97	82-88	88-94	94-97
N/mm^2	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
21	90	145	110	90	165	135	110	190	155	135	225	190	165
25.5	80	125	125	65	145	110	90	165	135	110	200	165	145
30	65	100	-	-	125	90	-	145	110	90	165	135	110

(Table 2 of NCP 1: 1973)

10.3.6 DURABILITY

Concrete should be dense, impermeable and of a quality suitable for the conditions of exposure involved. The greater the severity of the exposure, the higher the quality of concrete required, and thus although a weaker concrete may be adequate from structural considerations this weaker mix may not be suitable from the durability viewpoint.
Nominal concrete mixes should not be used for structures exposed to sea water.

10.3.6.1 Protection from chemical attack: Concrete shall be protected from chemical attack by complying with the provisions of section 4.8 of NCP-1: 1973.

10.3.7 EVALUATION FOR ACCEPTANCE OF CONCRETE

10.3.7.1 General: For evaluation and acceptance of concrete the procedures established in section 2.8.3 (1)-(3) of NCP-1: 1973 shall be adopted.

10.3.8 FREQUENCY OF TESTING: Samples for strength tests of each mix of concrete placed each day shall be taken not less than once a day.

10.3.9 QUALITY CONTROL REQUIREMENTS

10.3.9.1 General: In order to maintain a high standard of quality, the following should be observed.

10.3.9.2 Supervision: A competent professional should be employed whose first duty it will be to supervise all stages in the preparation and placing of the concrete. All tests on materials, the making and testing of cubes and the maintenance and calibration of all mixing and measuring tools should be carried out under his direct supervision.
The requirements of section 2.9.4 of NCP-1: 1973 should be fully complied with.

10.3.9.3 MIXING AND PLACING OF CONCRETE

10.3.9.4 General: The preparation, handling and curing of concrete shall be performed in accordance with the requirement of this section.

10.3.9.5 Preparation of equipment and place of deposit: Preparation before concrete placement shall include the following:

a. All equipment for mixing and transporting concrete shall be clean.
b. All debris shall be removed from spaces to be occupied by concrete.
c. Forms shall be properly coated.
d. Masonry filler units that will be in contact with concrete shall be well drenched.
e. Reinforcement shall be thoroughly clean of all types of deleterious coating.
f. Water shall be removed from place of deposit before concrete is placed unless

otherwise permitted by the supervising officer.

g. All laitance and other unsound materials shall be removed before additional concrete is placed against hardened concrete.

(i) Mixing: All concrete shall be mixed until there is a uniform distribution of materials, and shall be discharged completely before the mixer is recharged. Concrete shall be mixed for four minutes immediately after water is added and should not stay for more than 45 minutes before placement.

(ii) Conveying: Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials. Conveying equipment shall be capable of providing a supply of concrete at site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.

(iii) Depositing: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. Concrete shall be deposited as soon as possible after mixing and without segregation of the material.

(iv) Placement timing: Concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement.

(v) Unacceptable concrete: Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.

(vi) Retempering: Retempering concrete or concrete that has been remixed after initial set shall not be used unless approved by the supervising officer.

(vii) Continuous concreting: After concreting is started, it shall be carried on as a continuous operation until placing of a panel or section, as defined by its boundaries or predetermined joints, is completed except as permitted or prohibited by the supervising officer.

(viii) Placement in walls: Top surfaces of vertically formed lifts shall be generally level.

(ix) Construction joints: When construction joints are required, joints shall be made in accordance with the recommendations of the structural engineer.

(x) Consolidation: All concrete shall be thoroughly consolidated by tampering or by any other suitable means, including vibration, during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

(xi) Curing: Concrete (other than high-early-strength concrete) shall be maintained above 50'F (10'C) and in a moist condition for at least the first seven days after placement.

(xii) Hot weather requirements: During hot weather, attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that would impair required strength or serviceability of the member or structure.

10.3.10 SHOT-CRETE

10.3.10.1 General: Except as specified in the following sections, shot-crete shall conform to the requirements for plain concrete or reinforced concrete.

10.3.10.2 Definition: Shot-crete is mortar or concrete pneumatically projected at high velocity unto a surface.

(i) Proportioning: Shot-crete proportions shall be selected that allow suitable placement procedures using the delivery equipment selected, and that results in in-place hardened shot-crete meeting the strength requirement of this code.

(ii) Aggregates: Coarse aggregates if used, shall not exceed 19mm in size.

(iii) Rebound: Any rebound or accumulated loose aggregate shall be removed from the surfaces to be covered prior to placing the initial or any succeeding layers of shot-crete. Rebound shall not be reused as aggregates.

(iv) Joints: Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless all edges are sloped to a thin edge. For structural elements which will be under compression and for construction joints shown on the approved plans, square joints shown on the approved plans, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.

(v) Damage: Any-in-place shot-crete which exhibits sags or sloughs, segregations, honey-combing, sand pockets or other obvious defects shall be removed and replaced.

(vi) Curing: During the curing periods specified herein, shot-crete shall be maintained in a moist condition. In highland areas, shot-crete shall be maintained at 4o°C.

(vii) Initial curing: Shot-crete shall be kept continuously moist for 24 hours after shot-creting is completed or shall be sealed with an approved curing compound.

(viii) Final curing: Final curing shall continue seven days after shot-creting, or for three days if high-early-strength cement is used, or until the specified strength is obtained. Final curing shall consist of either the initial curing process or the shot-crete shall be covered with an approved moisture retaining cover.

(ix) Natural curing: Natural curing shall not be used in lieu of that specified above unless the relative humidity remains at or above 85 percent, and is authorised by the design architect/engineer, and approved by the supervising officer.

10.3.11 Pre-stressed concretes

These concretes shall be dense, impermeable and of a quality suitable for the conditions of pre-stress involved. Concretes of high quality and durability are normally required and should conform with the recommendations of the registered structural engineer.

10.3.12 Precast concretes

Pre-cast concretes shall meet the durability requirements of their applications and shall satisfy the recommendations of a registered structural engineer.

10.3.13 SAND-CRETE BLOCKS

10.3.13.1 Sand-crete blocks:-shall mean a composite material made up of cement, sharp sand and water.

(i) Blocks shall be moulded for sand-crete using metal (wood) moulds of:

450mm x 225mm x 150mm

450mm x 225mm x 225mm

450mm x 225mm x 100mm

(ii) They are usually jointed by mortar which is a rich mix of sand-crete.

10.3.14 PRE-CAST CONCRETE BLOCKS

There shall be three types of pre-cast solid or hollow concrete blocks.

TYPE	AGGREGATE CONCRETE BLOCKS
A	Dense aggregate concrete block
B	Light weight aggregate concrete blocks for load-bearing walls
C	Lightweight aggregate concrete blocks for non-load bearing walls - partitions

10.3.14.1 NCP 1:1973 Aggregate: Included both coarse and fine, from natural sources, blast furnace slag, crushed clay and furnace clinker.

10.3.14.2 NCP 1:1973 Sand: shall be of approved clean, sharp, fresh water or pit sand. Free from clay, loam, dirt, organic or saline water of any description and shall mainly pass 4.70mm (3/16") Test sieve. If lagoon sand is used this must be properly washed to the approval of the Supervisor.

10.3.14.3 Mix proportions: Mix used for blocks shall not be richer than 1 part by volume of cement to 6 parts of fine aggregate (sand) except that the proportion of cement to mixed-aggregate may be reduced to 1:4 1/2. (Where the thickness of the web of the block is one 25mm or less).

10.3.14.4 Strength requirements: Sandcrete blocks shall posses resistance to crushing as stated below and the 28 day compressive strength for a load bearing wall of two or three storey building shall not be less than:-

Average strength of 6 blocks	Lowest strength of Individual block
2.00 N/mm^2 (300 psi)	1.75 N/mm^2 (250 psi)

10.3.14.5 Moulding: The twenty eight day compressive strength of a sandcrete block for load bearing wall of two or three storey buildings shall not be less than the values given above and shall comply with the existing NIS specification for sandcrete blocks.

10.3.14.6 Compaction: Two methods to be applied depending on the availability of materials (tools)

(1) By approved (standard) machine compaction.

(2) By metal mould (hand) compaction.

10.3.14.7 Production/processing: The sandcrete block shall be cast using an appropriate machine with cement/sand ratio of 1:6 measured by volume. Where hand mixing is carried out, the materials shall be mixed until an even colour and consistency throughout is attained. The measure shall be further mixed and water added through a fire hose in such sufficient quantity as to secure adhesion. It shall then be well rammed into moulds and smoothed off with a steel face tool.

10.3.14.8 Curing: After removal from the machine, the blocks shall be left on pallets under cover in separate rows, one block high, with a space between each block for at least 24 hours and kept wet by weathering through a fire watering hose. The blocks may then be removed from the pallets and stacked during which time the blocks shall be kept wet. The blocks may be stacked not more than five blocks high under cover at least seven (7) days before use after the previous period.

10.3.14.9 Physical requirements: Special sizes and shapes of blocks and blocks 11.25mm (i.e. 4 /") thick or less shall be solid with groove and tongued joints. Blocks of greater thickness, than 11.25mm (4 %") thick shall be hollow of used above damp proof course. Hollow blocks

shall be more than 50mm thick. Hollow blocks shall be used only where vertical steel reinforcement is to be fixed.

10.3.15 WORKMANSHIP

All block walling shall be built in cement and sand of 1:6 mortar. The mortar shall be used in within 1 hour of mixing. The mortar is also subject to variation in compressive strength. The strength of adhesion to the units, its jointing, and the manner with which it is placed. Mortar shall not be used or mixed with any other mortar after it has began to set, nor shall any mortar of any kind of a previous day's mixing be used.

A proper stage shall be provided to receive the mortar when made. The joints in the block-work shall not exceed 9.39mm (3/8) in thickness. Greater care should be taken during the laying of blocks to ensure proper adhesion of mortar to the blocks. The perpends in alternative course must be directly above one another and every joint both vertical and horizontal shall be properly flushed with mortar. Simple lipping at the edges of the joints shall not be permitted.

Joints on wall faces to be plastered shall be raked out 9.39mm (3/8").

All corners, cross-wall junctions and reveals shall be properly bonded. No blocks shall be well wetted before being laid or built on.

All block-work is to be laid in stretcher bond properly bedded and jointed with (at) course level, perpends true and all quoins, jambs and angles, plumbed as the work proceeds. It must be borne in mind that failure of the block columns at the joint should be avoided at all possible cost.

Note. The bending moment carrying capacity of the columns increase as the sand/cement ratio decreases. It also increases with water/cement ratio in the range of water/cement ratio considered.

10.4 GLASS

10.4.1 Definition: Glass herein is defined as a hard, brittle substance that is usually transparent, made by melting sand with soda, potash, lime, or other substances applicable to buildings and structures.

10.4.2 General: The provisions of this Section shall govern the materials, design, construction, quality and requirement of glass and glazing in vertical and sloped applications. All glass for the purposes of buildings shall have a flame - Spread rating as predetermined test exposure of 45-minute duration.

10.4.3 Glass for glazing: For building purposes, Annealed flat glass, processed flat glass, and miscellaneous glass in accordance to terms, definitions, together with details of nominal thickness, weight and tolerance shall conform to BS 952.

10.4.4 Glass use in industry: Terms used in the glass industry, covering types and properties of glass, raw materials, melting, forming and finishing, forms of glass shall be in accordance to BS 3447: 1962.

10.4.5 Louvered windows: Regular plate, sheet or patterned glass in louvered windows shall not be thinner than nominal 5.6mm and not longer than 1219mm. When other glass types are used, design shall be submitted to the supervising officer, for approval. Exposed glass edges shall be smooth (dulled).

10.4.6 Glass support: Where one or more sides of any sheet of glass is not firmly supported, or is subjected to unusual load conditions, detailed shop drawings, specification and analysis or data assuring safe performance for the specific installation shall be prepared by engineers experienced in this work and approved by the supervising officials.

10.4.7 Glass Panels: Where individual panels are more than 13mm^2 in an area, a

supplementary stiffener shall be provided behind the panels, anchored thereto and to the structural supports.

10.4.8 X-ray protection lead glasses: Essential requirement for lead barium silicate (Type LBSD) and lead Silicate (Type LS) glasses or protection against X-ray radiation and a method of measuring the lead equivalent shall conform as stipulated in BS 4031:1966 (as given in Table 17 below)

TYPICAL EXAMPLES OF MINIMUM LEAD EQUIVALENTS

Types of glass and manufacturer's reference	Minimum density	Thickness range of panel	Minimum lead equivalent at stated peak kilovoltage				
			100	150	200	250	300KV
Lead silicate	g/cm^3	mm	-	-	-	-	-
	4.2	6-8	1 .3	1.3	1.3	1.3	1.3
	4.2	9-11	2.0	2.0	2.0	2.0	2.0
	4.2	11.13	2.5	2.5	2.5	2.5	2.5
Lead barrium silicate	4.6	5-7	1.5	1.5	1.2	1.2	1.2
	4.6	8-10	2.5	2.5	2.0	2.0	2.0

(Table BS:17)

10.4.9 Impact performance requirement for flat safety glass and safety plastics for use in building: This section shall comply with BS 6206: 1981. Classification of safety glass and safety plastics according to behaviour on impact shall conform to Table 17.2 below.

TABLE 10.6

GLASS	BEHAVIOUR ON IMPACT		
	Drop height 305mm	Drop height 457mm	Drop height 1219mm
A	No breakage, or breaks safety.	No breakage, or breaks safety.	No breakage, or breaks safety.
B	No breakage, or breaks safety.	No breakage, or breaks safety.	No requirement.
C	No breakage, or breaks safety.	No breakage, or breaks safety.	No requirement.

10.4.10 Wind loads: Glass in windows, curtains and window walls, skylights, doors, and other exterior applications shall be chosen to resist the wind load in accordance with structural design requirements.

10.4.11 Sloped glazing and skylight: Any installation of glass or other transparent, translucent, or opaque glazing material installed at a slope of 15 degrees or more from the vertical plane including skylights, roofs and sloped walls shall comply with section 17.11.10.

10.4.12 Framing: All sloped glazing and skylight frames shall be constructed of non-combustible materials.

10.4.13 Limitations: Heat-strengthened glass and fully-tempered glass when used in monolithic glazing material, to protect building occupants from falling glass should breakage

occur.

10.4.14 Maximum area of skylight units: Each skylight unit shall have a maximum area within the curb of 9.3m^2 except that the area of skylight units shall not be limited in building equipped throughout with an approved automatic fire suppression system.

10.4.15 Aggregate area of skylight: The aggregate area of skylight shall not exceed 33 percent of the floor area of the room or space sheltered by the roof in which they are installed.

10.4.16 Glazed masonry units: This section shall be of quality equal to that required by ASTM C126.

10.4.17 Structural glass block walls: This section shall be in conformity with section 1420.0 - 1420.4 of the BOCA National Building Code 1987.

10.4.18 Minimum glazing area: Every room or space intended for human occupancy shall have an exterior glazing area of not less than 8 percent of the floor area.

10.4.19 Adjoining Spaces: Where natural light for room or spaces without exterior glazing area is provided through an adjoining room, the unobstructed opening to the adjoining room shall be at least 8 percent of the floor area.

10.4.20 Stairways: Interior stairways shall be provided with an exterior glazing area of not less than 0.93m^2 on every floor through which the stairway passes.

10.4.21 Hallways: Natural light shall be capable of providing a minimum illumination as specified for natural light.

10.4.22 Wired glass: Maximum size (6.35mm) wired glass which has been labelled for use in approved labelled opening protectives, shall conform to the size limitations set below:

Limiting size of wired glass panels: See Table below:

Rating opening	Max.Area sq.mm	Max.height mm	Max.width mm
3-hour	0	0	0
1 / - hour doors in exterior walls	0	0	0
1 - and 1 / hour	64516mm	838.2	25.4
% - hour	836127.36	1371.6	1371.6
Fire window	836127.36	1371.6	1371.6

10.4.23 Strength test for glass: The working strength of glass for any location in which it is required to withstand wind or impact shall comply with Section 12.1.8 as stipulated above.

10.4.24 Specific hazardous locations: The following shall be considered specific hazardous locations for purpose of glazing.

1. Glazing in ingress and egress doors.
2. Glazing in fixed, sliding or swinging panels of sliding or swinging - type doors.
3. Glazing in storm doors.
4. Glazing in all unframed swinging doors.
5. All glazing in railings regardless of area or height above a walking surface.

10.4.25 Packages and containers: All packages and containers of glass shall bear the label of an approved agency showing the flame - spread rating and fire-resistance rating of the product at the thickness tested or the use for which the product has been listed.

10.5 IRON AND STEEL

10.5.1 General: The provisions of this Chapter shall govern the materials and quality of steel structural members. Structural steel construction used in all building and structures shall be fabricated from materials of uniform quality, free from defects that would vitiate the strength or

stability of the structure.

10.5.2 Steel bars for The reinforcement of concrete: All the provisions of NIS 117: 1988 shall be complied with in the selection and use of reinforcing steel bars for concrete.

10.5.2.1 The structural use of steel:

10.5.2.2 General: The purpose of this section is to ensure that structural steel work is adequately protected against corrosion and has adequate strength, stiffness and stability.

10.5.2.3 Cleaning and protection against corrosion

(i) Structural steel shall be cleaned of loose scale and rust and, except where it is to be solidly encased with brick-work, concrete or other similar non-combustible material, shall be either thoroughly coated with at least two coats of paint or boiled oil, one coat of which, subject to sub-paragraph (with such other protection against corrosion as shall to the satisfaction of the supervising o with such other protection against corrosion as shall to the satisfaction of the supervising officer.

(ii) The coating with paint or boiled oil or the provision of other protection against corrosion, of all surfaces inaccessible after erection, except surfaces held in direct contact by riveting or intermittent welding, shall be carried out before erection.

10.5.3 REINFORCEMENT

10.5.3.1 General: The purpose of this Section is to ensure that reinforced concrete has adequate strength, stiffness and stability.

10.5.3.2 Reinforcement shall be free from loose mill scale, loose rust, oil or other matter which might affect adversely the proper function of reinforcement with concrete.

10.5.3.3 Grades: Bars shall be grade 230 or 420 in accordance with clause 2.1.1 or 2.1.2 of NIS 117: 1988 as applicable.

Table 18A shown below gives some properties of these grades of steel.

TABLE 10.7 TENSILE PROPERTIES

1	2	3	4	5
GRADE	REH (Minimum MPA) (OR N/MM^2	RP 0.2 (Minimum MPA)	RM (Minimum)	A (Minimum) %
230 HD	230	-	1.15 REH	22
230 HP	230	-	1.15 REH	22
420 HD	420	-	1.15 REH	12
420 CD	-	420	1.08 RPO.2	12

Note: Reh = Upper yield stress RPO.2 = 0.2% proof stress RM = Tensile strength A = Elongation 1MPA = 1N/MM^2 1PA = 1N/M^2

1MPa = 10 6Pa = 10 6N/M^2 = 1N/MM^2

1 MPA = 1 Megapascal

The grade designation is a number indicating the specified minimum yield stress or 0.2% proof stress (see Table 18A)

HD = Hot rolled deformed bars

HP = Hot rolled plain bars

CD = Cold - worked deformed bars.

10.5.3.5 Sizes: The preferred nominal sizes of bars shall be 6, 8, 10, 12, 16, 20, 20, 25, 28, 32, 36, 40 and 50mm.

10.5.3.6 Definitions: For the purpose of this standard the following definitions shall apply:

10.5.3.6(a) Bar: A steel product of any form of cross-section as rolled including a rod of steel. The bar may be plain, oblique ribbed or cross-ribbed.

10.5.3.6(b) Deformed bar: A steel bar, intended for use in concrete construction, the surface of which is provided with lugs or protrusions (hereinafter called “deformations”) which inhibit longitudinal movement of the bar, relative to the concrete which surrounds the bar in such construction.

10.5.3.6(c) Cold-worked deformed bar: A bar which has been deformed with its yield or proof stress raised by cold-working and has, in its cold-worked state, deformations complying with Clause 6.3 of NIS 117: 1988.

For the dimensional and mass requirements of the preferred nominal sizes or deformed steel reinforcing bars, reference should be made to Table 18B shown below.

TABLE 10.8

DIMENSIONAL AND MASS REQUIREMENTS FOR DEFORMED STEEL REINFORCING BARS

1	2	3	4	5	6	7
				Deformation Requirements		
Bar size (mm)	Calculated mass per meter (kg/m)	Calculated area (mm^2)	Nominal area (mm^2)	Maximum average spacing (mm)	Minimum average height (mm)	Maximum gap (mm)
6	0.222	28.2	30	4.2	0.2	2.3
8	0.395	50.3	47.8	5.6	0.3	3.1
10	0.617	78.5	73.8	7.0	0.4	3.9
12	0.888	110	110	8.4	0.5	4.7
16	1.579	201.1	200	11.2	0.7	6.3
20	2.466	314.2	310	14.0	1.0	7.9
25	3.853	490.9	479.2	16.8	1.25	9.9
28	4.834	615.8	620	19.6	1.40	11.0
32	9.313	804	800	22.4	1.60	12.6
36	7.991	1017.9	1020	25.2	1.80	14.1
40	9.864	1256.6	1260	28.0	2.00	15.7
50	1963.5	1963.5	1960	35.0	2.50	19.6

10.5.3.7:

TABLE 10.9 FREQUENCY OF TENSILE AND BEND TEST

NOMINAL SIZE	QUANTITY
Under 10mm	1 sample from each 25 tonnes or part thereof
10mm to 16mm	1 sample from each 35 tonnes or part thereof
over 16mm	1 sample from each 45 tonnes or part thereof

10.5.3.8 Other tests which may be considered necessary for the works to be done should comply with the provisions of Section 9.3, 9.4 and 9.5 of NIS 117: 1988.

10.6 DEFORMATION REQUIREMENTS

10.6.1 General: Deformations in concrete reinforcement bars shall conform to the requirement of this Section and Table 18B.
All the requirements of deformation stated in Section 6.3 of NIS 117: 1988 shall be complied with.

10.7 SAMPLING AND PREPARATION OF TEST PIECES

10.7.1 Hot - rolled bars

10.7.2 For bars of grade 230HD, 230HP and 420HD, samples shall be taken from steel on each ladle for tensile and bend test pieces. They shall not be annealed or otherwise subjected to heat treatment after selection.

10.7.3 Tensile and bend test pieces shall be the full section of the bar as rolled and the tensile properties shall be determined on the nominal area of the bar.

10.7.4 For bar having a diameter of 32mm or more, proportional tensile test pieces may be prepared from the test samples by machining, and the tensile properties shall be determined from the actual cross-sectional area of the piece.

10.7.5 Cold-worked bars

10.7.6 For bars of grade 420CD, test samples of sufficient length for the specified tensile and bend tests shall be cut from the finished bar after cold-working at a frequency not less than that given in Table 18C.

10.8 NON-FERROUS METALS AND THEIR ALLOYS

10.8.1 Galvanized corrugated steel sheets

10.8.2 Scope: This article governs the materials, profiles, properties and dimensions of hot-galvanized corrugated steel sheets for building and general purpose. The Nigerian Industrial Standards governing the manufacture and use of galvanised corrugated steel products as stipulated in NIS 180: 1988.
10.8.3 Glossary of terms: The standard definitions of the following terms and concepts: hot-dipping; galvanizing, coating, dross, fluxing, prickling, standard dimensions, pitch and depth of corrugation: shall be in conformity with those provided by NIS 180: 1989 under the appropriate sub-headings.
10.8.4 The quality of materials: The quality of steel sheets and the process to be used in the production of galvanized steel products shall be those specified in NIS 180: 1989.
The quality of zinc to be used in the galvanisation process should be of minimum purity of 98.5% for the bath.

10.8.5 Continuously hot-dip zinc coated and iron alloy coated steel: Wide strips, sheets, plates and slits: The standard required for Iron-zinc alloy-coated steel flat rolled products in forming and structural grades by a continuous process is governed by this article. The composition, mechanical strength, coating mass, test methods, dimensional tolerance, and geometrical deviations are as stipulated hereunder and in conformity with BS 2989: 1982.

10.8.6 Grades and types of galvanised corrugated steel sheets: This standard stipulates 4 types of galvanised steel corrugated steel sheets as specified in Table 6.1 below and as stipulated in NIS 180: 1989.

GRADE	MASS OF ZINC COATING ON BOTH SIDES		
	MINI	MAX	
	KG/m^2	KG/m^2	
A	0.381	0.455	
B	0.458	0.455	
C	0.550	0.608	
D	0.610	0.762	

Table 6.1: Typical metal and mass zinc coating:

10.8.7 Determination of galvanised coating mass: The mass of zinc coating on galvanised steel shall be determined by one of the two methods specified in NIS 180: 1989.

10.8.8 Freedom from defects: The galvanised corrugated steel shall be free from twist and buckle. Galvanised flat sheet shall be clean, and its surface free from contamination and other defects. It should conform to the standards stipulated in NIS 7: 1982.

10.8.9. General properties and standard specifications for galvanised corrugated steel with respect to: coating adherence of sheets, standard dimensions, thickness of base sheet, standard width and length, thickness and mass, marking and methods of calculation of mass of sheets shall be in accordance with NIS 180.8.12: 1983.

10.9 ALUMINIUM AND ITS ALLOYS

10.9.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of aluminium and its alloys for use in building construction.

10.9.2 Glossary of terms: The definition of terms used in wrought aluminium industry in connection with the manufacture of products shall be as defined hereunder and in conformity with BS 3660: 1976.

10.9.3 Sheets, plates and strips of aluminium and its alloys: The standard, quality and characteristics required of sheet, plate and strip made from various grades of aluminium and aluminium alloys under various conditions for use in building and general engineering purposes shall be in conformity with BS 1470: 1972.

10.9.4 Bars, extended tubes and sections of aluminium and its alloys: The requirement for solid bars, sections, extruded round tubes, and hollow sections made from various grades of aluminium and aluminium alloys under various conditions shall be in accordance with BS 1474: 1972.

10.9.5 Rivet, bolts and screw stock of aluminium and its alloys: Rivets, bolts and screw stock of one grade of aluminium and 4 aluminium alloys made under various conditions shall be in accordance with BS 1473: 1972.

10.9.6 Stoving, organic finishes in aluminium extrusions and preformed sections: This article specifies the requirements and methods for testing for organic coating used for finishing

aluminium sections, and also for the finish of the section themselves. The products and process shall be in accordance with BS 4842: 1972.

10.10 COPPER, ZINC, LEAD AND THEIR ALLOYS

10.10.1 Scope: The provisions of these articles shall govern the material, design, construction and quality of copper, zinc, lead and their alloys with particular reference to their use in building industry.

10.10.2 Glossary of Terms: Definition of the terms for wrought product of these metals to include the following: Cast forms, wrought forms, processing, thermal treatment, finishes, dimensional surface and structural characteristics, packaging and temper-designation shall be in conformity with those stipulated in the current Engineering Code of Practice.

10.10.3 Grades of copper: Three grades of copper are used in building (A) Deoxidized copper; (B) Rise-refined tough pitch copper, and (C) Electrolytic tough pitch high conductivity copper.

Grade A: Copper is used in domestic plumbing tubes where welding is to be carried out.

Grade B: Copper is a stronger grade and more resistant to atmospheric corrosion than grade A. It is used as sheets for fully supported roof covering.

Grade C: is similar to Grade B, but of higher purity. It is used for electricity conductors.

10.10.4 Copper alloys: The most common alloys of copper are those of copper and zinc in different proportions resulting in various types of brasses; and those of copper and tin for various types of bronzes. These two alloys are used in building industry for their enhanced characteristics.

Name plates, door furniture, extrusions and sheets for various uses.

10.10.5 Rolled copper and cooper alloy sheet, strip and foils: This section governs the standard, quality and characteristic requirements for rolled copper and copper alloy sheet, strip and foil for general purposes in thickness not exceeding 10mm covering several grades of copper and copper alloys which should be in conformity with stipulations of BS 2870: 1980.

10.10.6 Copper and copper alloys plates: The standard specification for wrought copper and copper alloys plates of over 10mm thickness shall be as stipulated in BS 2875: 1969.

10.10.7 Plain sheet zinc roofing: The standard specification governing the materials, freedom from defect, stamping, dimensions, guages, bending tests, and other requirements relating to Construction method of laying zinc on different roofing forms shall be as stipulated in BS 849: 1979.

10.10.8 Zinc alloy sheets and strip for building: This article governs the requirement for composition, manufacture, dimensions and use of 2 types of zinc alloys: a crip- resistant zinc/lead alloy for flashings; The typical sizes and physical and mechanical properties shall be in accordance with BS 6569: 1985.

10.10.9 Milled load sheet for building purposes: The standard specification for soft milled load sheet for roofing, flashings, wallings, damp-proofing courses and similar building work shall be as specified in BS 1178: 1982.

10.11 CLAY AND CLAY PRODUCTS

10.11.1 BURNT CLAY BRICKS

10.11.1.1 General requirements and quality: Bricks shall be hand or machine moulded. They shall be made of clay, properly prepared, rightly burnt and shall be free from deep or extensive cracks, warpage and other flaws to affect adversely their strength and quality. Moreover, the bricks shall be free from salts, pebbles, lime particles and any material likely to cause efflorescence or stains in the rendering of plaster. They shall also, when a cut surface is

examined, show a reasonable uniform texture. They shall have smooth rectangular faces with 2 sharp edges and emit clear ringing sound when struck.

10.11.2 BURNT CLAY BRICKS

Terminology:- A walling unit not exceeding 337.55mm in length, 225mm in width, or 112.5mm in height.

10.11.2.1 Clay block: A walling unit exceeding in length, width, or height, the dimensions specified for bricks.

Note: Bricks and blocks for walling are units designed to be

(i) laid in a bed of mortar;

(ii) when the term “brick” is used in this Code, it shall be deemed to refer to units of all sizes and blocks.

10.11.2.2 Common bricks: Suitable for general building works, to give an attractive

appearance.

10.11.3 Facing bricks: Specially made or selected to give an attractive appearance when used without rendering or plaster or other surface treatment of the wall.

10.11.4 SPECIAL BRICKS

ENGINEERING BRICKS: Having a dense and strong semi-vitreous body conforming to defined limits for absorption and strength.

10.11.5 Clay bricks are being made in modular sizes

203.2	x 101.6 x 50.8; 76.0 & 101.0mm} Nominal 200
x 100 x 50; 75, & 100mm	}
193.7	x 92.1 x 48.3 & 92.1mm }
190 x 90 x 40, 90	} Actual

10.11.6 Internal quality brick: Brick suitable for internal use only. (may need protection on site during inclement weather).

10.12 VARIATIONS

10.12.1 Solid Bricks:- In which small holes passing through, or nearly through it, do not exceed 25% of its volume, or in which frogs (depression in the beds faces of a brick) do not exceed 20% of its volume.

Note:- For the purpose of this definitions, a small hole is a hole less than 20mm wide or less than 500mm^2 which may be incorporated as aids to handling within the total 25%.

10.12.2 Perforated bricks:- In which holes passing through it exceed 25% of its volume (the holes are not small as defined in solid bricks alone up to three layer holes not exceeding 3250mm^2 each may be incorporated as aids to handling).

10.12.3 Hollow brick: In which holes passing through it exceeds 25% of its volume and the holes are not small, as defined above.

10.12.4 Cellular bricks: Normally made by pressing, perforated and hollow bricks and blocks by extrusion perforations and hollows may be either perpendicular to the bed faces (V -type) or parallel to the bed face (H-type).

10.12.5 Compliance: for dimension of bricks is based on a sample of twenty four (24) and of blocks on a sample of ten (10) of which no more than two (2) may exceed permissive deviations.

10.13 FORMATS

The formats of bricks shall be designated in term of their co-ordinating size, which includes the thickness of a mortar joint. This mortar joint is taken for the purpose of this Code as equal to 10mm. (See Table) - standard format bricks and blocks.

TABLE 10.10 STANDARD FORMAT (Bricks and blocks)

DESIGNATION	WORK SIZE

	LENGTH	WIDTH	HEIGHT
BRICKS 225 X 112.5 X 75	MM	MM	MM
BLOCKS	215	102.5	65
300 X 62.5 X 225	290	62.5	215
300 X 75 X 225	290	75	215
300 X 100 X 225	290	100	215
300 X 150 X 225	290	150	215
From Tables	1 and 2	BS	3921:1985

10.13.1 Dimensional tolerances (bulk supply): The bulk supply of load of bricks shall be deemed to comply with the formats (Clause above) if the overall measurement of a sample of 24, taken in accordance with (Clause 5.2 NIS 74: 2003 - Methods of Sampling): and tested in accordance with (Clause 3.3) NIS 74: 2003, do not fall outside the tolerance given in Table 2; NIS 74: 2003. If the measurement of the sample falls outside these tolerances the bulk supply or load shall be deemed not to comply. No testing of a second sample shall be permitted.

10.13.2 Determination of dimensions: Twenty four (24) whole bricks shall be selected in accordance with methods of sampling (Clause 5.2 NIS 74. 2003). All blisters, loose particles of clay and small projections shall be removed. They shall then be arranged upon a level surface successively as in Fig. 1a, 1b and 1c ( ) in contact with each other and in a straight line. The overall length of the assembled bricks shall be measured with a steel tape or other suitable inextensible measuring device sufficiently long to measure the whole row at one stretch. Measurement by repeated application of a short rule or measuring device shall not be permitted. If for any reason it is found impracticable to measure 24 bricks in a row, the samples may be divided into two rows of 12 or three rows of 8 which shall be measured separately to the nearest millimetre and their measurements added. The measurement of one row of 12 or 8 units and multiplication by 2 or 3 shall not be considered satisfactory, because of the probability that the mean dimensions of so small a sample would differ appreciably from the mean dimension of the bulk supply.

10.13.3 Physical properties (NIS 17. 1974): Compressive strength: When tested, the compressive strength of the bricks of ordinary quality shall not be less than 3.0N/mm^2. This minimum strength is acceptable provided the bricks are satisfactory in other respects.

10.13.4 Calculated compressive strength by the formula: Compressive strength (kgf/cm^2) = Maximum load at failure (kgf)
Cross sectional Area of bricks (cm^2).

The average of the results shall be taken as the compressive strength of the specimen.

Water absorption: When tested in accordance with the procedure laid down in Schedule B, the average water absorption of common building bricks shall not be more than 25% by weight after immersion in water for 24 hours.

Efflorescence: When common bricks are tested in accordance with the procedure laid down in Schedule C, the rating of efflorescence shall not be worse than moderate.

Warpage: When tested in accordance with the procedure laid down in Schedule D, the warpage shall not exceed 1% of the dimension measured.

10.14 BINDERS

10.14.1 CEMENT: shall be;

10.14.1.1(a) Ordinary Portland Cement shall comply with the appropriate provisions of NIS 11: 1974.

Ordinary Portland Cement should be ground to a very fine powder with an average specific surface of not less than 2500cm/g.

Shall have initial setting time of not less than 45 minutes and final setting time of 10 hours.

O.P.C shall be very sound with an expansion of not more than 5mm.
O.P.C shall be stored immediately in an air-tight container such as a bag made from thick water-proof sheets. The volume of air remaining in the filled container shall be the minimum practicable.

Cement shall be stored in the order in which it will be used, and in such a manner as to permit easy access for proper inspection and identification of each consignment and in a suitable weather-tight building to protect the cement from dampness and to minimize ware-house deterioration (FIRST IN, FIRST OUT). In addition, cement of different brand, shall not be used together in the mix.

O.P.C. shall have the average compressive strength of 3 mortar cubes prepared and stored and tested after 3 days and 7 days, the 3 days strength shall not be less than 15mn/m^2. The 7 day strength shall show an increase on the compressive strength at 3 days and shall not be less than 24MN/m^2.

TABLE 10.11

TESTS AND SPECIFICATIONS FOR GYPSUM BUILDING PLASTERS

	A	B	C	D
	Plaster of Paris	Retarded hemihydrate	Anhydrous gypsum	Keene's plaster
Chemical composition (% by weight of plaster)	35%	35%	40%	47%
Minimum SO	2/3 SO_3	2/3 SO_3	2/3 SO_3	2/3 SO_3
Minimum CaO_3	0.2%	0.2%	0.2%	0.2%
Maximum (Na_2O plus MgO)	4-9%	4-9%	Maximum 3%	Maximum 2%
Ignition loss	3% (metal lathing plaster)	3%(metal lathing plaster)		
Maximum free line	Maximum 5%	Maximum 1% plaster pats		
Residue on 1.8mm BS test sieve			Maximum 1% shall show no	Maximum 1% signs of

Soundness (Pat test)	The set	1.2N/mm^2		disintegration, popping or pitting
T ransverse strength (modulus of rupture) Minimum				
Mechanical resistance (dropping ball test)	2.5N/mm^2	4.5mm	4.5mm	4.0mm
Maximum diameter of indentation		Maximum 0.2%		
(Linear) Expansion on setting				

TABLE 10.12 (FROM BS 1191: PART 1: 1973)

TABLE 168
TESTS AND SPECIFICATIONS FOR PREMIXED LIGHTWEIGHT PLASTERS

	Type a: Undercoat plaster			Type b: Final coat plaster
	1 Browning plaster	2 Metal lathing plaster	3 Bonding plaster	
Soluble salt content	0.25%	0.25%	Not limited	0.25%
Minimum (Na_2O plus MgO)	640	Maximum 2.5%	770	4-5.5MM
Free lime content	850		1040	
Dry bulk density (kg/m^3)	0.93	770	1.0	
Maximum		1040		
Dry set density (kg/m^3)		1.0		
Maximum				
Compressive strength (N/mm^2)				
Minimum mechanical resistance (dropping ball test)				
Diameter of indentation				

Table 10.12 (From BS 1191: Part 2: 1973)

10.14.1.1(b) Rapid hardening Portland Cement shall be in conformity with the appropriate provisions of BS 12: 1978.

10.14.2 GYPSUM
Gypsum plaster shall comply with BS 1191: 1973.

Table 20.2.1 and Table 20.2.2 are provided for guidance.

10.14.3 LIME

10.14.3.1 Lime for mortar or plasters: Lime used for building works shall comply with the appropriate provisions of BS 890:1972.

(a) shall be properly slaked or run to putty before use, and all proportioning shall be in respect of one of these forms;
(b) shall to the satisfaction of the supervising officer, be in other respects suitable, having regard to the particular circumstances of the case;
(c) shall be used in such manner as the code enforcement officer may approve as being suitable.

Cement - Lime - mortar shall be composed of ordinary Portland cement or rapid hardening cement and lime mixed with sand in proportions specified by supervising officer and are capable of setting and hardening when cured under water.

10.14.4 Pozzolonas: Shall comply with BS 6588: and BS 6610: 1985.

The main criterion is that the Portland - pozzolona cement should be comparable in strength and other related properties to Ordinary Portland Cement.

10.15 FIXING AND JOINING MATERIALS

10.15.1 These shall comply with BS 647. 1981:

This standard specifies the methods of sampling and testing bone, skin and fish glues.
Table 20.5.1.1 lists the tests and summarises the mass of glue and the volume of water required for each test.

TABLE 10.13 GLUE CONCENTRATIONS

Clause	Tests	Mass of glue	Volume of water
6	Moisture content	g	m^1
7	Jelly strength (see 7.5.2)	1	10
8	Comparison of jelly strength	15 (7.5)	105 (105)
9	Viscosity	5 to 10	50
10	Melting point	15	105
11	Setting point	37.5	75
12	Foam: method 1	37.5	75
	method 2	5	50
13	Keeping quality	15	105
14	H	5	20
	P	1	100
15	Grease	10	15
16	Joint strength in shear	10	15

TABLE 10.14 BS 647: 1981

Strengths of adhesive	Test											
	Boiling water resistance			Hot water resistance			Cold water resistance			Micro-organism resistance		
	Condition	Time	Failing Force (min.)	Condition	Time	Failing force (min.)	Condition	Time	Failing force (min.)	Condition	Time	Failing force (Min.)
		h	kN		h	kN		h	kN		weeks	kN
WBP	Boiling water 72 0.90			Not applicable			Water at 15 plus 15 oC 16 to 24.1.10			Humid 25 plus 2 oC 4 1.10		
BR	Boiling water 3 0.45			Not applicable			Water 15 plus 5 oC 16 to 241.10			Humid 25 plus 2 oC 4 1.10		

TABLE NO. 7.1.2 — *continued*

TABLE NO. 7.1.2 — *continued*

MR	Not applicable	0.90 Water at 67 plus 2 oC 3	Water at 15 plus 5 oC 16 to 24 1.10	Humid 25 plus 2 oC 4 1.10
NT	Not applicable	Not applicable	Water at 15 plus 5 oC 16 to 24 1.10	Not applicable

BS 745: 1969 ANIMAL GLUE FOR WOOD (JOINER'S GLUE) (DRY GLUE, JELLY OR LIQUID GLUE)

10.15.2 Animal glue shall comply with BS 749: 1969. This standard specifies dry glue (supplied in cakes, pieces, granules, pearls cubes or powder) and jelly or liquid glue.
Requirements for dry glue are specified as follows:

i. Overlap joint strength in longitudinal shear: minimum 2.65KN. Moisture content: maximum 18%.

   Chlorides: Maximum 2% (calculated as sodium chloride).

   PH: Minimum 4.0 maximum 8.2.

   Odour: Not objectionable.

   Keeping quality: Minimum 6 days without evidence of liquefaction, putrefaction or mould growth.

ii. Requirements for jelly or liquid glue are specified as follows:

   Overlap joint strength in longitudinal shear: minimum 2.65KN PH: Minimum 4.0, maximum 8.2.

10.15.3 Synthetic resin adhesives (phenolic and aminoplastic) for plywood:

Synthetic resin adhesives shall comply with BS 1203: 1979.
This standard specifies requirements and test methods for four types of adhesive - three types for external use depending on performance (weather-proof and boil-proof (WBP), boiling-resistance (BR), moisture-resistant and moderately weather-resistant (MR) and one type for internal use (INT).
Requirements are summarised in Table 179.

10.15.4 Synthetic resin adhesives (phenolic and aminoplastic) for wood shall comply with BS 1204:
Part 1: 1979 Gap-filling adhesives.

Part 2: 1979 Close-contact adhesive.

This standard specifies requirements for four types of adhesives-three for external use depending on performance and one for internal use.
Requirements are summarised in Table 20.5.41: 20.5.4.2.

10.15.5 Cold-setting casein adhesive powers for wood shall comply with BS 1444: 1970:
Casein is a protein precipitated from skimmed milk which, when compounded with other reactants, is used as an adhesive for wood. Casein adhesive have a limited degree of water resistance and should be used only for interior applications.
Requirements are specified in this standard for storage properties and adhesive strengths. Sampling and method of test are appended.

10.15.6 Adhesive for hanging flexible wall-covering; shall comply with BS 3040: 1981:
This standard specifies requirements for five types of adhesives suitable for hanging flexible wall-coverings and ceiling coverings supplied in roll form.
Type 1: For use as a low solids adhesive with easy slip showing very low marking and every low tarnishing. Especially suitable for light grammage wall-coverings.

Type 2: Normally used as a medium solids adhesive, showing low marking and low tanishing, suitable for wall-coverings for all grammages and also for previous, washable wall-coverings.

Type 3: Adhesive with good wet adhesive, particularly suitable for wall-coverings of heavy grammage and also for previous washable coverings.

Type 4: Adhesive containing fungicide to inhibit mould growth (mould resistant) suitable for impervious wall-coverings of all grammages.

Type 5: High wet adhesion, high dry strength adhesive, containing fungicide to inhibit mould growth. Suitable for most impervious wall-coverings or special applications, often ready-mixed.

10.15.7 Methods of test for polyvinyl acetate adhesive for wood shall comply with BS 3544: 1962:

1. Freeze - than treatment.
2. Staining properties of the adhesive on wood.
3. Strength of double lap joints to sustained three-point loading, under dry and damp conditions.
4. Resistance of double lap joints to sustained three-point loading, under dry and damp conditions.

Preparation of test pieces for strength tests and a timing device for sustained loading tests are appended.

10.15.8 Polyvinyl acetate (PVA) emulsion adhesive for wood, shall comply with BS 4071: 1986:

This standard specifies requirements for resistance to freezing and thawing freedom from staining, strength, resistance to sustained loading and storage. It refers to the methods of test described in BS 3544.

10.15.9 Polyvinyl acetate (PVAC) emulsion bonding agents for internal use with gypsum building plaster, shall comply with BS 5270: 1976.

This standard specifies requirements for PVA emulsion bonding agents for internal use with gypsum building plasters, to improve adhesive to difficult back-grounds or to control high section as follows:

Soil content: not less than the minimum value state by manufacturer.

Saponification value: 575-652 (for non-volatile component).

Acid value: minimum 10 (for non-volatile component).

Ash: maximum 2 per cent by mass.

Flexibility: a dry film of the bonding agent 0.05mm thick shall not show any cracking when bent over a 1.5mm mandrel at 23 plus 2oC.

Bond strength: minimum 200N.

10.15.10 Methods of test for adhesives shall comply with BS 5350

Classification of adhesives for construction shall comply with BS 5442.

This standard is in three parts dealing respectively with adhesives for flooring, for internal wall and ceiling coverings and for use with wood:

Part 1: 1977 Adhesives for use with flooring materials.

Part 2: 1978 Adhesives for interior wall and ceiling coverings (excluding decorative flexible materials in roll form).

Part 3: 1979 Adhesives for use with wood.

Classifications of adhesives are summarised in Table 182 (for flooring), Table 183

(for internal wall and ceiling coverings) and Tables 184 and 185 (for wood and wood/non wood).

10.15.11 Adhesives for use with ceramic tiles and mosaics shall comply with BS 5980:1980: This standard classifies adhesives into five types depending on their chemical composition and physical form and into three classes based on their resistance to water.

The five types and classes are as follows:

Type 1: Hydraulically - hardening mortar.

Type 2: Dispersion adhesive.

Type 3: Dispersion/cement adhesive.

Type 4: Dissolved resin adhesive.

Type 5: Reaction resin adhesive.

Class AA. materials with a faster development of water resistance.

10.16 BITUMINOUS MATERIALS

10.16.1 Definition: Shall be those comprising either bitumen, natural or derivative, coal tar or pitch. Natural bitumen is a non-crystalline solid or viscous material comprising complex hydrocarbons which is soluble in carbon disulphide.
It softens when it is heated, is waterproof and has good powers of adhesion.

Derivative bitumens are distilled from mineral oils. Bituminous materials shall be those formed by applying soluble bitumen on ground limestone, coarse aggregate, natural rock aggregate, hessian cloth or felt fiber. Bituminous materials namely those comprising bitumen coal tar or pitch shall not be intermixed or appted over one another. Bituminous materials shall conform to the following standards:

(i) Sampling and testing - BS 598 Parts 1 and 2: 1974.

(ii) Design and Physical Testing - BS 598 Part 3: 1985.

(iii) Test for petroleum and its products BS 2000: 1983.

(iv) Determination of softening point of bitumen and tar in ethylene glycol (ring and ball) - BS 5094: 1974.

(v) Sampling and testing mastic asphalt and pitch mastic used in building BS 5284: 1976.

10.16.2 BITUMINOUS ROOFING FELT

Shall consist of a core of sheet laid between two layers of bituminised felt fibre coated with bitumen and surfaced with talc or other suitable material and shall be such as the Supervising Officer may approve as being durable, impervious to moisture and in all other respects suitable for their purpose having regard to the particular circumstances of the works.

It shall comply with BS 747 class 5: 1968 in all respects and be laid in 3 layers and bonded together with thin layers of bitumen which is poured on while hot. The first and second layers should weigh not less than 1.35kg/m^2 and top layer is to be finished with white mineral surface and to weigh not less than 3.2kg/m^2 and each layer shall be fully lapped 50mm at all points and inter-sections and laid to prime surfaces with 144 bituminous primer and continuously bedded in hot tropical grade.

10.16.3 Types: The following types shall be applicable in built-up roofing:

(i) Bitumen felt (fibre base) - BS 747 Class 1: 1968.

(ii) Bitumen felt (glass fibre base) - BS 747 Class 3: 1968.

The two types shall be sub-divided as follows:

Type (i) Class 1	A.	Saturated
(Fibre base)	B.	Fine sand surfaced
	C.	Self-finished
	D.	Coarse sand surfaced
	E.	Mineral surfaced
Type (ii) Class 3	F.	Reinforced.
(Glass fibre base)	B.	Fine sand surfaced
	E.	Mineral surfaced
	G.	Venting base layer.

Saturated felts shall not be used for the lower layers of a built-up felt roof in climates to avoid holding of moisture that may cause blistering.

10.16.4 Insulating material: Where an insulating material is to be laid directly under the felt, it must be fairly dense to withstand foot traffic and handling during construction and it must be able to withstand the lifting effect of the wind. Where the felt is laid over expanded polystyrene it must conform to BS 3837: 1977 and 4735.

10.16.5 Fire resistance: When stone chippings are used as topping, all felt roofs shall have their fire rating conform to BS 476 Part 3.

10.16.6 Mastic asphalt containing natural rock aggregate for roofing: Shall be composed of natural rock asphalt, and coarse aggregate where applicable incorporated with asphaltic cements and shall comply with BS 6577: 1985.

It shall be applied to flat roofs sloping or curved surfaces and upstand. It shall not be applied where the ambient temperature is more than 35oC when insulation is used, the surface of the asphalt should be top dressed with reflective chippings, embedded in bitumen compound. It shall have minimum and maximum soluble bitumen contents of 14% and 17% respectively. Grading of mineral aggregate shall be in accordance with BS 410 test sieves.

TABLE 10.15 COMPOSITION BY ANALYSIS OF MASTIC FOR ROOFING

PROPERTY	Percentage by mass of mastic asphalt			
Grading of mineral aggregate BS 410 test sieves:	All other Swiss rock	Natural asphalt	Natural rock	Asphalt
	Using min.	Maximum	Minimum	Maximum
Retained on 3.35mm mesh	0	3	0	3
Passing 3.35mm mesh retained on 600um mesh	14	23	14	23
Passing 600um mesh retained on 212um mesh	5	15	5	15
Passing 212um mesh retained on 75um mesh	5	18	5	18
Passing 75um mesh	40	55	40	55
Soluble bitumen	11	13	14	17

(TABLE 2: BS 6577: 1985).

10.16.7 Mastic asphalt containing natural rock aggregate for damp-proof courses: Asphalt as an ordinary horizontal damp-proof course above ground level or for example through a parapet wall may be applied in one 13mm coat.

Below ground level: Except in work which comes under the category of tanking both horizontal and vertical work should be in two layers, the former 20mm thick and the latter not less than 13mm. All internal angles shall have asphalt fillet. In horizontal damp-proof courses, the asphalt shall have sufficient stability to prevent material being displaced under load.

It shall comply with BS 6577: 1985 and the soluble bitumen content shall lie between 17% and 20%. Grading of mineral aggregate shall be in accordance with BS 410 test sieves as detailed in table 20.5.8 below:

TABLE 10.16

COMPOSITION BY ANALYSIS OF MASTIC ASPHALT FOR TANKING

PROPERTY	Percentage by mass of mastic asphalt			
	All other Swiss rock	Natural Asphalt	Natural rock	Asphalt
	Using min.	Maximum	Minimum	Maximum
Grading of mineral aggregate BS 410 test sieves: retained on 3.35mm mesh Passing 3.35mm mesh	0	10	0	10

retained on 600um mesh Passing 600um mesh retained on	5	20	5	20
212um mesh	5	20	5	20
Passing 212um mesh retained on 75um mesh Passing 75um mesh	45	65	45	65
Soluble bitumen	13	16	17	20

(TABLE 4: BS 6577: 1985)

10.16.9 Mastic asphalt containing natural rock aggregate for tanking: Tanking shall be continuous mastic lining to a basement, reservoir, water tower, or swimming pool, for the purpose of water-proofing, as distinct from damp-proof coursing. The asphalt shall be applied in three coats, with 150mm laps, on horizontal work and 75mm on vertical with a two-coat asphalt fillet at all internal angles. Horizontal work shall be laid to a total thickness of 30mm and vertical shall not be less than 20mm. The asphalt covering shall be carried out under stanchions, by lining the pits to ensure the covering is continuous. It shall comply with BS 6577: 1985 and shall be soluble bitumen content in the same range as for damp-proof courses. Grading of material aggregate shall also be as specified for damp-proof course above and in the table below:

TABLE 10.17

COMPOSITION BY ANALYSIS OF MASTIC ASPHALT FOR TANKING AND DAMP-PROOF COURSES:

PROPERTY	Percentage by mass of mastic asphalt			
Grading of mineral aggregate BS 410 test sieves:	All other Swiss rock	Natural asphalt	Natural rock	Asphalt
	Using min.	Maximum	Minimum	Maximum
Retained on 3.35mm mesh				
Passing 3.35mm mesh retained on 600um mesh	0	10	0	10
Passing 600um mesh retained on 212um mesh	5	20	5	20
Passing 212um mesh retained on 75um mesh	5	20	5	20
Passing 75um mesh	45	65	45	65
Soluble bitumen	13	16	17	20

(TABLE 4: BS 6577: 1985)

10.16.10 Mastic asphalt containing natural rock aggregate for flooring: Shall comply with BS 6577: 1985. It shall be applied as flooring and paving material for industrial, office, hospital or domestic purposes and shall be jointless, comparatively noiseless, dustless, hard wearing, hygienic, easily cleaned and impervious to moisture in liquid or vapour form.

It can be laid on most forms of solid construction including concrete, sound timber boarding, bricks, quarry tiles or stone flags.

10.16.11 Thickness: It shall be laid from 15 to 40mm thick in one layer except when it serves as underlay for another floor finish such as tile, linoleum, rubber sheeting where it shall not be less than 15mm.

It shall have soluble bitumen content in the range of 16% and 20% and conform to grading of mineral aggregate using BS 410 test sieves as applicable to Table 7: BS 6577: 1985 as detailed below:

TABLE 10.18

COMPOSITION BY ANALYSIS OF UNGIFTED MASTIC ASPHALT FOR FLOORING

PROPERTY	Percentage by mass of mastic asphalt			
Grading of mineral aggregate BS 410 test sieves:	All other Swiss rock	Natural asphalt	Natural rock	Asphalt
	Using min.	Maximum	Minimum	Maximum
Retained on 3.35mm mesh				
Passing 3.35mm mesh retained on 600um mesh	0	10	0	10
Passing 600um mesh retained on 212um mesh	5	20	5	20
Passing 212um mesh retained on 75um mesh	5	20	5	20
Passing 75um mesh	45	65	45	65
Soluble bitumen	13	16	16	20

(Table 7: BS 6577: 1985)

10.16.12 Grades of Mastic Asphalt Flooring: Shall conform to Schedule A: BS 988: 1973 with regards to recommended thickness for different types of flooring.

Grades of mastic asphalt flooring.
Aggregate shall conform to BS 802: 1967.

(ii) Tarmacadam and tar carpets (gravel aggregate) shall conform to BS 1241: 1959.

(iii) Tarmacadam “Tarpaving” for footpaths, playgrounds and similar works shall conform to BS 1242: 1960.

10.16.16 Pitch: Pitch is the residue after distilling tar from coal fluxed back with some of the by-products. Like coal tar it softens at lower temperature and less plastic less able to resist temperature variations and is cheaper than bitumen.

It shall not be used only for temporary work.

Coat tar pitches for building purposes shall conform shall conform to BS 1310: 1965. It can be used in paints, fluxes e.g. for damp-proof membrane, as saturated for felts and as an impregnant in pitch-fibre drain pipes.

10.17 PAINTS AND PAINTS MATERIALS

10.17.1 Definition: Paints and paints materials shall consist of pigment suspended in either oil or water mixed together into uniform paste for application as decorative and/or protective film on walls, floors, timber and metals. They shall conform to BS.2015: 1965.
The different types of paints shall be in accordance with the following standards.

10.17.2 Paints: Paints and paints materials shall be an oil-based or water-based decorative and or protective material and shall be in accordance with the following Nigerian Industrial Standards:

(i)	Varnishes	- BS 256-258, 274
(ii)	Zinc Oxide Paints	- BS 267-268
(iii)	Colours for ready mixed paints	BS 381C
(iv)	Water paints and distempers (internal)	- BS 1053: 1966
(v)	Black paint (tar base) for iron	- BS 1070: 1973
(vi)	Ready mixed oil paints	- BS 929:
(vii)	Oil stains	- BS 1215
(viii)	Wood preservatives	- BS 1282
(ix)	Knotting	- BS 1336: 1971
(x)	Oil-based priming paints	- BS 2521, and 2524: 1966
(xi)	Lead-based priming paints	- BS 2521 and 2523: 1966
(xii)	Oil-based undercoating and finishing paints (exterior)	- BS 2525-2532: 1954
(xiii)	Colours for building and decorative paints	- BS 2660: 1966
(xiv)	Glue size for decorators use	- BS 3357: 1961
(xv)	Calcium plumbate priming paints	- BS 3698: 1964
(xvi)	Metallic-zinc priming paint (organic media)	- BS 4652: 1971
(xvii)	Ready-mixed aluminium priming paints for woodwork	- BS 4756: 1971
(xviii)	Powder cement paints	- BS 4764: 1986
(xix)	Water-thinned priming paint for wood	- BS 5082: 1974
(xx)	Low-lead solvent-thinned priming paint for woodwork	- BS 5358: 1976
(xxi)	Black bitumen coating solutions for cold application	- BS 3416: 1975
(xxii)	Black bitumen oil varnish	- BS 3634: 1963
(xxiii)	Bitumen-based hot applied coating materials for protecting iron and steel including suitable primers where required	- BS 4147: 1980
(xxiv)	Coal-tar-based hot applied coating materials for protecting iron and steel including primers where required	- BS 4164: 1980

10.17.3 Oil paints: Oil paint shall be ready-mixed oil paint in accordance with NISD (BS 929)

of the type approved and having a high gloss or enamel finish. The quality used shall be in either exterior or interior quality according to the position in the works. Where more than one coat is specified the manufacturer's recommended undercoating shall be used; the gloss or enamel coat being applied only as a finishing coat and not as an undercoat. Where different grades are manufactured for use either particularly on wood surfaces or on metal only the correct grade shall be applied.

10.17.4 Flat oil paint: Shall be an oil based wall paint having a flat egg shell finish and not a high gloss or enamel finish as specified for oil paint and should conform to NIS of BS 929.

10.17.5 Emulsion paint: Emulsion paint shall be composed of coloured pigment suspended in water and applicable on wood as primer and on concrete and blockwalls as undercoat and finishing coat. It shall not be diluted with water except in strict compliance with the manufacturer’s instructions.

10.17.6 Wood primer: It shall be composed of white linseed oil primer with 10% red lead added.

10.17.7 Metal primer for iron and steel: Metal primer for iron and steel shall be red lead primer confirming to Bs. 1011 Type 1.

10.17.8 Metal primer for zinc, aluminium and similar non ferrous metals: It shall be etching zinc chiromate priming paint.

10.17.9 Primer for softboard, hardboard, chipboard and the like: It shall be emulsion paint in accordance with BS 5082: 1974.

10.18 TEST FOR PAINTS

Procedure, apparatus and other related information on widely used test methods for paints, arnishes and similar products shall be in accordance with BS. 3900: 1969.

10.19 PAINT MATERIALS

These are materials that when mixed together in paste form produce the required paint.

10.19.1 Linseed oil: It shall comply with BS 242, 243, 259, 632: 1969

10.19.2 Mineral solvent: It shall comply with BS 245: 1976

10.19.3 Tung oil: It shall comply with BS 391: 1962

10.19.4 Soya bean oil: This shall comply with BS 4725: 1971

10.19.5 Water: This shall be clean, potable and free from impurities.

10.19.6 Pigment: This is colouring materials and shall comply with all relevant BS standards.

10.19.7 Putty: Asahard stopping materials and shall conform to BS 544: 1934 and shall be applied and finished with a knife. Water-soluble stopping should not be used out of doors.

10.20 STORAGE:

Paints shall be stored in cool places and arranged/stocked in order of delivery, paints not in use shall be properly covered.

10.21 PLASTICS:

10.21.1 Definition: For the purpose of this Chapter, certain terms are defined as follows:

10.21.1.1 Plastics: shall be defined as moulding or giving shape to materials (synthetics and nonsynthetics) applicable to buildings and structures.

10.21.1.2 Materials: Chemistry, industrial application, moulding process and after manufacturing processes shall be in accordance with BS 1755: 1951.

10.21.1.3 Plastics colours for building purposes: Plastics colours for building purposes shall

be in accordance with BS 4901: 1976 as being summarised in Table under section (GS) 'Colour'

10.21.1.4 Butyl rubbers compounds: Requirement for four rubber compounds based on either isobutene (isoptene (butyl) rubber or halogenated isobuten) or isopreme (halobutyle) rubbers, classified by their vulcanized hardness shall be in accordance with BS 3227: 1980. These compounds, are intended for the manufacture of items in the form of extrusions, mouldings, moulded or calendered sheet, or for items cut or purched from sheet.

10.21.1.5 Schedule of common names and abbreviations for plastics and rubbers shall conform to the table below:

Common name	Material	Abbreviation
ABS	Acnylomitrile butadiene styene polymer	ABS
ACETAL	Polyoxymethylene; polyformaldehyde (a polyacetal)	POM
ACETATE	Cellulose acetate	CA
ACRYLIC	Methylmethacrylate polymer	PMMA
BUTYTATE	Cellulose acetate butytate	CAB
CASEIN	Casein	CS
CELLULOID	Cellulose nitrate	CN
EPOXY	Fpoxide resin	EP
EVA	Ethylene vinyl acctate copolymer	EVAC
GRP	Glass fibre reinforced plastic based on a thermisething resin	GRP
MELAMINE	Melamine tormaldehyde	MF
NITRATE	Cellulose nitrate	CN
NYLON	Phenol formaidehyde	PA
PHENOLIC	Polycarbonate	PF
POLYESTER	Polybutylene terephthte	PC

POLYESTER	Polybutylene terephthtate	PEIP
POLYCARBONATE	Unsatinated polyester	PBIP
POLYESTER	Low density polyethylene	UP
POLYESTER	High density polyethylene	PE
POLYETHYLENE	Polypropylene and copolymers in which propylene is the major constituent	LDPE
LDPE	Polystyrene	PP
HDPE	Polytetrahane	PS
POLYPROPYLENE	Polycinyl acetate Polyvinl alcohol	PUR
POLYSTYRENE	Polyvinyl chloride and copolymers in which vinyl chloride is the major constituent	PIFE
TOUGHENED	substituted polysiloxane	DVAC
POLYSTYRENE	Thermoplastic material reinforced commonly with fibre	PVC
MODIFOED POLYSTYRENE	Cellulose triacetate	SAN
POLYURETHANE	Ureaformaldehyde	SI
URETHANE		FRP FRTP
PIFE		CTA
PVA		UF
PVA		
PVC		
VINYL		
SAN		
SILICON		
REINFORCED		
THERMOPLASTIC		
TRIANCETATE		
UREA		

10.21.1.6 Rigid expanded polyvinyl chloride for thermal insulation purposes and building applications: The rigid expanded PVC in the form of blocks, boards, and sheets of minimum thickness 12.5mm for thermal insulation and building applications at temperatures up to 50oC shall be in accordance with BS 3869: 1965. This standard is applicable to materials of apparent density 24-48 kg/m^3 and over 48 kg/m^3. Requirements are specified for cross-breaking strength, compressive strength, water vapour transmission and dimensional stability.

10.21.2 Guide to quality control requirement for reinforced plastics mouldings:

Method for preparation of test specimens, measurement of compressive strength, flexural strength, bond strength, density, modulus of elasticity, tensile strength and resistance to liquids shall be in accordance with BS 6319.

10.21.3 Installation: Approved light-transmitting plastics deffuers shall be in accordance to UBC standard 4201: 1985.

10.21.3.1 Connections and supports: All fastenings, connections and supports shall be proportioned to safety transmit two and one half times the design live load. Adequate

allowance shall be made in the fastenings and supports for differential expansion and contraction of the connected materials.

10.21.3.2 Partitions: Approved light-transmitting plastics used in or as partitions shall comply with the requirement of UBC standard 4201: 1985.

10.21.3.3 Bathroom accessories: Approved plastics shall be permitted as glazing in shower stails, shower doors, bathtub enclosures and similar accessory units.

10.21.3.4 Size limitations: Individual panels or units shall not exceed 3048mm in length nor $3m^2$ in area.

10.21.3.5 Other applicable requirements: Light-transmitting plastics used in glazing applications and skylight assemblies; exterior wall, and roof panels shall be in accordance with UBC standard section 5207.

10.21.3.6 Fire suppression system: In buildings having an approved automatic fire suppression system throughout, plastics light-diffusing system shall be protected both above and below. Unless the system has been specifically approved for installation only above the system.

10.21.3.7 Approval for use: The building official shall require that sufficient technical data be submitted to substantiate the proposed use or any light-transmitting materials and if it is determined that the evidence submitted is satisfactory for the use intended, he may approve its use subject to the requirement of this Chapter.

10.22 TIMBER

10.22.1 Timber is defined as wood in a form suitable for construction or carpentry, joinery or for reconversion for manufacturing purposes.

Standing trees or felled trees capable of being converted for the above uses shall also fall within this definition.

10.22.2 Nomenclature of nigerian commercial timbers: There are many types of timbers available for commercial use. The standard botanical name for timbers and their trade names as marketed in Nigeria are shown in Table 1 of NCP2: 1973.

10.22.3 Timber properties and characteristics: All timbers for construction shall conform with information relating to Nigerian timbers as given in Table 2, NCP2: 1973. These relate to density, strength, natural durability, resistance to impregnation, movement and shrinkage.

10.22.3.1. Density: The density is given at a moisture content of 18 percent; it thus provides an indication of the weight of the timber species at moisture content reasonably close at which it is likely to be used for construction.

10.22.3.2 Strength: The strength group is one of seven groups designated N1 to N7, into which it has been found convenient to divide Nigerian timbers. The strongest timbers fall into N1, group and the weakest into N7, group.

10.22.3.3 Each species is classified according to the ability of the heartwood to resist attack by fungi and insects; five durability classes are used as follows:

— Very durable
— Durable
— Moderately durable,
— Non-durable
— Perishable.

10.22.3.4 Preservation: The ease with which the timber can be impregnated with

preservatives is of importance when it is used under condition which favours decay or attack by insects or marine borers. Five classes indicating the resistance of the heartwood to impregnation are used as follows:

— Permeable

— Moderately resistant

— Resistant

— Very resistant

— Extremely resistant

10.22.3.5 Shrinkage: Allowable shrinkage in timber with those of the “movement” or dimensional changes in service is associated with changes in moisture content.

10.22.3.6 Moisture content of timber: Before timber is put to use, it must be properly seasoned and as near as practicable to the mean value of the moisture content it is expected to attain in service.

All Building timber for various purposes should conform to Table 3: NCP2: 1973.

10.22.4 Protection of timber in building: Timber shall be preserved and protected from insects, inclement weather, not exposed to excessive rain or cold, timber treatment will conform to Table 4: NCP2: 1973.

10.22.5 Metric sizes for sawnwood/timber: The cross-sectional sizes for sawn wood to be adopted by timber manufacturers and users in the country are as shown in Table 5 NCP2: 1973, special order may be allowed after a written permission from the supervising officer.

10.22.6 Strength characteristics and design considerations for timber: All structural members, assemblies or framework in a building in combination with floors walls and other parts, must be capable of sustaining all types of loading as shown in table 6.0 NCP2: 1973.

In sustaining these loads, the structure must maintain stability, stiffness and stress limit as specified in the table above.

10.22.7 Loadings: The loadings shall be in accordance with the NCP1. 1973 Part III (Refer to structural section)

10.22.8 Basic stresses and grouping of species: Species with similar basic stress and stiffness value are grouped together' (Table 7: of NCP2: designated seven strength groups that will apply to seasoned timber.

10.22.8.1 Species have been assigned appropriate strength groups in Table 8 of NCP2: 1973.

The allocation of species is based on calculated values of basic stresses and experience of the use of timber in Nigeria.

10.22.9 Wood piles: Timber piles are commonly designated at a critical section governed by tip size.

10.22.9.1 Quality requirement of pile: All piles shall be of sound wood, free of decay and insect attack.

Piles shall be cut above the ground swell and have a taper from butt to tip.

Piles shall have at least 6 rings per 25mm of average rate growth measured in the outer 50% of the radius of wood.

10.22.9.2 All knots and limbs shall be cut flush with the surface of pile, except that knots may be hand trimmed flush with the surface of the swell surrounding the knot.

10.22.9.3 Piles splits shall not be longer than the butt diameter.

Split is defined as lengthwise separation of the wood across the rings of nominal growth,

extending from one surface through the piece to the opposite surface.

10.22.9.4 Piles with checks - length wise separation of wood across the rings of normal growth, extending from surface towards the pitch, extending through the piece is not acceptable.

10.22.10 Compression members: Effective Length. For different conditions of end restraint, the effective length L, shall be taken from Table 16: NCP2-1973 in calculating slenderness ratio.

10.22.11 Assembly of structural units: This shall be done on a suitable level surface in such a manner that the finished structural units conform fully to specification. Twisted or damaged members shall be replaced before erection on site. Periodic checks shall also be made on all template and gauges.

10.22.11.1 Handling and erection of assemblies: Over stressing of members during handling shall be avoided. During transport, hoisting and erection, all materials and assemblies shall be protected from the weather.

10.22.11.2 Connections: See section 7:17 to 7.18.5 of NCP2: 1973

10.22.12 Fire retardant treated wood: Timber shall be treated with fire retarders and samples should be tested for 3 types of failure i.e. structural collapse, passage of flame and passage of heat (insulation value).

Other tests to be done are combustibility and the surface spread of flame test.

The tests should conform with 29.5.1 of this code and should conform with ASTME 84.

10.22.13 Inspection and testing: Timber structure during/after erection shall be inspected periodically in order to ensure satisfactory performance in service.

Remedial action shall be taken as necessary including in-situ treatment of any timber signs of decay.

10.22.13.1 Testing and method of testing of structures shall conform with Section 9.2.5 of NCP2: 1973.

10.23 OTHER MATERIALS

In this section, materials not considered in previous sections are treated.

These materials are adobe, rammed earth, cement stabilised blocks, fibre concrete roofing tiles and fibre concrete roofing sheets.

10.23.1 Sun dried soil bricks/blocks

10.23.1.1 Sun dried bricks and blocks made in the traditional manner shall be made from a suitable soil in a mould made of wood or steel. Most lateritic soil with clay content less than 20% are generally suitable.

10.23.1.2 Any water free from high quality of soluble salts shall be used for mixing the soil. Brakish and sea water shall not be used. Soluble salts can recrystalise upon drying and cause damage to the brick/block.

10.23.1.3 Drying time for brick/blocks will depend on the quality of mixing water, air temperature, humidity and wind. Drying shall be under a shade to minimise cracking. All bricks/blocks must, however, be dry before use.

10.23.1.4(i) Random bricks/blocks shall be taken for testing at the ratio of 5 samples for every 1000 bricks/blocks produced.

(ii) The compressive strength can be between 1.70 - 2.75N/mm^2 Brick/block of compressive strength of 1.60 N/mm^2 is suitable for use for the construction of one storey building (bungalow)

10.23.1.5 A simple field compressive strength test can be done as follows: A test sample is placed on two simple supports provided by two round steel rods placed on a plain timber placed on a level surface. A level timber is placed over the test sample. Known weights of blocks are placed in small increments until failure occurs.

10.23.1.6(i) Earth plaster of the same material as the brick/block should be used for laying of the bricks/blocks.

(ii) Where cement stucco (plaster) is to be used for rendering, weak cement sand mortar should be used for laying the bricks/blocks.
This is to ensure adhesion of the cement stucco to the adobe wall.

(iii) The mortar shall not exceed 10mm in thickness.

10.23.1.7 (i) A higher quality adobe can be produced by using an appropriate mechanical press such as the Cinva Rem, NBRRI block making machine etc. Where a mechanical press is used, water shall be mixed with the soil at the optimum water content of the soil. The optimum water content can be determined in the field as described in 23.1.7 (ii) below.

(ii) A simple field test to determine the optimum water content is to progressively wet the soil. At each stage, a handful of the soil is compressed firmly within the palm. On releasing the fingers, if the grains of the palm and fingers appear distinctly on the ball of the soil, the water content is suitable for block production.

10.23.1.8 The adobe shall not be used in any building more than one storey in height).

10.23.1.8.1 Wall Height/Thickness ratio: For load bearing wall, the height/thickness ratio shall not be less than 10/1, that is, the thickness of the wall shall not be less than h/10 where h is the height of the wall.

10.23.1.8.2 Wall Thickness: Provided that the recommended height/ thickness is satisfied, wall thickness is of relative less importance. However, recommended wall thickness, based on practical considerations, are as follows:

(i) Load bearing wall 225mm.

(ii) Internal non-bearing wall 113mm.

10.23.1.8.3 Maximum length of wall without crosswall support shall not exceed 3.65m
Wider spans of wall not exceeding 7.00m may be used if intermediate supports are provided in the form of columns, beams etc.

10.23.1.8.4 Brick/Block bonding: Minimum bonding of brick/block shall be half the length of the brick/block or 100mm whichever is greater.

10.23.1.8.5 Tie beam of timber or concrete shall be used as the wall plate and shall be designed and installed in the established manner.

10.23.1.8.6 Attachment of roof truss: The roof truss or roof shall be attached to the wall plate by toe nailing or bolting as applicable.

10.23.1.8.7 Lintels: Lintel strength can be determined by normal design calculations. Lintel less than 1 metre, can consist of timber, plain trunk, clay reinforced with traditional organic reinforcements. Lintels wider than 1 metre shall be determined by design calculation. Lintel bearing on adobe wall shall be a minimum of 200mm at each end.

10.23.1.8.8 Foundation walls: For permanent structures, low bearing walls below ground floor shall consist of more durable material such as burnt bricks, sandcrete etc.

10.23.1.8.9 Foundation footings: The foundation footing should be strong enough to support the wall above it with the allowance made for the bearing capacity of the soil.
Gravels, crushed rock or stone adequately compacted or bonded with cement mortar are

allowed.

10.23.1.8.10 Rendering

(i) Earth (mud) plaster shall be of the same basic material as the material of the adobe wall.

(ii) Cement stucco (plaster) shall be used provided the bonding mortar used for the adobe wall was a weak cement sand mortar.

(iii) Cement stucco with wire mesh employed irrespective of bonding mortar. The metal wire mesh of minimum 20 gauge by 2.50mm opening shall be securely attached to the exterior adobe wall surface by nails or staples with minimum penetration of 380mm.

The mesh fasteners shall have a maximum spacing of 3.80m. The cement stucco shall have a minimum thickness of 20mm.

(iv) Other protective coating may be used provided it is approved by the supervising officer.

10.24 RAMMED EARTH WALLS

10.24.1. Rammed earth construction consist of forming the wall by direct compact of the earth in place. It is different from the adobe wall which is built by laying blocks previously made from the soil.

10.24.2 Soils suitable for rammed earth walls: Soils suitable for producing adobe, sun-dried blocks are also suitable for rammed earth wall construction as indicated in Section 1.1.
However, soils with small aggregate are also suitable.

10.24.3 Mixing water content: The mixing water content should be such that the soil is damp but wet. A simple field test is to squeeze a handful of soil in the palm of the hand. If the water content is too wet, the soil will feel sticky. If the soil is too dry, the soil will not compact and bind together. If the water content is right, the grains of the palm and fingers will appear distinctly on the soil. When this ball is dropped onto a firm surface from a length of 1.0 metre, the soil ball will shorten into 4 or 5 lumps.

10.24.4 Formwork: Any systems of formwork which allows full compaction of the enclosed earth is allowed. Suitable forms range from single forms to complex patented systems.

10.24.5 Layers and compaction: The uncompacted demy soil shall be compacted in layers not exceeding 150mm until maximum compaction is achieved. Maximum compaction can be determined by a change of sound (ringing) when full compaction has been reached.

10.24.6 Wall thickness: Wall thickness shall be as for the adobe as considered in Section 1.7.1 and 1.7.2

10.24.7 Opening: All openings in rammed earth wall must be provided with a lintel strong enough to span the opening width, time should be allowed before such a bed is placed on the wall.

10.24.8 Drying: The compressive strength of most wet rammed earth is in the range 0.2 - 0.6 N/mm^2. Construction may therefore be continuous unless a structural load in this range is to be imposed in the wet state; in that case sufficient drying time should be allowed before such a load is placed on the wall.

10.24.9 Foundations: Foundation shall be as for adobe as described in Section 1.7.9.

10.24.10 Protective coating

(i) Earth plaster shall be for the same basic material as the material of the earth rammed wall;

(ii) Cement Stucco (plaster) shall be applied with and of wire mesh. The metal wire mesh of minimum 20 gauge by 2.50mm opening shall be securely attached to the

exterior of the rammed earth wall surface by nails or staples with minimum penetration of 380mm. The mesh fasteners shall have a maximum spacing of 3.80m. The cement stucco shall have a minimum thickness of 20mm;

(iii) Cement stucco (plaster) can be applied without wire mesh for rammed earth walls consisting of cement stabilised earth, after drying.

(iv) Other protective coating may be provided, it is approved by the Code Enforcement Division/Section/Unit.

10.25 CEMENT STABILISED BLOCK

10.25.1 Cement stabilised block shall be composed of a suitable soil stabilised by ordinary portland cement of not less than 5% by weight in a press with a minimum compacture effort of 3 N/mm^2

10.25.2 The minimum seven day compressive strength of a cement stabilised block for a bungalow shall not be less than 1.60 N/mm^2

10.25.3 The cement stabilised block shall have dimensions of 290 x 140 x 100mm with a frog on one face to facilitate uniform drying without shrinkage cracks and ensure minimum compressive strength.

10.25.4 Soils suitable for cement stabilised blocks

(i) Where a sieve analysis is available, the percentage of clay passing through should not be higher than 20%.

(ii) Where a simple sedimentation test is performed in the field, the thickness

(a) of the clay fraction shall not be more than 25 times the combined thicknesses of the sand and silt fractions.

(b) A sedimentation test is performed with a transparent glass jar at not more than one third the height of the jar. The jar is filled with water. The soil and water are rigorously shaken together until the soil is suspended in the water.

The mixture is now allowed to settle down for about half an hour. Three distinct zones can now be observed and identified. Starting from the bottom upwards are sand, silt and clay zones.

(iii) Most lateritic soils are usually suitable for producing cement stabilised blocks.

10.25.5 Production of cement stabilised blocks

10.25.5.1 Water is added to a dry clay-cement mixture at approximately the optimum water content of the clay and thoroughly mixed together.
The mixture is then transferred to a suitable press and pressure applied.

10.25.5.2 (a) A simple field test to determine the optimum water content is to progressively wet the soil. At each stage, a handful of the soil is compressed firmly in the fist and then allowed to drop onto a hard and flat surface from a height of about 1.10 metres. The water content is right if the ball of the soil breaks into 4 or 5 lumps. If the ball flattens without disintegrating, the water content is high. If the ball breaks into lots of small pieces, the soil is too dry.

(b) A simpler variation of (a) above is at each water content to squeeze the ball of soil within the palm. On releasing the fingers, if the grains of the palm had fingers appear distinctly on the ball, the water content is suitable for block production.

10.25.6 Curing cement stabilised blocks: The wet stablilised blocks should first be allowed to air dry under a shade for twenty four hours. Thereafter curing is continued by sprinkling water morning and evening and covering the blocks with polythene sheet for one week.

10.25.7 Rendering: Cement stabilised block wall can be rendered with normal cement-sand mortar (1:6). Rendering is recommended for external wall to increase its durability. It is also

recommended where the durability of the cement stabiliser block is marginally below acceptable limit.

10.25.8 Compressive test on cement stabilised blocks: A soft packing material such as soft plywood 10mm thick is placed over the block, top and bottom. The compressive strength test is then carried out in the conventional manner. Cement-sand mortar should not be used as this leads to an under estimate of the compressive strength of the block.

10.25.9 Other stabilising agents including lime pozzolona cement, asphalt, plyash be used with the approval of the Code Enforcement Officer.

10.26 FIBRE CONCRETE ROOFING SHEET

10.26.1 Fibre concrete roofing (FCR) sheet: Ordinary Portland cement; a suitable fibre and well-graded sand, the mix proportions of cement, sand and fibre in the range of 4:4:0.01 to 4:3:0.1 by weight are provided as a guide. The usual dimensions are 750 x 1000mm or 1000 x 1000mm and 10mm thickness. The normal weight for 750 x 1000mm is 32kg/m^2.

10.26.2 Suitable fibres: Unlike FCR tiles, fibres provide reinforcement for FCR sheets and should be tested for suitability. Coconut fibre and raffia have been found to be suitable. There are indications that palm kernel fibres may be suitable.

10.26.2.1 The preparation of fibres, types of sand, cement and water required are as described in 1.2, 1.3, 1.4 and 1.5 above.

10.26.3 Production method

(a) The raw materials - sand, cement and fibre-are batched in the recommended proportions. The fibre is soaked in water for one hour before use. The batched materials are mixed thoroughly with water. The slurry is transferred to the working bench previously covered with a polythene sheet. The material is spread over the table and may be vibrated where provision is made for vibration. The screeded material is next drawn over a corrugated mould with the aid of the polythene sheet on which the screeded material was placed.

The wet roofing sheets on the moulds are air dried for about twenty four hours on stacks. The sheets are then demoulded and transferred to a water tank for curing.

(b) Production method can be improved by the use of an appropriate hydraulic press.

10.26.4 Breaking load and water tightness tests are as described in Sections 1.7 and 1.8 above.

10.26.5 Roof design: The roof design is done in the conventional manner. The minimum pitch should be 30°.

10.26.5.1 Installation: The installation of the sheets should be in accordance with BS 8000 Part 5, 1990.

10.26.6 Fibre concrete roofing tiles

10.26.6.1 Fibre concrete roofing tiles: Portland cement, a suitable fibre and well- graded sand. The mix proportions in the range 4:4:0.01 to 4:3:0.1 are provided as a guide. The tiles shall be produced by means of a standard vibrator. The nominal dimensions are 500 x 250mm and of 6mm thickness.

10.26.6.2 Suitable fibres:

(a) Most fibres can be used for fibre concrete roofing tiles (FCR) since their main function is to sustain the shape of the tiles while wet.

(b) Coconut, palm kernel and raffia fibres have been found suitable for producing FCR tiles. Coconut and palm kernel fibres are available in southern part of the country and

raffia in the savannah north. The coconut fibres should be completely free of any traces of the husk material. palm kernel fibres should be washed free of all traces of palm oil by any effective means.

10.26.6.3 Preparation of fibre for production: Fibres are cut in lengths ranging from 1 to 2cm. Any suitable cutting device may be used. Cutting devices include knives, matchets, scissors, paper cutting machines and so on. Palm kernel fibres may not require further cutting.

10.26.6.4 Sand: Any type of clean sand which is suitable for cement mortars can be used. Sand with particles size between 0.125mm and 2mm is suitable.

10.26.6.5 Cement: Ordinary Portland cement is the type used for FCR tiles. It is essential that the cement meets the accepted standard in order to achieve the desired results.

10.26.6.6 Water: Clean water is essential for the production of good quality product, preferably standard portable water.

10.26.6.7 Production method: The raw materials - sand, cement and fibre-are batched in the recommended proportions. The fibre is soaked in water for one hour before use. The batched materials are mixed thoroughly with water. The slurry is transferred to the vibrator previously covered with a polythene sheet or any other suitable material. While the material is being spread on the table, the vibrator is put on. After adequate vibration usually not lasting more than two minutes, the vibrated screed material is drawn, with the aid of the polythene sheets, onto a corrugated mould. The wet roofing tiles on the moulds are air dried for about twenty four hours on stacks. The tiles are demoulded and transferred to a water tank for curing. Curing can also be done in a high humidity tank.

Spray pigment - high humidity.

10.26.6.8 Testing procedure for breaking load: The title is simply supported on two edges. Progressively, known weights are placed on the tile until failure point is reached.

10.26.6.9 Water tightness test: A simple field test is to provide ridges at both ends of a tile with sand cement mortar. Water is then poured into the trough for observation to check the water tightness.

10.26.6.10 Roof design: The roof design is done in the conventional manner.

The minimum pitch shall be 30^{o}. The span of rafters should not exceed 3.5 metres for lean-to roofs and 6 metres for gable roofs for wider buildings, triangular trusses provide economical solution up to a limit of 10 metres span.

10.26.6.11 Installation:

The laying of the tiles shall be in accordance with BS 8000 Part 6, 1990

CONSTRUCTION STAGE SECTION 11 BUILDING CONSTRUCTION REQUIREMENTS

Sections ***Page***

SECTION 11 BUILDING CONSTRUCTION REQUIREMENTS

11.1 SPECIAL BUILDING DESIGN REQUIREMENTS

11.2 PROHIBITED USE

11.3 EXISTING BUILDINGS

The provisions of Sections 7.2, 7.4, 7.5 and 12.1 of this Code shall apply to these sub-sections.

11.4 BUILDING MATERIALS AND COMPONENTS REQUIREMENTS

The provisions of Section 10 of this Code shall apply to this sub-section.

11.5 POST-CONSTRUCTION REQUIREMENTS

The provisions of Section 12 of this Code shall apply to this sub-section.

11.6 PRECAUTIONS DURING BUILDING OPERATIONS

11.6.1 GENERAL

11.6.1.1 Scope: The provisions of this Chapter shall apply to all construction operations in connection with the erection, alteration, repair, rehabilitation, demolition or removal of buildings and structures.

11.6.1.2 Other laws: Nothing herein contained shall be construed to nullify any rules, regulations or statutes of State agencies governing the protection of the public or workers from health or other hazards involved in manufacturing, mining and other processes and operations which generate noise toxic gases, dust or other elements dangerous to the respiratory system, eye-sight or general well-being.

11.6.1.3 Combustible and explosive hazard: The provisions of this Code which apply to the storage, use or transportation of explosives, highly flammable and combustible substances, gases and chemicals shall be construed as supplemental to the requirements of the federal laws, and the rules and regulations of the states and local governments.

11.6.1.4 PLANS, SPECIFICATIONS AND SPECIAL PERMITS

11.6.1.4.1 Temporary construction: Before any construction operation is started, plans and specifications shall be filed with the Code Enforcement Division/Section/Unit showing the design and construction of all temporary construction interfacing the public highways access and services. Approval shall be secured before the commencement of any such work.

11.6.1.4.2 Special permits: All special licenses and permits for the storage of materials on sidewalks and highways, for the use of water or other public facilities and for the storage and handling of explosives shall be secured from the administrative authorities having jurisdiction.

11.6.1.4.3 Temporary encroachments: Subject to approval, sidewalk sheds, underpinning and other temporary protective guards and devices shall project beyond the interior and street plot lines where required to ensure the safety of the adjoining property and the public. When necessary, the consent of the adjoining property owner shall be obtained.

11.6.1.5 TEST

11.6.1.5.1 Loading: It shall be unlawful to load any structure, temporary support, scaffolding, sidewalk bridge or sidewalk shed or any other device or construction equipment during the construction or demolition of any building or structure in excess of its safe working capacity as provided in Chapters 24 and 25 for allowable loads and working stresses.

11.6.1.5.2 Unsafe equipment: Whenever any doubt arises as to the structural quality or strength of scaffolding plank or other construction equipment, such material shall be replaced, or the Code Enforcement Officer shall require a strength test to four times the super-imposed live load to which the material or structural member is to be subjected.
The member shall sustain the test load without failure.

11.6.1.6 INSPECTION

11.6.1.6.1 Unsafe condition: When inspection of any construction operation reveals that any unsafe or irregular conditions exist, the Code Enforcement Officer shall notify the owner and direct the owner to take the necessary remedial measures to remove the hazard or violation.

11.6.1.6.2 Failure to comply with orders: Unless the owner so notified proceeds to comply with the orders of the Code Enforcement Officer within 7 days, the Code Enforcement Officer shall have full power to correct the usage conditions as provided in Section 2.3.6.2 and 2.6. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

11.6.1.6.3 Unsafe construction equipment: When the strength and adequacy of any scaffolding or other device or construction equipment is in doubt, or when any complaint is made, the Code Enforcement Officer shall inspect such equipment and shall prohibit its use until tested as required in Section 13.1.6.2, or until all danger is removed.

POST-CONSTRUCTION STAGE

SECTION 12 POST-CONSTRUCTION REQUIREMENTS

SECTION 12 POST-CONSTRUCTION REQUIREMENTS

12.1 MAINTENANCE

12.1.1 General: All construction equipment and safeguards shall be constructed, installed and properly maintained and shall be so operated as to ensure protection to the workers engaged thereon and to the general public. It shall be unlawful to remove or render inoperative any structural, fire protection or sanitary safeguard or device herein required except when necessary for the actual installation and prosecution of the work.

12.1.2 EXISTING BUILDINGS

12.1.2.1 Protection: All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

12.1.2.2 Chimney, soil and vent stacks: Whenever a new building or structure is erected to greater or less heights than an adjoining building, the construction and extension of new or existing chimneys shall conform to the provisions of the mechanical code listed in the Schedule, and the construction and extension of soil and vent stacks and the location of window openings shall comply with the provision of Section 28.5.4.

12.1.2.3 Adjoining walls: The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. The owner shall underpin where necessary and support the adjoining building or structure by proper foundations to comply with Section 13.6.

12.1.2.4 Maintenance: In case an existing party wall is intended to be used by the person who causes an excavation to be made, and such party wall is in good condition and sufficient for the use of both the existing and proposed building, such person shall preserve the party wall from damage and support it by proper foundations at his own expense, so that it shall be and remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weatherproof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.

12.1.2.5 Beam holes: When a structure involving a party wall is being demolished the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick up all open beam holes and otherwise maintain the safety and usefulness of the wall.

12.1.2.6 Party wall exits: A party wall balcony or horizontal exit shall not be destroyed unless and until a substitute means of egress has been provided and approved by the Code Enforcement Officer.

12.1.2.7 Adjoining roofs: When a new building or demolition of an existing building is being undertaken at a greater height, the roof, roof outlets and roof structures of adjoining buildings shall be protected against damage with adequate safeguards by the person doing the work.

12.1.3 PROTECTION OF PUBLIC WORKERS

12.1.3.1 General: Whenever a building or structure is erected, altered, repaired, removed or demolished, the operation shall be conducted in a safe manner and suitable protection for the general public and workers employed thereon shall be provided.

12.1.3.2 Fences: Every construction operation located 1.5m or less from the street plot line shall be enclosed with a fence not less than 2.4m high to prevent entry of unauthorised persons. When located more than 1.5m from the street plot line, a fence or other barrier shall be erected when required by the Code Enforcement Division/Section/Unit. All fences shall be of adequate strength to resist wind pressure.

12.1.3.3 Sidewalk bridge: Whenever the ground is excavated under the sidewalk, a sidewalk bridge shall be constructed at least 1.2m wide, or a protected walkway of equal width shall be erected on the street, provided the required permit for such walkway is obtained from the administrative authority as provided for in 13.1.4.1.

12.1.3.4 Sidewalk shed: Sidewalk sheds shall be provided in accordance with subsection 13.4.5 through to 13.4.8. as follows:

12.1.3.5 Within 3 meters of street plot line: When any building demolished or erected is located within 3 meters of the street plot line is to be erected or raised more than 12 meters in height, or whenever a building more than 12 meters in height within 3 meters of the street plot line is to be demolished, a sidewalk shed shall be erected and maintained for the full length of the building on all street fronts, for the entire time that work is performed on the exterior of the building.

12.1.3.6 Within 6 meters of street plot line: When the building being demolished or erected is located within 6 meters of the street plot line and is more than 12 meters in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than two floors.

12.1.3.7 Buildings higher than six floors: When the building being demolished or erected is more than six floors or 22 meters (22860mm) in height, unless set back from the street plot line a distance more than one-half its height, a sidewalk shed shall be provided.

12.1.3.8 Walkway: An adequately lighted walkway at least 1.2meters wide and 2.4 meters high in the cl shall be maintained under all sidewalk sheds for pedestrians. When ramps are required, they shall conform to the relevant provisions of this code.

12.1.3.9 Thrust-out platforms: Thrust-out platforms or other substitute protection in lieu of sidewalk sheds shall not be used unless approved and deemed adequate to ensure the public safety. Thrust-out platforms shall not be used for the storage of materials.

12.1.3.10 Watchman: Whenever a building is being demolished, erected or altered, a watchman shall be employed to warn the general public when intermittent hazardous operations are conducted across the sidewalk or walkways.

12.1.4 DEMOLITION AND EXCAVATION

12.1.4.1 Notice of intent: The person intending to cause a demolition or an excavation shall deliver written notice of such intent to the owner of each potentially affected adjoining plot, building or structure at least 30 days prior to the commencement of work. The notice shall request a license to enter the potentially affected plot, building or structure prior to the commencement of the work and at reasonable intervals during its execution to inspect and preserve it from any damage which might result from the intended work. The potentially affected adjoining owner shall have the right to inspect the drawings of the proposed works.

12.1.4.2 Protection of adjoining property: If afforded the necessary license to enter the adjoining plot, building or structure, the person causing the demolition or excavation to be made shall at all times and at his own expense preserve and protect it from damage or injury. If the necessary license is not afforded, it shall be the duty of the owner of the adjoining plot, building or structure to make safe his own property, for the prosecution of which he shall be granted the necessary license to enter the premises of the demolition or excavation.

12.1.4.3 Removal of debris: All waste materials shall be removed in a manner which prevents injury or damage to persons, adjoining properties and public rights of way and keep such premises in safe and sanitary condition.

12.1.4.4 Notice to the Code Enforcement Division/Section/Unit: If the person causing a demolition or excavation to be made is not afforded license to enter an adjoining structure,

plot or building, he shall immediately notify both the Code Enforcement Officer and the owner of the adjoining property in writing that the responsibility of providing support to the adjoining plot, building or structure has become his (the person causing the demolition or excavation) exclusive responsibility.

12.1.5 REGULATION OF PLOTS

12.1.5.1 General: When a building has been demolished and building operations have not been projected or approved, the following shall apply:

12.1.5.1.1 Grading of plot: The vacant plot shall be filled, graded and maintained in conformity to the established street grades at curb level. The plot shall be maintained free from the accumulation of rubbish and all other unsafe or hazardous conditions which endanger the life or health of the public. Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

12.1.5.1.2 Utility connections: All service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.

12.1.6 RETAINING WALLS AND PARTITION FENCES

12.1.6.1 General: When the adjoining grade is not higher than the permissible level, the person causing an excavation to be made shall erect, when necessary, a retaining wall at his own expense and on his own land. Such wall shall be built to a height sufficient to retain the adjoining earth, shall be properly coped and shall be provided with a guardrail or fence not less than 1 meter in height.

12.1.6.2 Design capacity: Materials or equipment stored within the building, or on sidewalk, sheds or scaffolds shall be placed so as not to overload any part of the construction beyond its design capacity, nor interfere with the safe prosecution of the work.

12.1.6.3 Special loading: Unless the construction is designed for special loading, materials stored on sidewalk sheds and scaffolds shall not exceed a one-day supply. All materials shall be piled in an orderly manner and height, to permit removal of individual pieces without endangering the stability of the pile.

12.1.6.4 Pedestrian walkways: Materials or equipment shall not be stored on the street without a permit issued by the administrative official having jurisdiction. When so stored, they shall not unduly interfere with vehicular traffic or the orderly movement of pedestrians on the highway or street. The piles shall be arranged to maintain a safe walkway not less than 1.2 meters wide, unobstructed for its full length, and adequately lighted at night and at all necessary times for the use of the public.

12.1.6.5 Obstruction: Material and equipment shall not be placed or stored so as to obstruct access to fire hydrant, standpipes, fire or police alarm boxes, utility boxes, catch basins or manholes, nor shall they be located within 6 meters of a street intersection, or so placed as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

12.1.7 REMOVAL OF WASTE MATERIAL

12.1.7.1 General: Material shall not be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection. Wood or metal chutes shall be provided for this purpose and any material which in its removal will cause an excessive amount of dust shall be wet down to prevent the creation of a nuisance.

12.1.7.2 Protection of adjoining property

12.1.7.3 General: Adjoining property shall be completely protected from any damage incidental to the building operation when the owner of the adjoining property permits free access to the building at all reasonable times to provide the necessary safeguards in

accordance with Section 13.6.

12.1.7.4 Guardrails: All floor and wall openings shall be protected with adequate guardrails and toe board.

12.1.8 SCAFFOLDS

12.1.8.1 Load capacity: Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load. All platform and supporting elements of scaffolds shall be designed and constructed to support uniform minimum live loads in kilograms per meter square of the platform area in accordance with the classifications described in Table 13.10.

12.1.8.2 Erection: Built-up, swinging and suspended scaffolds shall be erected by competent workers only.

12.1.8.3 Scaffolding: All scaffolding shall be constructed in accordance with Sections 13.10.4 and 13.10.5 as follows:-

12.1.8.4 All buildings: All scaffolding exceeding 26 meters or seven floors in height used in construction operations involving the erection, alteration or maintenance of buildings, shall be constructed of non-combustible or fire-retardant materials complying with the provision of Section 29.4.

TABLE 12.1 SCAFFOLD LOAD CAPACITY

CLASSIFICATION	SERVICE TYPE	LOAD KILOS PER SQUARE METER
Light duty	**Carpenters Stone setters**	**122.05**
	(No stone on scaffold) Miscellaneous	**122.05**
		122.05
Medium duty	**Bricklayers**	**244.10**
	Stucco	**244.10**
	Lathers and plasterers	**244.10**
Heavy duty	**Stone masons**	**366.15**

12.1.8.5 Use Group F: All scaffolding used in construction operations involving the repair or partial demolition during occupancy of buildings of Use Group F-2 and F-3 shall be constructed of non-combustible or fire-retardant materials complying with the provisions of Section 29.4

12.1.9 HOISTS

12.1.9.1 Hoist protection: All material hoists shall be adequately protected. When erected on the outside of a building over 26 meters or seven floors in height, the hoist structure shall be built of non combustible or approved fire-retardant materials with the exception of the loading platform.

12.1.9.2 Passengers prohibited: Persons shall not be permitted to ride a material hoist. Temporary elevators shall be installed when necessary to transport workers as provided in Chapter 27.

12.1.9.3 Guarding of cables: All hoisting cables and signal cords shall be guarded whenever they pass through working spaces to prevent injury to persons.

12.1.9.4 Rigger's license: All persons engaged in the erection of derricks and other hoisting

apparatus shall secure a license or certificate of fitness for the performance of such work from the authorised administrative official.

12.1.10 STAIRWAYS AND LADDERS

12.1.10.1 Temporary stairways: When a building has been constructed to a greater height than 15 meters or four floors, or when an existing building exceeding 15 meters in height is altered, at least one temporary lighted stairway shall be provided unless one or more of the permanent stairways are erected as the construction progresses.

12.1.10.2 Ladders: Temporary ladders, when permitted for access to floors before stairways are installed, or which are designed for other working purposes, shall extend at least 1.0 meter above the floor level which they serve.

12.1.11 LIGHTING

12.1.11.1 General: All stairways and parts of buildings under demolition, erection or repair shall be adequately lighted while persons are engaged at work, to comply with the provisions of Sections 10.25 and 26.2.7.

12.1.12 FIRE HAZARDS

12.1.12.1 General: The provisions of this code and of the fire prevention code listed in the Schedule, shall be strictly observed to safeguard worker against hazards attendant upon construction operations.

12.1.12.2 Storage of flammables: Storage of gasoline for hoist, oils, paints and other highly flammable materials shall be permitted only as specified in Chapter 6 and when stored in approved safety containers. The storage of larger quantities shall not be approved unless stored in separate compartments or enclosures of approved noncombustible construction.

12.1.12.3 Flame cutting and welding: The use of oxyacetylene torches for cutting or welding shall be permitted only in accordance with ANSI Z49.1 listed in the Schedule.

12.1.12.4 Concrete forms: Combustible materials shall not be stored on any floor of a building under construction until all combustible concrete forms are removed from the tier immediately above.

12.1.12.5 Fire extinguishers: Fire extinguishers shall be provided as required by Section 30.22.

12.1.12.6 Standpipes and fire lines: Where standpipes are provided as a permanent part of the building, they shall be installed and made ready for instant use by the fire service as the structure progresses in accordance with the provisions of Section 30.14. Free access from the street to such standpipes shall be maintained at all times. Materials shall not be stored within 1.5 meters of any fire hydrant or in the roadway between such hydrant and the center line of the street.

12.1.12.7 Housekeeping: Rubbish and trash shall not be allowed to accumulate on the site and shall be removed as fast as conditions warrant. Combustible rubbish shall be removed daily, and shall not be disposed of by burning on the premises or in the immediate vicinity. The entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulation of trash, rubbish, nuts, bolts, small tools and other equipment.

12.1.13 HEALTH HAZARDS

12.1.13.1 General: Every construction or maintenance operation which results in the diffusion of noise, dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of local ventilation or other protective devices to ensure the safety of the workers and the public as

required by this Code and contained in Tables 12.2, 12.3, 12.4, and 12.5.

12.1.13.2 Removal of dust: Dust, sand blasts or other harmful agents, when employed or occurring in construction operations shall be disposed of at or near the point of origin to prevent their diffusion over adjoining premises or streets as contained in Section 12.3.

12.1.13.3 Protective equipment: Facilities shall be provided in approved closed containers for housing the necessary vision, respiratory and protective equipment required in welding operations, and in accordance with the regulations of the administrative official.

12.1.13.4 Welding enclosures: All welding and flame-cutting operations shall be performed in protected areas with full consideration of safety and fire hazards. Such closed spaces shall be properly ventilated while welding or cutting is being done. Suitable protection against the rays of the electric arc shall be maintained by the contractor where welding operations might be viewed within harmful range by persons other than the welding operations and inspectors.

12.1.13.5 Flammable materials: Proper precautions shall be taken to avoid all risk of fire or explosion, and flammable or explosive materials shall not be stored in the vicinity of welding or cutting operations.

12.1.14 SANITATION

12.1.14.1 General: Every building in the course of demolition, erection or repair shall be provided with toilet and drinking water facilities which shall be constructed and installed in accordance with the plumbing code listed in the Schedule.

12.1.15 DISPUTES

12.1.15.1 General: The Code Enforcement Division/Section/Unit when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner, tenant and their agents who fail to conform to the requirements of this Chapter, directing such person to take the necessary remedial action. If the person whose duty it is to protect his own or adjoining property under those provisions fails to proceed to fully comply with such notice within seven days of receipt thereof, or within a reasonable time thereafter as determined by the Code Enforcement Officer, such officer is authorised to cause the necessary work to be done when the health, safety and general welfare of the public are involved. The cost of such work shall become a lien against the property of the offending owner, and the legal authority of the jurisdiction shall institute appropriate action for its recovery.

TABLE 12.2 ACCEPTABLE NOISE LEVEL

The table below shows recommended maximum daily exposure

Sound Pressure Level (dB(A)	Max. Exposure in any 24 hours
85 or less	24 hours
87	16”
90	8”
93	4”
96	2”
99	1 hour
102	30 minutes
105	15”
108	71/2”
111	3-3/4”

TABLE 12.3 DUST

THRESHOLD LIMIT VALUES in mg/m^3 (Total and respirable mass) FOR SOME DUSTS

	Threshold limit value	
Substance	Respirable Mass mg/m^3	Total Mass mg/m^3
Asbestos, all forms	2 fibres/c.c 5 um in length	2 fibres/c.c 5 um in length
Silica (Si02) Amorphous	(3)	(6).
Cristobalite	0.05	0.15
Fused Silica	0.1	0.3
Quartz	0.1	0.3
T ridymite	0.05	0.15
Lead	0.15	0.15
Coal	2 5% quartz	(4) 5% quartz
Nuisance Particulates	(5)	10
Aluminium metal and/or oxide	10mg/m3	10mg/m3
Ferric Oxide (iron oxide)	5mg/m3	5MG/M3
Portland Cement	(%)	(10)
Diatomaceous Earth, Natural	1.5	
Graphite	(2.5)	(5)

TABLE 12.4 FIRST AID FACILITIES 1 SUPPLEMENT

Waterproof Dressings	Anti-diarrhea e.g. mexoform
Antiseptic lotion and cream	Anti-malarial e.g. malaria
Antihistomine lotion and cream	Anti acids e.g. Gilusil
Splints (all sizes)	Splint forceps
Rubber Bandages	Eye lotion
Stretchers e.g. Neil Robertson type where necessary	Book for record keeping
Anti-snake venom	Scissors
Anti-tetanus serum	Razor blades
Morphine injection (individual plits)	Oxygen cylinder
Amyl mitrite ampodes	Mechanical resuscitaror e.g. Ambu Bay

Analgesics Airways.

plus 7 - 14 as per standing order of medical officer.

TABLE 12.5 FIRST AID FACILITIES 2

Sterilized medicated dressing	plus 1-20	plus 21100	plus 101-199
(a) Finger	12	24	50
(b) Medium sized	6	12	25
(c) Large sized	6	12	25
Adhesive wound dressing (all sizes)	25	40	100
Triangular bandages of unvleached colics	2	4	12
Adhesive plaster (all sizes)	6	12	24
/ oz. packets of cotton wool	1	4	12
Sterilized eye pads	2	6	12
Safety pins	6	12	24
Rubber bandages/pressure dressing	1	1	1

plus 1 - 20 - First Aid Kit; 21 - 100 - First Aid Box; 101 - 199 First Aid Post

12.2 FIRE PROTECTION SYSTEMS

12.2.1 GENERAL

12.2.1.1 Scope: The provisions of this Part shall specify where fire protection systems are required in all buildings or structures or portions thereof.

12.2.1.2 Installation requirements: The installation methods, repair, operation and maintenance of fire protection systems shall be in accordance with this Code and the fire safety code listed in the Schedule.

12.2.1.3 Maintenance: The owner, tenant or lessee of building or structure shall be responsible for the care and maintenance of all fire protection systems, including equipment and devices, to ensure the safety and welfare of the occupants. Fire protection systems shall not be disconnected or otherwise rendered unserviceable without first notifying the fire department. When installations of required fire protection systems are interrupted for repairs or other necessary reasons, the owner, tenant or lessee shall immediately advise the fire department and shall diligently prosecute the restoration of the protection.

12.2.1.4 Threads: All threads provided for fire department connections to sprinkler systems, standpipe systems, yard hydrants or any other fire hose connections shall be uniform to those used by the local fire department.

12.2.1.5 Signs: Where fire suppression control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering for such sign shall be of a conspicuous colour and shall be at least 100mm in height, and shall read Sprinkler Control Valves or Standpipe Control Valves or indicate other types of systems (see Section 12.1.14. for additional signs).

12.2.1.6 Tests: Where required by this Part and the standards referenced herein, all flow test connections and points of fluid discharge shall be reasonably accessible and acceptable to the administrative authority.

12.2.2. PLANS AND SPECIFICATIONS

12.2.2.1 Required: Plans shall be submitted to indicate conformance with this code and shall be reviewed by the department prior to issuance of the permit.

12.2.2.2 Note: Since the fire department is responsible for inspection for the proper maintenance of fire protection systems in buildings, the administrative authority shall cooperate with the fire department in the discharging of responsibility to enforce this Part.

12.2.2.3 Plans: The plans and specifications submitted to the department shall contain sufficient detail to evaluate the hazard and the effectiveness of the system. The details on the hazards shall include materials involved, the location and arrangement, and the exposure to the hazard.

12.2.2.4 Calculations: The details on the fire protection system shall include the design considerations, calculations and other information as required by this Code.

12.2.3 FIRE SUPPRESSION SYSTEMS

12.2.3.1 Where required: Fire suppression systems shall be installed and maintained in full operating condition, as specified in this code, in the locations in Section 12.1.1.2 through to 12.1.3.27

12.2.3.2 EXCEPTION: Buildings of Use Group H-3

Use Group A-1: In all buildings or structures or portions thereof of use Group A-1.

Exception: Auditoria, foyers, lobbies, and toilet rooms.

12.2.3.3 Use Group A-2: In all buildings or structures or portions thereof of Use Group A-2.

1. When more than 465m^2 in area; or
2. When more than one storey in height.

12.2.3.4. Use Group A-3: In all buildings or structures or portions thereof of use Group A-3 when more than 1116m^2 in area.

12.2.3.5 Stages and enclosed platforms: Stages under the roof and gridiron, in the tie and fly galleries, and in all places behind the proscenium wall of the stage; over and within

enclosed platforms in excess of 46.5m^2 in area: and in dressing rooms, lounges, workshops and store rooms accessory to such stages or enclosed platforms.

12.2.3.6 EXCEPTIONS

1. Stages or enclosed platforms open to the auditorium room on three or more sides.
2. Altars, pulpits or similar platforms and their accessory rooms.
3. Stage gridirons when side wall sprinklers with 57 degrees C (135 degrees F.) rated heads with heat-baffle plates are installed around the perimeter of the stage except for the proscenium opening at points not more than 75cm below the gridiron nor more than 15cm below the baffle plate.
4. Under stage or under enclosed platform areas less than 1.2m in clear height used exclusively for chair or table storage and lined on the inside with materials approved for 1 hour fire-resistance rated construction.

12.2.3.7 Use Groups B, H-1 and H-2: In all buildings or structures of use Groups B, H-1 and H-2 when more than 12 storeys or 45 m in height.

12.2.3.8 EXCEPTION: In buildings of use group H, sprinklers are not required in bathrooms not greater than 5.12m^2 in area

12.2.3.9 Use Group E: In all buildings or structures or portions thereof of use group E.

12.2.3.10 Use Group F: In all buildings or structures or portions thereof of use group F.

12.2.3.11 EXCEPTIONS

1. Use Group F-2 hospitals of Type 1 construction not over five storeys and 22.5m, hospitals of Type 2A construction not over three storeys and 13.5m, and hospitals of Type 2B construction not over one story in height.
2. Use Group F-2 nursing homes of Types 1, 2A or 2B construction, not over one story in height.
3. Use Group F-2 child care facilities not over one story in height which accommodate 100 children or less with each room having an exit directly to the outside.
4. Buildings of use group F-3 two storeys of less in height and having an occupant load of less than 20.
5. Buildings of use Group F-3 having an occupant load of less than six.

12.2.3.12 Use Groups G I-1 and D-1: In all buildings or portions thereof of Use Groups G, I-1 and D-1

1. When more than 1116m^2 in area; or
2. When more than 2232m^2 in total area on all floors; or
3. When more than three storeys in height.

12.2.3.13 Public garages (Group 1): In all Group 1 public garages

1. When more than 930m^2 in area.
2. When more than 697.5m^2 in area and more than one story in height.
3. When more than 465m^2 in area and more than two storeys in height.
4. When more than three storeys in height.
5. When located in buildings where the upper storeys are designed for other uses.
6. When located in any story that is more than 50 percent below grade.
7. In fuel dispensing areas.

12.2.3.14 Public garages (Group 2): In all Group 2 public garages

1. When more than 930m^2 in area and more than one storey in height.

2. When more than two storeys in height.
3. When located in buildings where the upper storeys are designed for other uses.

12.2.3.15 EXCEPTION: Open parking structures or portions of buildings classified as open parking structures according to the definition in Section 8.8.1.

12.2.3.16 Bus garages: In all bus garages

1. When required by Section 8.10.
2. When used as passenger terminals for four or more buses.
3. When used for storage or loading of four or more buses.

12.2.3.17 Unlimited area buildings: In unlimited area buildings as required.

12.2.3.18 EXCEPTION

12.2.3.19 Storage and workshop areas: In all portions of use group A, B, C, F, H-1 and H-2 occupied for storage, workshop or similar purposes and as provided in Sections 8.11.2 and 8.12.7 for Use F-2 and F-3 respectively.

12.2.3.20 EXCEPTIONS

1. Individual storage or workshop area located entirely within unsprinklered dwelling units.
2. Storage and workshop rooms less than 2.23m^2 in area.

12.2.3.21 Windowless storey: In every storey or basement of all buildings where there is not provided at least 1.86m^2 of opening entirely above the adjoining ground level at each 15 m or a fraction thereof of exterior wall in the storey or basement, on at least one side of the building. Openings shall have minimum dimensions of not less than 55 cm. Such openings shall be accessible to the fire department from the exterior and shall be unobstructed to allow firefighting and rescue operations from the exterior. When openings in a storey are provided on only one side and the opposite wall of such story is more than 22.5 m from such openings, the storey shall be provided with an approved automatic fire suppression system, or openings as specified above shall be provided on at least two sides of the exterior walls of the storey. If any portion of a basement is located more than 22.5 m from openings required in this section, the basement shall be provided with an approved automatic fire suppression system.

12.2.3.22 Painting rooms: In spray painting rooms or shops where painting, brushing, dipping or mixing is regularly conducted using flammable materials.

12.2.3.23 Trash rooms and chutes: In rooms or areas used for incineration, trash and laundry collection or similar uses; and at alternate floor levels and at the top of all chutes used in conjunction with these rooms or areas.

12.2.3.24 Furnace rooms: In furnace rooms, boiler rooms and rooms for similar uses and as provided in Sections 8.11.2 and 8.12.7 for use groups F-2 and F-3 respectively.

12.2.3.25 EXCEPTION: Such a room located entirely within and serving a single dwelling unit. Unenclosed vertical openings: In unenclosed vertical openings between floors as required by Section 8.7.3.

12.2.3.26 Kitchen exhaust systems: In commercial kitchen exhaust systems when such systems are required by the mechanical code listed in the Schedule.

12.2.3.27 Hazardous exhaust systems: In duct systems exhausting hazardous material in accordance with the mechanical code listed in the Schedule.

12.2.3.28 Alternative protection: In special use areas of buildings or structures, an automatic fire alarm system shall be installed in lieu of a fire suppression system where such

fire suppression system installation would be detrimental or dangerous to the specific use or occupancy, as approved by the code enforcement officer and the fire safety Code Enforcement Officer.

12.2.3.29 Telephone central office equipment buildings: Within telephone central office equipment buildings, the automatic fire suppression system is not required in the following rooms or areas when such rooms or areas are protected with an approved automatic fire alarm system.

1. Generator and transformer rooms.
2. Communication equipment areas when such areas when such areas are separated from the remainder of the building by 1-hour fire-resistance rated wall and 2-hour fire-resistance rated floor/ceiling assemblies and are used exclusively for such equipment.

12.2.4 SUPPRESSION SYSTEM SELECTION

12.2.4.1 General: To guide the administrative authority with the selection of the proper type of fixed fire suppression system, the extinguishing agents for each type of hazard or fire are classified as follows.

12.2.4.2 Class A. Fires involving ordinary combustible materials (such as wood, cloth, paper, rubber and many plastics) requiring the heat-absorbing (cooling) effects or water, water solutions or the coating effects of certain dry chemicals which retard combustion.

12.2.4.3 Class B. Fires involving flammable or combustible liquids, flammable gases, grease and similar materials where extinguishment is most readily secured by excluding air (oxygen), inhibiting the release of combustible vapours, or interrupting the combustion chain reaction.

12.2.4.4 Class C. Fires involving energised electrical equipment where safety to the operator requires the use of electrically nonconductive extinguishing agents.

12.2.4.5 Note: Portable Class A or B extinguishers and hand-held solid stream nozzles are inappropriate for fighting electrical fires. However, fixed water spray systems are appropriate for fighting fires in energised electrical systems.

12.2.4.6 Special hazards: In rooms or buildings containing combustibles such as aluminium powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quick-lime, magnesium powder or sodium peroxide, which are incompatible with the use of water as an extinguishing agent, other extinguishing agents shall be used.

12.2.4.7 Types: Where a fire suppression system is required in this Code, Table 12.1.4 provides the code enforcement officer with information to assist in the determination of the type of suppression system suitable for the hazard involved, if not otherwise specified in this Code.

Installation: Fixed fire suppression systems shall be of an approved type designed and installed in accordance with the requirements of this Code.

Tests: All tests required by this code and the standards listed in this Code shall be conducted at the expense of the owner or the owner's representative.

TABLE 12.6 GUIDE FOR SUPPRESSION SYSTEM SELECTION

Hazard	Water sprinklers or spray 1004.0	Foam 1007.0	Carbon dioxide or halogenate d 1008.0 to 1009.0	Dry chemical 1010.0	Wet chemical 1011.0
Class A fire potential	x	x	x	x	x
Class B fire potential	x	x	x	x	x
Class C fire potential	x		x		
SPECIAL FIRE HAZARD AREAS	x	x	x	x	
Aircraft hangars	x	x	x	x	
Alcohol storage	x				
Ammunition loading	x				
Ammunition magazine	x	x			
Asphalt impregnating			x		
Battery rooms	x	x	x	x	
Carburator overhaul shops	x	x	x	x	
Cleaning plant equipment	x		x		
Computer rooms	x				
Dowtherm	x	x	x	x	
Drying ovens	x		x		
Engine test cells	x				
Escalator, stair wells	x				
Explosives, manufacturing storage	x	x	x		
Flammable liquids storage	x				
Flammable solids storage	x	x			
Fuel oil storage	x	x			
Hangar decks					
High piled storage in excess of 15 feet in height	x	x			
HMP use facility:					
Fabrication areas (Ordinary Hazard Group 3)	x				
Services passages (Ordinary Hazard Group 3)	x	x			
Separate inside HPM storage rooms without dispensing (Ordinary Hazard Group 3)	x		x		
Separate inside HPM storage rooms with dispensing (Extra Hazard Group 2)			x		
Egress Corridors (Ordinary Hazard Group 3)	x				

Hydraulic oil, lubricating oil	x				
Hydroturbine generators	x	x	x	x	
Jet engine test cells	x		x	x	
Library stacks	x		x	x	
Lignite storage and handling	x		x		
Liquified petroleum gas storage		x	x		
Oil quenching bath	x	x	x		
Paints, manufacturing, storage	x				
Paint spray booths	x	x	x	x	
Petrochemical storage	x	x			
Petroleum testing laboratories	x		x		
Printing presses	x				
Rack and palletized storage in excess of 12 feet (3658mm) in height	x	x	x		
Range hoods	x		x		
Reactor and fractionating towers	x		x	x	
Record vaults	x		x	x	
Rubber mixing and heat treating	x		x		
Service stations (inside buildings)	x				
Shipboard storage					
Solvent thinned coatings		x	x		
Switchgear rooms		x	x	x	
Transformers, circuit breakers (outdoors)	x				
Transformers, circuit breakers (indoors)	x	x			
Turbine lubricating oil	x	x			
Vegetable oil, solvent Extraction	x	x			

Note a: Within buildings or areas, so classified, as to require a suppression system.

12.2.5 Water sprinkler systems

12.2.5.1 General: Water Sprinkler extinguishing systems shall be of an approved type and installed in accordance with the provisions of this Code and NFiPA 13 listed in the Schedule.

12.2.5.2 Occupancy sprinkler system: Within a building of mixed occupancies and where an occupancy is required by this Code to be sprinklered with more than 20 sprinklers, the use group requiring sprinklers shall be separated from other uses by fire separation walls and floor/ceiling assemblies having a fire-resistance rating corresponding to the highest fire grading prescribed at Table 29.3 for the separate uses and equipped throughout with a complete automatic sprinkler system.

12.2.5.3 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water

supply source. Sufficient information shall be included to identify the apparatus and devices used. The design of the sprinkler system for a HPM use facility shall be in accordance with NFiPA 13 listed in the Schedule, and not less than that required for the special fire hazard areas shown in Table 30.4.

12.2.5.4 Actuation: Water sprinkler extinguishing systems shall be automatically actuated unless otherwise specifically provided in this Code.

12.2.5.5 Sprinkler alarms: Approved audible or visual alarm devices shall be connected to every water sprinkler system. Such alarm devices shall be activated by water flow and shall be located in approved location.

12.2.5.6 Exception: Alarms and alarm attachments shall not be required for limited area sprinkler systems (see Section 12.1.6).

12.2.5.7 Additional alarms: At least one additional audible or visual alarm device shall be installed within the building.

12.2.5.8 Water control valve tags: Identification tags shall be provided in accordance with NFiPA 26 listed in the Schedule.

12.2.5.9 Sprinkler riser: A sprinkler system riser which also serves as the wet stand pipe riser in buildings required to have or having both systems shall conform to Section 12.1.13.

12.2.6 LIMITED AREA SPRINKLER SYSTEMS

12.2.6.1 General: A limited area sprinkler system shall be of an approved type and installed in accordance with the provisions of this section.

12.2.6.2 Installation: Where the provisions of this Code require a limited number of sprinklers, a limited area sprinkler system is permitted to be installed to comply with these requirements.

12.2.6.3 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

12.2.6.4 Actuation: A limited area sprinkler system shall be automatically actuated.

12.2.6.5 Sprinkler alarms: Alarms and alarm attachments shall not be required.

12.2.6.6 Standpipe connection: The water supply for the limited area sprinkler system shall be from the building standpipe system when the building is equipped with a standpipe system that is sized for 0.032m^3/s (500 gallons per minute) minimum flow and has an automatic water supply (see Section 12.1.13).

12.2.6.7 Domestic supply: Where limited area sprinklers are supplied from the domestic water system, the domestic water system shall be designed to adequately support the design flow of the largest number of sprinklers in any one of the enclosed areas. When supplied by the domestic water system, the maximum number of sprinklers in any one enclosed room or area shall not exceed 20, and the sprinklers shall be capable of totally protecting the room or area.

12.2.6.8 Fire department connections: A fire department connection is not required for limited area sprinkler systems supplied from the domestic water system.

12.2.6.9 Cross connection: There shall not be a cross connection between the domestic water system and the standpipe system.

12.2.6.10 Domestic connection: A check valve shall be provided at the point where the suppression system piping is connected to the domestic water piping to prevent contamination of the domestic water supply. Shut-off valves shall not be permitted in the suppression system piping. Water supply shall be controlled by the riser control valve to the domestic water piping.

Use: Limited area sprinklers shall be used only in rooms or areas enclosed with construction assemblies as required by this Code.

12.2.7 WATER-SPRAY FIXED SYSTEMS

12.2.7.1 General: Water-spray extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 15 listed in the Schedule.

12.2.7.2 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

12.2.7.3 Actuation: Water-spray extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

12.2.7.4 Tests: All new system piping shall be hydrostatically tested in accordance with the provisions of NFiPA 15 listed in the Schedule.

12.2.8 FOAM EXTINGUISHING SYSTEM

12.1.8.1 General: Foam extinguishing systems shall be of an approved type and installed in accordance with the provisions of this Code and NFiPA 11, 11A and 16 listed in the Schedule.

12.1.8.2 Design: The details of the system supplied with the plans and specifications shall include complete computations showing pressure drop in all system piping, friction loss calculations of liquid lines and a detailed layout of the entire hazard area to be protected. Hydraulic characteristics of foam proportioners and foam makers as determined by tests shall be supplied by the manufacturer to the department (including the range of operating conditions required for the proposed installation) to permit determination of the adequacy of the hydraulics of the proposed protection.

12.1.8.3 Actuation: A foam extinguishing system shall be automatically actuated with supplementary manual tripping capability.

12.1.8.4 Tests: All piping, except that piping which handles expanded foam, shall be subjected to a 2-hour hydrostatic pressure test of 1375kpa (200 psi) or 345 kpa (50psi) in excess of the maximum pressure anticipated, whichever is greater, without leakage. The systems shall be subjected to a flow test to ensure that the hazard area is fully protected in conformance with the design specifications, and to determine the flow pressures, actual discharge capacity, foam quality, consumption rate of foam-producing materials, manpower requirements and other operating characteristics.

12.2.9 CARBON DIOXIDE EXTINGUISHING SYSTEMS

12.2.9.1 General: Carbon dioxide extinguishing systems shall be of an approved type installed in accordance with the provisions of this code and NFiPA 12 listed in the Schedule.

12.2.9.2 Design: The details of the system supplied with the plans and specifications shall include information and calculations of the amount of carbon dioxide, the location and flow rate of each nozzle including equivalent office area and the location, size and the carbon dioxide storage facility. Information shall be submitted pertaining to the location and function of the detection devices, operating devices, auxiliary equipment and electrical circuitry, if such used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

12.2.9.3 Actuation: Carbon dioxide extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

12.2.9.4 Safety requirements: In any proposed use of a carbon dioxide system where there is a possibility that persons will enter or be trapped in atmospheres made hazardous by a

carbon dioxide discharge, warning signs, discharge alarms and breathing apparatus shall be provided to ensure prompt evacuation of and to prevent entry into such atmospheres, and also to provide means for prompt rescue of any trapped personnel.

12.2.9.5 Tests: A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labelling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder high pressure systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis test shall be made. All tests to be conducted as indicated in NFiPA 12 listed in the Schedule.

12.2.9.6 Range hoods: In addition to the requirements of this section, Section 1002.20 and the mechanical code listed in the Schedule, range hood C02 systems shall bear the label of an approved agency. The system shall be installed in accordance with the manufacturer's installation instructions.

12.2.10 FM 200 FIRE EXTINGUISHING SYSTEMS

12.2.10.1 General: FM 200 fire extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 12A and 12B listed in the Schedule.

12.2.10.2 Design: The details of the system supplied with the plans and specifications shall include information and calculations of the amount of extinguishing agent, container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; the location, size and equivalent length of pipe, fittings and hose; and the locations and size of the storage facility. Information shall be submitted pertaining to the location and function of the detection devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify property the apparatus and devices used. Any special features shall be adequately explained.

12.2.10.3 Actuation: FM 200 fire extinguishing systems shall be automatically actuated with supplementary manual tripping capacity.

12.2.10.4 Safety requirements: In any proposed use of a FM 200 fire extinguishing system where there is a possibility that persons will enter or be trapped in atmospheres made hazardous by a discharge, warning signs, discharge alarms and breathing apparatus shall be provided to ensure prompt rescue of any trapped personnel.

12.2.10.5 Tests: A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labelling of devices with proper designations and instructions shall be checked. Operational test shall be conducted on all devices except cylinder valves in multi-cylinder systems. Where conditions prevail that make it difficult to determine adequately analysis shall be made. All tests are to be conducted as indicated in NFiPA 12A and 12B listed in the Schedule.

12.2.11 DRY CHEMICAL EXTINGUISHING SYSTEMS

12.2.11.1 General: Dry chemical extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 17 listed in the Schedule.

12.2.11.2 Design: The details of the system supplied with the plans and specifications shall include sufficient information and calculations on the amount of dry chemical; the size, length, and arrangement of connected piping, or piping and hose; description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to

identify properly the apparatus and devices used. Any special features shall be adequately explained.

12.2.11.3 Actuation: Dry chemical extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

12.2.11.4 Safety requirements: Where there is a possibility that personnel will be exposed to a dry chemical discharge, warning signs, alarms and breathing apparatus shall be provided to ensure prompt evacuation of such locations, and also to provide means for prompt rescue for any trapped personnel.

12.2.11.5 Tests: A completed system shall be tested by a discharge or expellant gas through the piping and nozzles. Observations for gas leakage and for continuity of piping with free unobstructed flow shall be made. Observations shall be made of the flow or expellant gas through all nozzles. The labelling of devices with proper designations and instructions shall be checked. After testing, all piping and nozzles are to be blown clean using compressed air or nitrogen and the system properly charged and placed in the normal "set" condition. All tests are to be conducted as indicated in NFiPA 17 listed in the Schedule.

12.2.11.6 Range hoods: In addition to the requirements of this section, Section 1002.20 and the mechanical code listed in the Schedule, range hood dry chemical systems shall bear the label of an approved agency. The system shall be installed in accordance with the manufacture's installation instructions. The dry chemical agent of the system shall be non-toxic.

12.2.12 WET CHEMICAL RANGE HOOD EXTINGUISHING SYSTEMS

12.2.12.1 General: Wet chemical extinguishing systems shall be installed in accordance with the provisions of this section, and the mechanical code and NFiPA 17A listed in the Schedule. The system shall bear the label of an approved agency and be installed in accordance with manufacturer's installation instructions. Wet chemical is defined as a solution of water and potassium-carbonate-based chemical, potassium-acetate-based chemical or a combination thereof which forms the extinguishing agent.

12.2.12.2 Tests: A completed system shall be tested by a discharge or wet chemical in sufficient amounts to verify that the system is properly installed and functional. Tests shall include a check of the detection systems, alarms, and releasing devices, including manual stations, fuel and power shutoff devices and other associated equipment. All tests are to be conducted as indicated in NFiPA 17A listed in the Schedule.

12.2.13 STANDPIPE SYSTEMS

12.2.13.1 General: Standpipe systems shall be of an approved type and installed and maintained in accordance with the provisions of this code, the fire prevention code and NFiPA 14 listed in the Schedule.

12.2.13.2 Where required: Standpipe systems shall be installed in the locations prescribed in Section 12.1.13.1 through 12.1.13.14.

12.2.13.3 Use Group A: In all buildings or structures or portions thereof of use group A when:

1. Two or more storeys in height of Use Group A-1, A-2, or A-3, and having an occupant load of more than 300; or
2. three or more storeys in height regardless of the area per floor; or
3. having an auditorium seating over 500. Standpipes shall be located one on each side of the auditorium in each tier, one in each mezzanine, one in each tier or dressing rooms, and protecting each property, store and work room;
4. having a stage. Standpipes shall be located on each side of the stage. Such standpipes shall be not less than 62.5mm diameter, equipped with 37.5cm hose and 10mm nozzles.

12.2.13.4 Use Group B: In all buildings or structures or portions thereof of use Group B when:

1. Three or more stories in height, and more than 279m^2 in area per floor; or
2. four or more stories in height regardless of the area per floor.

12.2.13.5 Use Group C: In all buildings or structures or portions thereof of Use Group C when three or more stories in height regardless of the area per floor or when having a stage or auditorium in accordance with Section 12.1.13.2 and 12.1.13.4.

12.2.13.6 Use Group D: In all buildings or structures or portions thereof of Use Group D when:

1. Three or more stories in height, and more than 279m^2 in area per floor; or
2. four or more stories in height regardless of the area per floor.

12.2.13.7 Use Group E: In all buildings or structures or portions thereof of Use Group E when:

1. Three or more storeys in height, and more than 930m^2 in area per floor; or
2. four or more storeys in height regardless of the area per floor.

12.2.13.8 Use Group F: In all buildings or structures or portions thereof of Use Group F three or more storeys in height regardless of the area per floor.

12.2.13.9 Exception: Use Group F-I when three storeys in height and less than 930m^2 in area per floor.

12.2.13.10 Use Group G: In all buildings or structures or portions thereof of Use Group G when:

1. Three storeys or more in height, and more than 279m^2 in area per floor; or
2. four or more storeys in height regardless of the area per floor; or
3. classified as a covered mall building within the mall portions (see Section 8.2.11).

12.2.13.11 Use Group H: In all buildings or structures or portions thereof of Use Group H when:

1. Three or more storeys in height and of Use Group H-1 regardless of the area per floor; or
2. three or more storeys in height and more than 930m^2 in area per floor; or
3. four or more storeys in height regardless of the area per floor.

12.2.13.12 Use Group I: In all buildings or structures or portions thereof of Use Group S, other public garages which shall conform to Section 2.1.13.14, when:

1. Three more storeys in height, of Use Group I-1 and more than 279m^2 in area per floor; or
2. Three or more storeys in height, of Use Group I-2 and more than 930m^2 in area per floor; or
3. Four or more storeys in height of Use Group I-1 or I-2 regardless of the area per floor.

12.2.13.13 Use Group Y: In all buildings or structures or portions thereof Use Group Y when:

1. Three or more storeys in height and more than 930m^2 in area per floor; or
2. four or more storeys in height regardless of the area per floor.

12.2.13.14 Public garages: In all Group I and II public garages when:

1. More than 930m^2 in area per floor; or
2. More than 698m^2 in area per floor and more than one story in height; or
3. More than 465m^2 in area per floor, and more than two storeys in height; or

4. More than three storeys in height; or

5. Located in buildings where the upper storeys are designed for other uses; or

6. When located in any storey that is more than 50 percent below grade.

12.2.13.15 Note that open parking structures are not public garages (see Section 8.8).

12.2.13.16 Standpipe system piping sizes: The riser piping, supply piping, and the water service piping shall be sized to maintain a residual pressure of at least 65 psi (448kPa) at the topmost outlet of each riser while flowing the minimum quantities, of

water specified in Sections 12.1.13.20 of this Code.

12.2.13.17 EXCEPTION: The 448kPa (65 psi) residual pressure is not required to be maintained in buildings less than 22.5 meters in height which are equipped throughout with an approved automatic fire suppression system.

12.2.13.18 Riser sizing: The vertical water pipe(s) within a building to which fire hose outlets and valves are attached shall be sized for a minimum flow of 0.032m³/s (500 gpm).

12.2.13.19 Exceptions

1. Where only 37.5mm valves are required or are provided, the riser(s) shall be sized to provide a minimum flow of 0.0063m³/s (100gpm). The minimum size shall be 62.5mm.
2. In buildings where limited area sprinkler systems are supplied water from a common standpipe riser, the riser shall be sized to satisfy total demand.
3. In buildings equipped throughout with an approved automatic fire suppression system where both the suppression system and standpipe fire hose outlets are supplied water from a common riser, the minimum riser diameter shall be adequate for the sprinkler system or the standpipe system, whichever is greater. The minimum riser diameter shall be not less than that based on hydraulic calculations.
4. In buildings which are not equipped throughout with an approved automatic fire suppression system wherein the minimum diameter of the common riser is based on hydraulic calculations, all risers shall have a minimum diameter as described in Table 30.13.
5. In buildings of Use Groups B, H-1, H-2, and F equipped throughout with an approved automatic fire suppression system, each vertical standpipe riser shall be sized for a minimum flow of 0.016m³/s. (250gpm).

BUILDING HEIGHT AND STANDPIPE RISER SIZE

6. Standpipe systems in covered mall buildings as provided in Section 8.2.11.

TABLE 12.7

12.2.13.20 Supply pipe sizing: The supply piping, including the horizontal or common feeder lines within a building and the water service line outside of the building, shall be sized for a minimum flow of 0.032h³/s (500 gpm). When more than one standpipe riser is required or provided, all common supply piping shall be sized for a minimum flow of 0. 032m³/s (500gpm) for the first riser plus 0.016m³/s (250gpm) for each additional riser, and the total need not exceed 0.16m³/s (2,500gpm).

Maximum building height	Minimum riser size
4 storeys or 15.24m	62mm
6 storeys or 22.86m	100mm
23.16m to 76.20m	150mm
Over 76.20m	200mm

12.2.13.21 Exceptions

1. Where only 37.5mm valves are required or are provided, the supply piping shall be sized for a minimum flow of 0.0063m³/s (100gpm) for each riser, and the total need not exceed 0.032m³/s (500gpm). The minimum size shall be 62.5mm.
2. In buildings where limited area sprinkler systems are supplied water from a common standpipe riser, the supply piping shall be sized for a minimum flow of 0. 032m³/s (500gpm) plus the sprinkler demand for the first riser, plus 0.016m³/s 250gpm for each additional riser and the total need not exceed 0.16m³/s (2,500 gpm).

12.2.13.22 In buildings of Use Group B, F, H-1 and H-2 equipped throughout with an approved automatic fire suppression system, all common supply piping shall be sized for a minimum flow of 0.016m³/s (250 gpm) for the first riser plus 0.016m³/s (250 gpm) for each additional riser, and the total need not exceed 0.095m³/s (1,500gpm).

12.2.13.23 Number of risers: The number of standpipe risers shall be such that all parts of every floor area can be reached by a 9m hose stream from a nozzle attached to not more than 30m of hose connected to a riser outlet. In those buildings equipped with an interior smoke proof enclosure vestibule, at least one standpipe hose connection shall be located in the vestibule. In covered mall buildings, outlets shall be located in accordance with Section 8.2.11.

12.2.13.24 Combination: Where a standpipe system riser also serves as the water sprinkler system riser in buildings required to have both systems or in buildings having both systems, control valves shall be installed where sprinklers are connected to the riser so that sprinklers are under the control of a separate floor control valve(s) to allow standpipes to remain operational while the sprinkler system is in a closed position. If control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering of such sign shall be of a conspicuous colour and shall be at least 100mm in height and shall read Standpipe Control Valve or indicate other types of systems.

12.2.13.25 Outlets: Standpipe system outlets shall comply with the provisions of Sections 12.1.13.26 through to 12.1.13.30.

12.2.13.26 Hose connections: At each floor level, and not more than 1.5m above the floor, there shall be connected to each standpipe a 62.5mm hose connection with valves and threads conforming to the local fire department standards, if deemed necessary by the local fire department, 37.5mm hose connection shall be provided and equipped with not more than 30m of 37.5mm approved lined fire hose with an approved variable fog nozzle and couplings and hung in an approved rack or cabinet. Hose provided for rack and cabinet use shall be of ozone-resistant materials and designed to be folded in a pin rack unit.

12.2.13.27 Exception: In buildings equipped throughout with an approved automatic fire suppression system, the 37.5mm hose connection, hose and cabinet are not required.

12.2.13.28 Roof hydrants: Where standpipes are installed in buildings more than six storeys or 22.5m in height, at least one riser shall extend through the roof and terminate in a two-way, 62.5mm hose connection. The main control valve on a roof hydrant or manifolded hose connection shall be located in an area not subject to freezing, as close to the roof access as practical and plainly marked (see Section 12.1.15.9).

12.2.13.29 Pressure reducers: When the residual pressure at any standpipe fire hose outlet exceeds 690 kPa (100 psi) approved pressure reducing devices or discs shall be installed at the outlets to reduce the pressure to 690 kPa (100 psi) while the required quantity of water per minute is flowing. Any standpipe riser over 75m in height shall be equipped with an

approved pressure regulating device on each hose outlet, which controls discharge pressures under both flow (residual) and no-flow (static) conditions.

12.2.13.30 Test gauges: An approved water pressure gauges shall be attached to the top of each standpipe riser for inspection and test purposes. Shutoff valves, with provisions for bleeding pressure from the gauge, shall be installed between the gauge and the top of the riser. Gauges shall be accessible and located in spaces not subject to freezing.

12.2.13.31 Materials: All standpipes shall be constructed of approved materials. All pipes, fittings and valves shall be of extra heavy pattern when the normal working pressure will exceed 1207 kPa (175 psi).

12.2.13.32 Tests: All standpipe systems shall be flow tested and hydrostatical tested in accordance with the fire prevention code listed in the Schedule.

12.2.14 STAND PIPES FOR BUILDINGS UNDER CONSTRUCTION OR DEMOLITION

12.2.14.1 General: Standpipes required by this section are to be either temporary or permanent in nature, with or without a water supply, provided, however, that such standpipes conform to the requirements of Section 12.1.13 as to number of risers, capacity, outlets and materials.

12.2.14.2 Where required: Temporary or permanent standpipes shall be installed, as the work of the building progresses, beginning at the 5th storey or at 19.5m in height.

12.2.14.3 Height: The standpipe systems shall be carried up with each floor and shall be installed and ready for use as each floor progresses. Standpipes shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

12.2.14.4 Outlets: Hose outlets shall be provided with caps and attachment chains. The 37.5mm hose and nozzle shall not be required during construction.

12.2.14.5 Fire department connections: At the street level there shall be provided for each temporary or permanent standpipe installation one or more two-way fire department inlet connections. Fire department inlet connections shall be prominently marked and readily and easily accessible at all times (see Section 12.1.15.9).

12.2.14.6 Buildings under demolition: Where a building is being demolished and a standpipe is existing within such a building. Such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be more than one floor below the floor above being demolished.

12.2.15 FIRE DEPARTMENT CONNECTIONS

(See Section 12.1.15 for temporary standpipes).

12.2.15.1 Required: All water sprinkler and standpipe systems shall be provided with at least one two-way fire department connection. Each inlet of the fire department connection shall be at least 62.5mm in diameter. The pipe from the standpipe system and the pipe from the water sprinkler system to the fire department connection shall not be smaller than 100mm. Single fire department connections shall not be installed unless approved by the department.

12.2.15.2 EXCEPTIONS

1. A fire department connection shall not be required for limited area sprinkler systems (see Section 12.1.15).
2. On standpipe or sprinkler systems where the supply pipe to the system is less than 100mm, the pipe from the system to the fire department connection shall not be smaller than 62.5mm.

12.2.15.3 Connections: Fire department connections shall be arranged in such a manner that the use of any one water sprinkler connection will serve all the sprinklers, and the use of any one standpipe connection will serve all the standpipes within the building.

12.2.15.4 Location: Fire department connections shall be located and be visible on a street front or in a location approved by the department. Such connections shall be located so that immediate access can be made by the fire department. Obstructions such as fences, bushes, trees, walls or any other similar object, shall be permitted for new or existing installations.

12.2.15.5 Height: Fire department connections shall not be less than 45 centimetres and not more than 1m in elevation, measured from the ground level to the centre line of the inlets.

12.2.15.6 Projection: Where the fire department connection would project beyond the property line or into the public way, a flush-type fire department connection shall be provided.

12.2.15.7 Hose thread: Hose thread in the fire department connection shall be uniform with that used by the local fire department.

12.2.15.8 Fittings: Fire department inlet connections shall be fitted with check valves, ball drip valves and plugs with chains or frangible caps.

12.2.15.9 Signs: A metal sign with raised letters at least 25mm in height shall be mounted on all fire department connections serving sprinklers or standpipe. Such signs shall read "Automatic Sprinklers and/or Standpipe"

12.2.16 WATER SUPPLY AND OTHER EXTINGUISHING MEDIA

12.2.16.1 Required: All fire suppression and standpipe systems shall be provided with at least one automatic supply of extinguishing material of adequate pressure, capacity and reliability to perform the function intended, except as provided in Section 12.1.14.

12.2.16.2 Combination sprinkler/standpipe water supply: Where both sprinklers and standpipes are installed and have a common fire water service as their combined source of supply, the water supply line shall be adequately sized to meet the flow and pressure demands of the water supplies for the sprinkler system or the standpipe system, whichever is greater.

12.2.16.3 Combination sprinkler/domestic water supply: Where a sprinkler system is connected to the domestic water supply system, it shall be of adequate pressure, capacity and size for the simultaneous operation of the water sprinkler system and domestic water needs. Taps for domestic water from water sprinkler systems are prohibited.

12.2.16.4 Size: The extinguishing material supply for fire suppression systems shall be sized in an approved manner in accordance with this Code.

12.2.16.5 Standpipe water service: All standpipe systems shall be connected to a street water main. Water mains shall be adequately sized and have enough pressure and discharge capacity to supply the total water demand for the building. Taps into the main and water service lines from the main to the building shall be at least equal in size to the largest supply line inside the building. Common supply lines from the main, from which standpipes, domestic or sprinkler systems are supplied, shall be sized to satisfy total demand.

12.2.16.6 Standpipe interconnection: The required water supply shall be connected to the base of each standpipe riser. Where more than one standpipe riser is required, all risers shall be interconnected at their base with a common supply line and an approved indicating valve shall be installed at the base of each riser so as to permit individual risers to be taken out or service if damaged or broken without interrupting the water supply to other risers.

12.2.16.7 Standpipes in unheated areas: Standpipes installed so that all or any portion of

the system is installed through unheated areas subject to freezing shall be so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve or through the use of approved remote control devices located at each hose station.

12.2.17 YARD HYDRANTS

12.2.17.1 Fire hydrants: Fire hydrants installed on private property shall be located and installed as directed by the fire department. Hydrants shall conform to the standards of the administrative authority of the jurisdiction and the fire department. Hydrants shall not be installed on a water main less than 150mm in diameter.

12.2.18 FIRE PROTECTIVE SIGNALING SYSTEMS

12.2.18.1 Plans and specifications: Where a fire protective signalling system is required by this Code, the plans and specifications shall show the location and number of all sending stations and signals with specifications of the type, construction and operation of the system. Installation of all equipment shall conform to the requirements of this Code and NFiPA 72A listed in the Schedule.

12.2.18.2 Approval: The fire protective signalling systems shall be approved for the particular application and shall be used for the fire protective signalling purpose only. Alarm boxes shall be painted a distinctive red colour.

12.2.18.3 Where required: A fire protective signalling system shall be installed and maintained in full operating condition in the locations described in Section 12.1.18.4 through 12.1.18.11.

12.2.18.4 Use Groups A-4 and C: In all new and existing buildings of Use Groups A-4 and C.

12.2.18.5 Exception: Sanctuary and nave areas of churches and similar religious buildings.

12.2.18.6 Use Group B: In all buildings of Use Group B when three or more storeys in height.

12.2.18.7 Exception: Buildings equipped through with an approved automatic fire suppression system and less than seven storeys in height.

12.2.18.8 Use Group F: In all buildings of Use Group F.

12.2.18.9 Use Group F-3: In all buildings of Use Group F-3. The manual pull boxes shall be permitted to be locked, provided that staff is present within the subject area when occupied.

12.2.18.10 Use Group H-1: In all buildings of Use Group H-1.

12.2.18.11 Use Group H-2: In all buildings of Use Group H-2 when four or more storeys in height.

12.2.18.12 Location: Manual pull stations shall be located in each storey, including basement, not more than 1.5m from each exit. In buildings of Use Group A, where a stage is provided, a manual pull station shall be located adjacent to the lighting control panel.

12.2.18.13 Box height: The height of the manual pull station boxes shall be a minimum of 1 meter and a maximum of 1.35m measured vertically, from the floor level to the activating handle or lever of the pull station.

12.2.18.14 Coding: Systems shall be either coded or non-coded. Coded stations shall be coded in conformance with NFiPA 72A listed in the Schedule.

12.2.18.15 Power supply: The power for the fire alarm system shall be provided from an emergency electrical system conforming to Section 9.2.9.1.

12.2.18.16 Requirements: Fire protective signaling systems shall be of the closed circuit type and shall be electrically or mechanically supervised. In addition, such systems shall

comply with Section 12.1.18.17 through to 12.1.18.21.

12.2.18.17 Wiring: All wiring or mechanical tubing shall conform to the requirements of NFiPA 72A listed in the Schedule.

12.2.18.18 Alarms: Audible alarms of the approved type shall be provided. The operation of any fire alarm device shall cause all audible or visual alarms to operate Visual and audible alarms shall be provided in occupancies housing the hard of hearing. Alarm sounding devices shall be of approved type, shall provide a distinctive tone and shall not be used for any purpose other than that of a fire alarm. They shall be of such character and so located as to be seen or effectively heard above all other sounds, by all the occupants, in every occupied space within the building.

12.2.18.19 EXCEPTION: Smoke detectors in buildings of Use Group F-3 shall be permitted to alarm at a constantly attended location and are not required to accomplish general alarm indication.

12.2.18.20 Presignal system: Presignal systems shall not be installed unless approved by the code enforcement officer and by the fire department. Where a presignal system is installed, 24-hour personnel supervision shall be provided at a location approved by the fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

12.2.18.21 Zones: Each floor shall be zoned separately. If the floor area exceeds 1860m^2 additional zoning shall be provided. The length of any zone shall not exceed 90 meters in any direction. Zoning indicator panels and controls shall be located as approved by the department. Annunciators shall lock in until the system is reset.

12.2.18.22 Acceptance tests: Upon completion of the fire protective signaling system, the installations shall be subjected to a performance test to demonstrate its efficiency of operation. All connections and wiring, with signal devices disconnected, shall develop an insulation resistance of not less than 1 (one) megohm.

12.2.19 AUTOMATIC FIRE DETECTION SYSTEMS

12.2.19.1 Plans and specifications: Where an automatic fire detection system is required by this Code, the plans and specifications shall show the location and number of all sending stations and signals with specifications of the type of construction and operation of the system including all automatic detection devices. Installation of all equipment shall conform to requirements of this Code and NFiPA 72E listed in the Schedule. The system shall be installed in accordance with this section and shall be part of and subject to the requirements of a fire protective signalling system specified in Section 12.1.18

12.2.19.2 Approval: The automatic fire detection system shall be approved for the particular application and shall only be used for detection and signalling in the event of fire. The automatic detecting devices shall be smoke detectors, except an approved alternative type of detector shall be installed in space such as boiler rooms where during normal operation products of combustion are present in sufficient quantity to cause alarm.

12.2.19.3 Where required: An automatic fire detection system shall be installed and maintained in full operating condition in the locations described in Section 12.1.19.4 through to 12.1.19.11.

12.2.19.4 Use Group F-1 and F-2: In all buildings of Use Group F-1. Buildings of Use Group F-2 shall be equipped with a fire protective signalling system in accordance with this section and Section 7.2.11.7.

12.2.19.5 Use Group F-3: Automatic smoke detectors shall be installed throughout all resident housing areas.

12.2.19.6 Exception

1. Smoke detectors shall not be required in sleeping rooms with four or less occupants in Use Group II or III (see Section 4.8.5).
2. Smoke detectors shall not be required in sleeping rooms with four or less occupants in buildings protected throughout with an approved automatic fire suppression system.

12.2.19.7 Use Group H-1: In all buildings of Use Group H-1.

12.2.19.8 Exception: Motel/hotel units that do not have interior corridors and which have direct access to the outside from the sleeping unit at grade level.

12.2.19.9 Use Group B or H-2: In all buildings of Use Group B or H-2 when such buildings have floors used for human occupancy located more than 22.5m above the lowest level of fire department vehicle access.

12.2.19.10 Exception: In buildings of Use Group H-2, smoke detectors are not required within the individual dwelling units except as required by Section 12.1.19.11.

12.2.19.11 Sleeping areas and dwelling units: In addition to any automatic fire protective signaling system required by Section 12.1.19.4, 12.1.19.7 and 12.1.19.9, a minimum of one single-station smoke detectors shall be installed in each guest room, suite or sleeping area in buildings of Use Group H-1 and F-1 and in dwelling units in the immediate vicinity of the bedrooms in buildings of Use Group H-2 or H-3. When actuated, the detector shall provide an alarm suitable to warn the occupants within the individual unit. In buildings of Use Groups H-1 and H-2 which have basements and additional smoke detectors shall be installed in the basement. In buildings of Use Group H-3, smoke detectors shall be required on every story of the dwelling unit including basements. In dwelling units with levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level provided the lower level is less than one full story below the upper level. If there is an intervening door between the adjacent levels, a smoke detector shall be installed on both levels. All detectors shall be installed in an approved location. Where more than one detector is required to be installed within an individual dwelling unit, the detectors shall be wired in such a manner that the situation of one alarm will actuate all the alarms in the individual unit.

12.2.19.12 Sprinklered buildings exception: Buildings or portions thereof equipped throughout with an automatic fire suppression system are not required to be equipped with an automatic fire detection system, but are required to be equipped with a manual fire protective signaling system conforming to Section 12.1.18. This exception does not apply to buildings of Use Group F-2 to single-station smoke detectors as required in Section 12.1.19.11.

12.2.19.13 Distances: Smoke detectors shall be installed not to exceed the lineal or square footage allowances specified, based on the test standards under which they were tested and approved.

12.1.19.14 Zones: The automatic fire detection system shall be connected to the same zones as those required for the fire protective signalling system in Section 12.1.18. Automatic detectors which have separate indication on the annunciator panel from the manual pull stations and the fire suppression systems shall have detection zones which match the pull station zones in size and arrangement.

12.2.20 SMOKE CONTROL SYSTEMS

12.2.20.1 General: Smoke control systems required by this Code shall conform to the provisions of this section.

12.2.20.2 Acceptance: Before a certificate of occupancy is issued, the smoke control system shall be tested in an approved manner to show compliance with the applicable requirements of this section.

12.2.20.3 Standby power: All equipment required to provide smoke control shall be equipped with a standby source complying with Section 9.2.9.8.

12.2.20.4 Exceptions

1. Mechanical air-handling equipment designed to accomplish smoke control in systems specified in Sections 12.1.20.6 and 12.1.20.11, when the building is equipped throughout with an approved automatic fire suppression system.
2. Smoke control systems specified in Section 12.1.20.12.

12.2.20.5 Inspections: All operating parts of the smoke control systems specified in Sections 12.1.20.17 and 12.1.20.23 (including dampers) shall be tested by the owner every three months and a log of the tests shall be kept for examination by the fire department. At six-month intervals, the system shall be inspected and operated in accordance with the fire prevention code listed in the Schedule.

12.2.20.6 High-rise buildings: Where required by Section 8.3.7, natural or mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one of the methods described in Section 12.1.20.7 through 12.1.20.10.

12.2.20.7 Panels or windows: Panels or windows shall be provided in the exterior walls which can be opened remotely from an approved location other than the fire floor. Such venting facilities shall be provided at the rate of 1.85m^2 per 15m length of exterior wall in each story and shall be distributed around the perimeter at not more than 15m intervals. Such windows or panels and their controls shall be clearly identified.

12.2.20.8 Exception: When a complete automatic fire suppression system is installed, remotely operated operable panels and windows are not required when windows or panels manually operable from within the fire floor are installed or approved fixed tempered glass is used. Such windows shall be clearly identified and shall be of the size and spacing indicated above.

12.2.20.9 Mechanical system: Where a complete and approved automatic fire suppression system is installed and the mechanical air handling equipment is designed to accomplish smoke removal, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building under fire conditions. The air handling system shall provide a minimum of one exhaust air change each 10 minutes for the area involved.

12.2.20.10 Other designs: Any other approved design which will adequately remove smoke from each compartment served in an unsprinkled building is permitted, provided the system is tested and approved by the code enforcement officer before the building is ratified for occupancy.

12.2.20.11 Elevators: When equipped with a mechanical smoke control system that will restrict smoke and hot gases from entering the elevator shaft in the fire floor, hoistway venting specified in Section 9.1.8.18.6 is not required. In high-rise buildings equipped with this system and equipped throughout with an approved automatic fire suppression system, the 1-hour fire-resistance rated elevator lobbies specified in Section 8.3.8 are not required.

12.2.20.12 Covered mall buildings: Where required by Section 8.2.12, the mall and adjacent tenant spaces shall be equipped with an approved smoke control system. Smoke

control equipment serving the mall shall be sized to provide a minimum of six air changes per hour for malls having a volume of 16800m^3 or less, and a minimum of four air changes per hour for malls having a volume of more than 16800m^3. The volume shall be measured from the entrance to tenant spaces and to a height of 3.6m above each pedestrian area. Exhaust inlets for the mall shall be located a minimum of 1.8m above the walking surface. Necessary outside air to accomplish the required air changes per hour shall be provided.

12.2.20.13 Activation: The exhaust system shall be activated by smoke detectors complying with NFiPA 72E listed in the Schedule, by operation of the sprinkler system, and manually. A smoke detector shall be installed in the return air portion of every heating and cooling system ahead of any fresh air intake. The activation system shall be installed in an approved manner.

12.2.20.14 Operation: The approved automatic exhaust system shall be a separate system or shall be integrated with an approved air conditioning system. Where a separate system is provided, operation of the fire emergency ventilation system shall automatically shut down the air conditioning system or any other devices which interfere with the effective operation of the fire emergency ventilating system.

12.2.20.15 Tenant space zones: When a fire occurs within a tenant space zone, that zones shall operate at 100 percent exhaust, and supply air to that zone shall be shut down. Adjoining tenant space zones shall go to normal operations and the mall system shall operate at 100 percent fresh air supply.

12.2.20.16 Mall system: When a fire occurs within the mall, the mall system shall operate at 100 percent exhaust, and adjoining tenant spaces shall go to normal operation.

12.2.20.17 Atriums: Where required by Section 8.7.2.1, a smoke control system shall be designed to control the migration of products of combustion in the atrium spaces. A mechanically operated air handling system shall be installed that will exhaust smoke either entering or developing within the atrium. Exhaust openings shall be located in the ceiling or in a smoke trap area immediately adjacent to the ceiling of the atrium. Supply opening sized to provide 50 percent of the exhaust volume shall be located at the lowest level of the atrium. For purposes of this section, the volume of the atrium shall include all spaces not separated from the atrium in accordance with Section 8.7.2.2.

12.2.20.18 Supply air: Where the height of the atrium is 16.5 meters or less, supply air introduced by gravity is permitted provided smoke control is accomplished. When the height of the atrium is more than 16.5 meters, supply air shall be introduced mechanically from the floor of the atrium and be directed vertically toward the exhaust outlets. In atriums over six stories in height or having open floors above the second storey, introduction of supplemental supply air at upper levels is permitted.

12.2.20.19 Exhaust: The atrium smoke control system shall exhaust not less than the following quantities of air:

1. For atriums having a volume of not more than 16800m^3, including the volume of any levels not physically separated from the atrium, not less than 18.88m^3/s nor less than six air changes per hour.
2. For atriums having a volume of more than 16800m^3, including the volume of any levels not physically separated from the atrium, not less than four air changes per hour.

12.2.20.20 Smoke detectors: Smoke detectors shall be installed at the perimeter and on the ceiling of the atrium and on the underside of each floor level that is open to the atrium space. Detectors shall be located in accordance with their listing.

12.2.20.21 Smoke control activation: The smoke control system required for the atrium

spaces, shall be activated by the fire suppression system, by smoke detectors required by Section 12.1.20.20, and by manual controls provided for fire department use. The system shall not be activated by a manual fire protective signalling system required by Section 12.1.18. Manual controls shall be located in the central control station or other location approved by the fire department. When the smoke control system is activated, other air handling systems which interfere with its function shall shut off automatically.

12.2.20.22 Other approved methods: Any other approved design which will achieve the same level of smoke control as described in this section is permitted in lieu of these requirements.

12.2.20.23 Floor openings: The smoke control system required by Section 8.7.2.1 shall be an automatic exhaust system designed to prevent the passage of smoke to the storey above in accordance with Section 12.1.20.24 through to 12.1.20.26 or any other approved system of smoke control which will accomplish the same purpose.

12.2.20.24 Control: The system shall be a separate unit or shall be integrated with an approved air handling system and shall be thermostatically controlled to operate simultaneously with the detection of fire.

12.2.20.25 Capacity: The system shall be of adequate capacity to create a controlled draft in the floor opening with sufficient velocity of flow over the entire area of the floor opening under normal conditions of window and door openings in the building.

12.2.20.26 Operation: The system shall be so arranged as to automatically stop the operation of the normal mechanical air handling ventilating systems, and close the dampers of the return air duct connections, in the event of fire.

12.2.21 SUPERVISION

12.2.21.1 Fire suppression systems: Fire suppression systems required for buildings of Use Groups A, C, F or H shall be supervised by methods 1, 2, 3 or 4 below. All other fire suppression systems shall be supervised by one of the following methods.

1. Approved central station system in accordance with NFiPA 71 listed in the Schedule.
2. Approved proprietary system in accordance with NFiPA 72D listed in the Schedule.
3. Approved remote station system of the jurisdiction in accordance with NFiPA 72C listed in the Schedule.
4. Approved local alarm service which will cause the sounding of an audible signal at a constantly attended location in accordance with NFiPA 72A listed in the Schedule.
5. Locking valves open.

12.2.21.2 Exception

1. Underground gate valves with roadway boxes.
2. Halogenated extinguishing systems.
3. Carbon dioxide extinguishing systems.
4. Dry chemical extinguishing systems.
5. Limited area sprinkler systems.

12.2.21.3 Fire protection systems: All required fire protection systems, other than fire suppression systems, shall be connected to an approved central station system, proprietary system, or remote station system of the jurisdiction when approved by the fire department. Fire suppression systems shall conform to Section 12.1.21.

12.2.21.4 Exceptions

1. Standpipe systems.
2. Fire alarm systems in buildings of Use Group H when less than five storeys in

height.

3. Single-station detectors required by Section 12.1.19.11.
4. Smoke detectors in buildings of Use Group F-3.

12.2.22 FIRE EXTINGUISHERS

12.2.22.1 Approval: Portable fire extinguishers shall bear the label of an approved agency and shall be installed in a location visible and accessible to the occupants.

Where required: A portable fire extinguisher shall be installed in the following locations in accordance with NFiPA 10 listed in Schedule A.

1. In all buildings of use groups.
2. In all areas containing commercial kitchen exhaust wood system.
3. In all areas where fuel is dispensed.
4. In all areas where a flammable or combustible liquid is used in the operation of spraying, coating or dipping.
5. In all buildings of Use Group F-3 at staff locations. Access to portable extinguishers shall be permitted to be locked.
6. On each completed floor of buildings under construction, other than buildings of Use Group H-3.

12.3 FIRE RESISTIVE CONSTRUCTION

12.3.1 General

12.3.1.1 Scope: The provisions of this Part shall govern the use and design of all materials and methods of construction in respect to required fire resistance rating and flame-resistance, as determined by the potential fire hazard of the use and occupancy of the building or structure and the location and function of all integral structural and other fire resistive elements of the building; and the installation of safeguards against the spread of fire to and from adjoining structures.

12.3.1.2 Performance standards: The requirements of this Part shall constitute the minimum functional performance standards for fire protection purposes; and shall not be deemed to decrease or waive any strength provisions or in any other manner decrease the requirements of this code in respect to structural safety.

12.3.1.3 Use of combustibles: All materials and forms of construction that develop the fire-resistance ratings required by this code shall be acceptable for fireproofing and structural purposes; except that the use of combustible component materials in structural units or structural assemblies shall be limited in types of construction specified in Section 6.2.2, 6.2.3, 6.2.4 and 6.2.5, and in Section 29.1.4.

12.3.1.4 Combustible components: Combustible aggregates are permitted in concrete mixtures approved for fire-resistance rated construction as provided in (refer to section on Gypsum) for gypsum concrete, in (Chapter on Materials, ext. walls) for cinder concrete, and any other approved component material or admixture is permitted in assemblies that meet the fire-resistive test requirements of this code; and wood nailing stir or any other materials if similar combustible characteristics are permitted in concrete and masonry construction for securing trim and finish.

12.3.2 PLANS AND SPECIFICATIONS

12.3.2.1 General: Plans for all buildings shall designate the type of construction and fire-resistance rating of all structural elements as required by this code. The plans and specifications shall include documentation or supporting data substantiating all required fire resistance ratings.

12.3.2.2 Penetrations: Plans for buildings more than two stories in height shall indicate where preparations will be made for electrical, mechanical, plumbing and communications conduits, pipes and systems, and shall also indicate the materials and methods for maintaining the required structural integrity, fire resistance rating and fire- stopping.

12.3.3 FIRE HAZARD CLASSIFICATION

12.3.3.1 General: The degree of fire hazard of buildings for each specific use group as defined by the fire grading in Table 12.2.3 shall determine the requirements for fire walls, and horizontal and vertical assemblies separating mixed uses as prescribed in Section 5.2.11 and all structural members supporting such elements unless otherwise provided for in this code.

12.3.3.2 Unclassified uses: The Code Enforcement Officer shall determine the fire hazard classification of a building or structure designed for a use not specifically provided in Table 12.2.3 in accordance with the fire characteristics and potential fire hazard of the Use Group which it most nearly resembles; or its designation shall be fixed by the approved rules.

TABLE 12.8 FIRE GRADING OF USE GROUPS

Use Group		Fire grading in hours
A-1	Assembly, theatres	3
A-2	Assembly, night clubs	3
A-3	Assembly, recreation centers, lecture halls terminals, restaurants	
A-4	Assembly, churches	1 1/2
B	Business	2
C	Educational	1 1/2
D	Factory and industrial	3
E	High hazard	4
F-1	Institutional residential care	1
F-2	Institutional, incapacitated	2
F-3	Institutional, restrained	3
G	Mercantile	3
H-1	Residential, hotels	2
H-2	Residential, multi-family dwellings	1 1/2
H-3	Residential, 1- and 2-family dwellings	1
I-1	Storage, moderate hazard	3
I-2	Storage, low hazard	2

12.3.4 FIRE TESTS

12.3.4.1 Structural building assemblies: Built-up masonry units and composite assemblies of structural materials including walls, partitions, columns, girders, beams slabs and assemblies of slabs and beams or other combinations of structural units for use in floor and roof construction shall be regulated by the fire resistance ratings of Table 6.1. Floor assemblies which are required to be fire-resistance rated shall extend to and be tight against

exterior walls, or other provisions shall be made for maintaining the fire- resistance rating of the assembly at such locations.

12.3.4.2 Fire-resistance ratings: The fire-resistance ratings of building assemblies and structural elements shall be determined in accordance with the test procedures set forth in ASTM E119 listed in the Schedule. The fire resistance rating of concrete assemblies and structural elements shall be established as heretofore required, or shall be determined in accordance with the procedures of the CRSI book Reinforced Concrete Fire Resistance or PCI MNL 124-77 listed in the Schedule. The fire-resistance rating of protected steel shall be established as heretofore required or shall be calculated in accordance with AISI Designing Fire Protection for Steel Columns, AISI Designing Fire protection for Steel Beams and AISI Designing Fire Protection for Steel Trusses listed in the Schedule.

12.3.4.3 Tested assemblies: Assemblies of building construction shall be tested according to Section 12.2.4 or be detailed in GA-600 or in the UL Fire Resistance Directory listed in the Schedule as having the fire-resistance ratings specified therein for determining compliance with the requirements of this Code.

12.3.4.4 Alternative protection: Where it can be shown to the Code Enforcement Officer that the structural integrity of structural framing elements will not be reduced below a safe level by a fire within the building or in an adjacent building having a severity corresponding to the fire-resistance rating required for the elements through the use of heat shields, separations or other approved means of protection, fire-resistive coverings or insulating enclosing materials are not required for such elements.

12.3.4.5 Opening protectives: Opening protectives shall include the fire door, fire shutter, fire window, or fire damper and all required hardware, anchorage, frames and sills necessary for the assembly.

12.3.4.6 Combustibility tests: Where the behaviour of materials under exposure to fire is specified in this Code, the characteristics of materials shall be determined by the tests and criteria set forth in Sections 12.2.4.8.

12.3.4.7 Tests: The tests indicated in Sections 12.2.4.8 and 12.2.4.9 shall serve as criteria for acceptance of building materials as set forth in Sections 6.2.2, 6.2.3,6.2.4 and

6.2.5 governing the combustibility of building materials for use in Types 1,2,3, and 4 construction. The term “noncombustible”does not apply to the flame spread characteristics of interior finish or trim materials. A material shall not be classed as a noncombustible building construction material which is subject to an increase in the combustible or flame spread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

12.3.4.8 Elementary materials: Materials which are intended to be classified as non-combustible shall be tested in accordance with ASTM E136 listed in the Schedule. Such materials shall be acceptable as non-combustible materials when at least three of the four specimens tested meet all of the following criteria.

1. The recorded temperature of the surface and interior thermocouple shall not at any time during the test rise more than 30 degrees C above the furnace temperature at the beginning of the test.
2. There shall not be flaming from the specimen after the first 30 seconds.
3. If the weight loss of the specimen during testing exceeds 50 percent, the recorded temperature of the surface and interior testing thermocouple shall not at any time during the test rise above the furnace air temperature at the beginning of the test, and there shall not be flaming of the specimen.

12.3.4.9 Composite materials: Materials having a structural base of non-combustible material as defined in section 29 with a surfacing not more than 3mm thick which has a flame

spread rating not greater than 50 percent when tested in accordance with ASTM E84 listed in the Schedule, shall be acceptable as noncombustible materials.

12.3.5 FIRE-RETARDANT TREATED WOOD: Shall comply with Sections 12.2.5.1 and 12.2.5.2.

12.3.5.1 General: Where permitted for use of a structural element, fire retardant treated wood shall be defined as any wood product which when impregnated with chemicals by a pressure process, or other means during manufacture, shall have, when tested in accordance with ASTM E84 listed in the Schedule, a flame spread rating not greater than 215 when the test is continued for a period of 30 minutes, without evidence of significant progressive combustion and the flame front shall not progress more than 3.15m beyond the centerline of the burner at any time during the test. The material shall bear the identification of an approved agency having a re-rating of the material. Fire-retardant treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for plywood before use.

12.3.5.2 Use limitations: An assembly of wood which has been pressure treated with fire-retardant chemicals in accordance with AWPA C20 and AWPA C27 listed in the Schedule, or treated by other approved means during manufacture, is permitted to be used in Types 1 and 2 construction for partitions, structural elements and roof framing and sheathing as indicated by Note in Table 6.1, and shall produce the required fire- resistance rating when tested in accordance with ASTM E119 listed in the Schedule. When the material is to be exposed to the weather, the material shall be further identified to indicate that there is not an increase in the listed flame spread classification after being weathered in accordance with ASTM D2898 listed in the Schedule. Fire-retardant treated wood subjected to high humidity conditions shall be identified to indicate the treated wood has a moisture content of not over 28 percent when tested in accordance with ASTM D3201 listed in the Schedule at 92 percent relative humidity.

12.3.6 FLAME SPREAD AND FLAME RESISTANCE TESTS

12.3.6.1 General: All materials which are required to restrict the spread of flame or to be flame-resistant under the provisions of this code, including but not limited to interior finish materials, fire-retardant treated wood, tents and tarpaulins, and interior hangings and decorations, shall meet the requirements for their respective use and classifications as determined by the applicable test procedures listed in this section.

12.3.6.2 Interior finish and trim material: All materials used for interior finish and trim shall be classified in accordance with ASTM E648 listed in the Schedule.

12.3.6.3 Interior floor finish materials: Interior floor finish materials which are judged by the code enforcement officer to represent an unusual hazard and are to be installed in exits, passageways and corridors shall be classified in accordance with ASTM E648 listed in the Schedule

12.3.6.4 Interior hangings and decorations: Interior hangings and decorations shall comply with Section 12.2.6.5 through to 12.2.6.8.

12.3.6.5 Acceptance criteria: Where required to be flame resistant under the provisions of this code, all materials used for artistic enhancement, decorations, draperies, curtains, scenery and hangings shall comply with this section. If treated to be flame resistant, these materials shall not generate smoke more dense than that given off by untreated wood or paper burning under comparable conditions when tested in the vertical flame test in accordance with NFi; PA 701 listed in the Schedule.

12.3.6.6 Limitation of approval: All approvals of organic decorative material shall be limited to one year. The owner or the owner's authorised agent shall file an affidavit with the Code Enforcement Officer certifying that the process and materials used comply with this code and

stating the date of treatment and the warranty period of effectiveness of the process.

12.3.6.7 Field test for decorative materials: The Code Enforcement Officer shall subject decorative materials, where required to be flame resistant, to a field test in accordance with Chapter 6 of NFIi;PA 701 listed in the Schedule .

12.3.6.8 Replacement of defective materials: All treated hangings, draperies, canvas and other decorative and tent materials that fail to meet the field test requirements shall be retreated or replaced by an approved installation.

12.3.7 FIRE RESISTIVE REQUIREMENTS

12.3.7.1 General: In buildings or parts thereof of the uses and types of construction herein specified, the general fire-resistive requirements of Table 6.1 and the height and area limitations of Table 11.2.0 shall be subject to the exceptions and modifications described in Section 12.2.7.1 and 12.2.7.6.

12.3.7.2 Use Groups B, G and H: Buildings of Use Group B, G and H shall comply with the special fire-resistive requirements of Section 12.2.7.3 through to 12.2.7.5.

12.3.7.3 Type 3A construction: The height limitation for buildings of Use Group H-2 of Type 3A construction shall be increased to six storeys and 22.5m where the first floor construction above the basement has fire-resistance rating of not less than 3 hours and the floor area is subdivided by 2-hour fire walls into fire areas of not more than 279m^2.

12.3.7.4 Type 2B construction: The height limitation for buildings of Use Group H-2 of Type 2B construction shall be increased to nine stories and 30m where the building is separated by not less than 15m from any other building on the plot and from interior plot lines, the exits are segregated in a fire area enclosed in a fire wall of 2-hour fire- resistance rating and the first floor construction has a fire-resistance rating of not less than 1 $^1/_2$ hours.

12.3.7.5 Use Groups B and G: The first floor of buildings of Type 2C, 3B or 5B construction shall not be occupied for Use Groups B and G, unless the floor/ceiling assembly and enclosure walls are protected to afford 1-hour fire-resistance rating and the exits from the residential floors are separately enclosed in accordance with the requirements of Section 12.2.

12.3.7.6 Interior partitions: In buildings or structures of other than Use Groups F and H of Types 1, 2A and 2B construction, partitions of a single thickness of wood or approved composite panels, and glass or other approved materials of similar combustible characteristics, are permitted to subdivide rooms or spaces into offices, entry areas, or other similar compartments, provided they do not establish a corridor serving an occupant load of more than 30 in areas occupied by a single tenant and do not exceed 465m^2; between fire separation assemblies or fire walls. The maximum allowable compartment size shall be increased to 697.5m^2 where subdivided with fire-retardant treated wood complying with Section 12.2.5.

12.3.8 EXTERIOR WALLS

12.3.8.1 General: All exterior walls shall comply with the applicable provisions of this Code and with the fire-resistance rating requirements of this section and Section 6.1, except as provided in Section 12.2.8.3 for open parking structures.

12.3.8.2 Exception: The provisions of Sections 12.2.8.4 and 12.2.8.9 shall not apply to exterior walls which face buildings on the same plot when the buildings are such that, if combined into one structure, the resulting building would otherwise comply with the height and area limits of Section 11.2.0 (Section 11.2.1).

12.3.8.3 Omission of exterior walls: The provisions of this Code shall not be deemed to prohibit the omission of exterior walls for all or part of a storey where the provisions of Section 12.2.8.4 do not require a non-load-bearing exterior wall to provide a fire- resistance rating. Except as otherwise specifically permitted in Section 12.2.14.5, the piers, columns

and other structural elements within the open portion shall be constructed with the fire-resistance rating required for exterior bearing walls in Table 6.1. Open parking structures erected without exterior walls shall have an enclosure wall having a fire-resistance rating of not less than 2 hours without openings when located with a fire separation distance of less than 1.8 meters from an interior plot line.

12.3.8.4 Fire resistance ratings: The fire resistance rating of exterior walls shall comply with Table 12.2.8.4. Load-bearing exterior walls with a fire separation distance of greater than 1.5m shall be rated for exposure to fire from the inside. The fire-resistance rating of exterior walls with a fire separation distance of 1.5m or less shall be rated for exposure to fire from both sides.

12.3.8.5 Wall height: The wall shall extend the full height of the building and shall be constructed so that it will remain in place for the duration of time indicated by the required fire-resistance rating.

12.3.8.6 Automatic fire suppression: In buildings protected throughout with an approved automatic fire suppression system, the required fire-resistance rating of nonload bearing exterior walls shall be reduced by one hour. This reduction shall not apply to buildings of Use Group E.

12.3.8.7 Noncombustible construction exemptions: One-storey buildings of Type 2C construction which do not exceed 279m^2 in area shall be exempted from all protected exterior wall requirements. This exemption shall not apply to buildings of Use Group A, C, E and F.

12.3.8.8 Unexposed surface temperature: Where protected openings are not limited by Table 12.2.8.5, the limitation on the rise of temperature on the unexposed surface or exterior walls as required by ASTM E119 listed in the Schedule shall not apply. Where protected openings are limited by Table 12.2.8.4, the limitation on the rise of temperature on the unexposed surface of exterior walls as required by ASTM E119 listed in the Schedule shall not apply provided correction is made for radiation from the unexposed exterior wall surface in accordance with the following formula.

Ac = A+ (Af x Feo)

Where

Ae = equivalent area of protected openings.

A = actual area of unprotected and protected openings.

AF = area of exterior wall surface in the storey under consideration exclusive of openings, on which the temperature limitations of ASTM E119 for walls is exceeded.

Feo = an “equivalent opening factor” derived from Figure 12.2.8.8 Graph of fig. 12.2.8.8 below.

FIGURE 12.9 EQUIVALENT OPENING FACTOR

12.3.8.9 Openings: The maximum area of unprotected or protected openings permitted in an area of exterior wall in any storey shall not exceed the values given in Table 12.2.8.4. Where both unprotected and protected openings are used in the exterior wall in any story, the total area of the openings shall comply with the following formula.

A + Au < 1.0

a au

Where A = actual area of protected openings, or the equivalent area of protected openings Ae (see Section 12.2.8.4)

a = allowable area of protected opening.

Au = actual area of unprotected openings.

au = allowable area of unprotected openings.

TABLE 12.10

MAXIMUM PERCENT AREA OF EXTERIOR WALL OPENINGS b.c

Classification of opening	0 to 0.9	Greater than 0.9 to 1.5	Greater than 1.5 to 3.0	Greater than 3.0 to 4.5	Greater than 4.5 to 6.0	Greater than 6.0 to 7.5	Greater than 7.5 to 9.0	Greater than 9.0
Unprotected	NP	NPa	10%	15%	25%	45%	70%	NIL
Protected	NP	15%	25%	45%	75%	NIL	NIL	NIL

Note a: For buildings of Use Group H-3, the maximum percentage of unprotected exterior wall openings shall be 5 percent.

Note b: This table assumes that the openings are reasonably uniformly distributed. Where openings are not reasonably uniformly distributed, the portion of the wall used to calculate compliance with Table 29.8.4 shall be approved.

Note c: NP = not permitted: NL - no limit.

12.3.8.10 Automatic fire suppression: In buildings equipped throughout with an approved automatic fire suppression system, other than buildings, or portions thereof, of Use Group E, the area of unprotected openings shall not exceed the tabulated limits for protected openings.

12.3.8.11 First storey: In all buildings, other than buildings, or portions thereof, of Use Group E, unlimited unprotected openings are permitted in the first storey of exterior walls facing a street and having a fire separation distance of greater than 4.5m.

12.3.8.12 Vertical separation of openings: Openings in exterior walls in adjacent storeys shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 1.5m of each other horizontally and the opening in the lower storey is not a protected opening in accordance with Section 12.2.9. Such openings shall be separated vertically at least 90 centimeters by spandrel girders, exterior walls, or other similar assemblies with a fire resistance of at least 1 hour or by flame barriers which extend horizontally at least 75 centimeters beyond the exterior wall. Flame barriers shall also have a fire resistance rating of at least 1 hour. The unexposed surface temperature limits specified in ASTM E119 listed in the Schedule shall not apply to the flame barriers or vertical separation unless otherwise required by the provisions of this code.

12.3.8.13 Exception

1. This section shall not apply to buildings of three storeys or less in height.
2. This section shall not apply to buildings equipped throughout with an approved automatic fire suppression system.

12.3.8.14 Vertical exposure: Approved protective shall be provided in every opening which is less than 4.5m vertically above the roof of an adjoining building or adjacent structure that is within a horizontal fire separation distance of 4.5m of the wall in which the opening is located unless such roof construction affords a fire resistance rating of not less than 1 hour.

12.3.8.15 Continuity of exterior walls: Exterior walls required to be fire resistance rated by

Section 12.2.8.4 because of fire separation distance, shall be continuous from the foundation to not less than 75 centimeters above the roof surface.

12.3.8.16 Exceptions

1. Where the roof deck or sheathing is constructed of approved noncombustible materials or of fire-retardant treated wood for a distance of not less that 1.2m from the wall, and the roof covering has a minimum of a Class C rating, the exterior wall shall be permitted to stop at the underside of the roof deck or sheathing.
2. Exterior walls in buildings of Use Group H-3 or buildings not exceeding 93m^2 in area.
3. Exterior walls of a building where the roof has an angle of more than 20 degrees (0.35 rad.) with the horizontal.

12.3.9 EXTERIOR OPENING PROTECTIVES

12.3.9.1 Where required: Exterior opening protectives shall be provided in all exterior wall openings required to be protected by Section 12.2.8.

12.3.9.2. Outside sprinklers: Approved outside automatic sprinklers used for the protection of exterior openings shall be installed in accordance with NFiPA 13 listed in the Schedule, shall have an automatic source of water supply and shall be provided with a fire department connection.

12.3.9.3 Automatic protection: Approved fire protective assemblies shall be fixed, self-closing or equipped with approved automatic closing devices meeting the requirements of this section and Section 12.2.4, 12.2.19, 12.2.20 and 12.2.21.

12.3.9.4 Fire resistance rating: An exterior opening in a wall required by Section 12.2.8 to have a fire resistance rating greater than 1 hour shall be protected with an assembly having a fire-resistance rating of not less than $1^1/_2$ hours. An exterior opening in a wall required by Section 12.2.8 to have a fire-resistance rating of 1 hour shall be protected with an assembly having a fire-resistance rating of not less than $^3/_4$ hour.

12.3.9.5 Unprotected openings: Where protected openings are not required by Section 12.2.8, windows and doors shall be constructed of any approved materials. Glazing shall conform to the requirements of section 10.

12.3.10 FIRE WALLS AND PARTY WALLS

12.3.10.1 General: Walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall, and shall be constructed of any approved non-combustible materials providing the required strength and fire-resistance rating specified in Table 6.1 for the type of construction, but not less than the fire grading of the Use Group specified in Table 12.2.3. Strength stability shall comply with the provisions of (Chap. 3 of Chapters on ext. walls).

12.3.10.2 Cutting walls: A wall 20 centimeters of less in thickness shall not be cut for chases or socketed for insertion of structural members subsequent to erection.

12.3.10.3 Hollow walls: When combustible members frame into hollow walls or walls of hollow units, all hollow spaces shall be solidly filed for the full thickness of the wall and for a distance not less than 10 centimeters above, below and between the structural members with noncombustible materials approved for firestopping in Section 12.2.23. The wall shall be not less than the minimum thickness specified in NBS 211 for reinforced masonry, NBS H74 for reinforced masonry, BIA Building Code Requirements for Engineered Brick Masonry, NCMA TR75-B or ACI 1531 listed in the Schedule.

12.3.10.4 Combustible insulation: The Code Enforcement Officer shall permit the

application of cork, fiber board or other combustible insulation where laid up without intervening air spaces and attached directly to the face of the wall, and protected on the exposed surface as provided in Sections 10.22 and 12.2.30.

12.3.10.5 Continuity of walls: In all buildings or structures, walls shall be continuous from foundation to 80 centimetres above the roof surface, except as provided in Section 29.10.6 through to 29.10.8. Fire walls shall be made smoke-tight at their junction with exterior walls. In exterior walls construction employing studs, the wall shall extend through the stud space to the exterior sheathing.

12.3.10.6 Non-combustible roofs: The wall is permitted to terminate at the underside of the roof deck where the roof is of noncombustible construction and is properly firestopped at the wall.

12.3.10.7 Combustible roofs: The wall is permitted to terminate at the underside of the roof deck in Types 3, 4, and 5 construction where all of the following conditions below are met.

1. The wall is properly firestopped at the deck.
2. The roof sheathing or deck is constructed of approved noncombustible materials, or fire-retardant treated wood, for a distance of 1.2 meters on either side of the wall.
3. Combustible material does not extend through the wall.
4. The roof covering has a minimum of a Class C rating.

12.3.10.8 Non-combustible frame: The wall shall not be supported on the structural frame in buildings of noncombustible construction unless such supporting frame has a fire-resistance rating at least equal to that required for the wall.

12.3.10.9 Offset fire walls: Where fire walls are offset at intermediate floor level in protected skeleton-frame construction, the offset floor construction and the intermediate wall supports shall be constructed of noncombustible materials with a fire-resistance rating not less than that required for the fire wall.

12.3.11 FIRE WALL OPENINGS

12.3.11.1 General: Openings in fire walls shall not exceed the limits in size and area herein prescribed and the opening protectives shall conform to the provisions of Sections 12.2.4 and 12.2.9.

12.3.11.2 Size of opening: Except in sprinklered buildings, an opening through a fire wall shall not exceed 11.16m^2 in area, and the aggregate width of all openings at any floor level shall not exceed 25 percent of the length of the wall.

12.3.11.3 First storey: Where the entire first storey areas on both sides of a fire wall are provided with an approved automatic fire suppression system complying with the requirements of Section 7.3 the maximum size of openings on the first storey of the building designed for the passage of trucks shall be increased to 22.32m^2 in area with a minimum distance of 90 centimeters between adjoining openings. Such openings shall be protected with approved automatic opening protectives of 3-hour fire-resistance rating, and provided with an approved water curtain in addition to all other requirements.

12.3.11.4 Opening protectives: Every opening in a fire wall shall be protected with an approved automatic opening protectives assembly as herein required or the approved labelled equivalent in accordance with Section 12.2.18.3, except as provided in Section 7.15.2 for horizontal exit openings.

12.3.11.5 Hold-open devices: Heat actuated hold-open devices shall be installed on both sides of the wall, interconnected so that the operation of any single device will permit the door to close. Heat detectors or fusible links shall be installed at the door opening and at the

ceiling in conformance with NFiPA 80 listed in the Schedule for the particular type of door to be installed. Swinging fire doors, where the ceiling is less than 90 centimeters above each side of the opening, are permitted to be actuated by a single link incorporated in the hold-open arm of an approved automatic door closer. Doors opening in a means of egress shall be closed by an approved door closer or shall be closed by actuation of a smoke detector located in conformance with NFiPA 80 listed in the Schedule.

12.3.12 FIRE SEPARATION WALLS

12.3.12.1 General: Fire separation walls for subdividing purposes shall be constructed of the types of materials and shall have the minimum fire-resistance rating as prescribed by Table 6.1 for the type of construction, except as provided in Section 12.2.12.4.

12.3.12.2 Mixed uses: When a building contains more than one occupancy, and each part of the building is separately classified as to use, the mixed uses shall be completely separated with fire separation walls as specified in Section 5.2.1.1.

12.3.12.3 Multiple single-family dwellings: Single-family dwelling units (Use Group H- 3) located above or adjacent to other single-family dwelling units (Use Group H-3) shall be considered as one building classified as Use Group H-3 for the purpose of determining the applicable provisions of this Code, provided each dwelling unit is completely separated from the adjacent dwelling unit(s) by fire separation wall(s) and floor/ceiling assemblies of not less than 1-hour fire-resistance rated construction and each unit has independent means of egress.

12.3.12.4 Exits: Fire separation walls required for the enclosure of exits and areas of refuge shall be constructed of masonry, reinforced concrete or any other approved noncombustible materials having the minimum fire-resistance rating prescribed by Table 6.1. Such walls, where permitted to be of combustible materials by Section 12.2.17, shall comply with Section 12.2.12.4.1.

12.3.12.5 Combustible stair enclosures: Where permitted by Section 7.17.21, combustible stair enclosures shall be constructed of approved combustible assemblies protected with component materials to afford the required fire-resistance ratings, shall be continuous through combustible floor construction; and shall provide an unbroken fire barrier in combination with protected floors, ceiling and fire doors, separating the exits from the unprotected areas of the building. Such enclosures shall be firestopped to comply with Section 12.2.23.

12.3.12.6 Openings for lighting: Openings for the purpose of providing light in combustible stair enclosures are permitted to be protected with wired glass with single panes not more than 0.23m^2 in area and a total area in one storey of not more than
0. 46m^2. Such light panels shall comply with the provisions of Section 12.2.21, and shall be contained in stationary sash and frames of steel or other approved non-combustible material.

12.3.12.7 Openings: Exit doors located in fire separation walls shall be limited to a maximum aggregate width of 25 percent of the length of the wall and the maximum area of any single opening shall not exceed 4.46m^2.

12.3.12.8 Protectives: All opening protectives in fire separation walls shall comply with the provisions of Section 12.2.4 and shall have the minimum fire-resistance rating as set forth in Section 12.2.18.

12.3.12.9 Continuity: All fire separation walls shall extend from the top of the fire- resistance rated floor/ceiling assembly below to the fire-resistance rated floor/ceiling assembly above, unless otherwise provided for in this code, and shall be securely attached thereto. Where these walls enclosed required exits, areas of refuge and shafts, or where these walls

separate mixed uses, they shall be continuous through all concealed spaces such as the space above a suspended ceiling, and they shall be constructed tight to the underside of the floor slab or roof deck above. The supporting construction shall be protected to afford the required fire-resistance rating of the wall supported except for exit access corridor walls in buildings of Types 2C, 3B and 5B construction. All hollow vertical spaces shall be fire-stopped at every floor level as required in Section 12.2.23.

12.3.12.10 Exterior walls: Where exterior walls serve as a part of a required fire- resistance rated resistance rated enclosure requirements shall not apply.

12.3.13 SMOKE BARRIERS

12.3.13.1 Where required: Smoke barriers shall be provided as required in Section 8.11.6 for buildings of Use Group F-2 and Section 8.12.8 for buildings of Use Group F-3.

12.3.13.2 Construction: Smoke barriers shall have a fire-resistance rating of not less than 1 hour. Such barriers shall form an effective membrane continuous from outside wall to outside wall and from floor slab to floor or roof deck above, including continuity through all concealed spaces, such as those found above suspended ceilings, and including interstitial structural and mechanical spaces. Transfer grilles, whether equipped with fusible link-operated dampers or not, shall not be used in these partitions. The supporting construction shall be protected to afford the required fire-resistance rating of the wall supported in buildings of other than Types 2C, 3B and 5B construction.

12.3.13.3 Exception

1. Smoke barriers are not required in interstitial spaces when such spaces are designed and constructed with ceilings that provide resistance to the passage of fire and smoke equivalent to that provided by smoke barriers.
2. Smoke barriers in buildings of Use Group F-3 are permitted to be constructed of nominal 2.5mm thick steel plate.

12.3.13.4 Doors: Doorways separating corridors in adjoining smoke compartments shall be equipped with a pair of swinging type doors, each swinging in a direction opposite from the other, and the minimum clear width of each door shall be 1.1 meters for corridors used for the movement of beds and 80 centimeters for other corridors. Other doors in smoke barriers shall be of the swinging type of required width.

12.3.13.5 Exception: Horizontal sliding doors complying with Section 8.12 are permitted to be used in smoke barriers in buildings of Use Group F-3.

12.3.13.6 Opening protectives: Doors in smoke barriers shall have a fire-resistance rating of not less than 20 minutes when tested in accordance with ASTM E152 listed in the Schedule, without the hose stream and labelled by an approved agency. Double egress corridor doors shall have vision panels of 6mm thick labelled wired glass mounted in approved steel frames. Vision panels provided in other doors in smoke barriers shall be 6mm thick labelled wired glass mounted in approved steel frames. The glass area of the vision panels shall be limited to 0.84m^2 for each door. The doors shall close the openings with only the clearance necessary for proper operation under self-closing or automatic closing and shall be without undercuts, louvres or grilles. Rabbets or astragals are required at the meeting edges of double egress doors, and stops are required on the head and jambs of all doors in smoke barriers. Positive latching devices are required on double egress corridor doors.

12.3.13.7 Exception

1. Protection at the meeting edges of doors and stops at the head and sides of door frames shall not be required in buildings equipped throughout with an approved engineered smoke control system. The engineered smoke control system shall respond automatically, preventing the transfer of smoke across the barrier.

2. In buildings of Use Group F-2 positive latching devices are not required on double egress doors, and center mullions are prohibited.

12.3.13.8 Door closers: Doors in smoke barriers shall be self-closing or shall be provided with approved door hold-open devices of the fail-safe type which shall release the doors, causing them to close upon the actuation of smoke detectors as well as upon the application of a maximum manual pull of 244N against the hold-open device.

12.3.13.9 Smoke damper: An approved damper designed to resist the passage of smoke shall be provided at each point a duct penetrates a smoke barrier. The damper shall close upon detection of smoke by an approved smoke detector located within the duct.

12.3.13.10 Exception

1. In lieu of an approved smoke detector located within the duct, ducts which penetrate smoke barriers above smoke barrier doors required by Section 12.2.13.6 shall have the approved damper arranged to close upon detection of smoke by the local device designed to detect smoke on either side of the smoke barrier opening.
2. Dampers are not required in buildings equipped throughout with an approved engineered smoke control system.
3. Dampers are not required where the openings in ducts are limited to a single smoke compartment and the ducts are of steel construction.

12.3.14 FIRE RESISTANCE RATING OF STRUCTURAL MEMBERS

12.3.14.1 Requirements: The fire-resistance rating of structural members and assemblies shall comply with the requirements for the type of construction and not less than the rating required for the fire-resistance rated assemblies supported, except as provided in Section 12.2.12.9 for support of exit access corridor walls and in Section 12.2.12.9 for support of smoke barriers.

12.3.14.2 Protection of structural members: Columns, girders trusses, beams, lintels, or other structural members that are required to have a fire-resistance rating and that support more than two floors or one floor and roof, or support a bearing wall or a nonbearing wall more than two storeys high, shall be individually protected on all sides for their length or height with materials having the required fire-resistance rating. All other structural members required to have a fire-resistance rating shall be protected by individual encasement, by a membrane or ceiling protection as specified in Section 12.2.15, or by a combination of both.

12.3.14.3 Embedments and enclosures: Pipes, wires conduits, ducts or other service facilities shall not be embedded in the required fire protective covering of a structural member that is required to be individually encased.

12.3.14.4 Impact protection: Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise, or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other non-combustible material to a height adequate to provide full protection, but not less than 1.5meters from the finished floor.

12.3.14.5 Exterior structural members: Structural members located in exterior walls or along the outer lines of a building or structure shall be protected as required by Table 6.1 for exterior bearing walls for the type of construction involved and shall be protected against corrosion by an approved method complying with see section (on steel). The interior faces of exterior structural members shall be protected with covering of not less than the required fire-resistance rating specified for interior structural members in Table 6.1. Where a fire-resistance rating is required in Table 6.1 for exterior bearing walls in buildings of Type 2C, 3B

and 5B construction, the interior faces of any exterior structural member of such buildings shall be protected to provide a fire-resistance rating not less than that required for exterior bearing walls.

12.3.14.6 Bottom flange protection: Fire protection is not required for the bottom flange of lintels, shelf angles and plates not a part of the structural frame or with a span of 1.8 meters or less.

12.3.14.7 Stone lintels: The use of stone lintels on spans exceeding 1.2 meters shall not be permitted, unless supplemented by fire-resistance rated structural members or masonry arches of the required strength to support the superimposed loads.

12.3.15 FIRE RESISTANCE RATED FLOOR/ROOF/CEILING ASSEMBLIES

12.3.15.1 Installation of ceiling fixtures: Openings to accommodate non-combustible piping, ducts or electric outlets in fire-resistance ceilings which constitute an integral part of a floor or roof assembly to meet a required fire-resistance rating shall not be greater in aggregate area than 0.065m^2 in any 9.30m^2 of ceiling area. The fixtures and attachments shall be installed so as not to decrease the fire-resistance rating of the assembly. All duct openings shall be protected with approved non-combustible ceiling dampers.

12.3.15.2 Exception: Ceiling dampers shall not be required when fire tests show that the integrity of the fire-resistance rated assembly is maintained without the ceiling dampers.

12.3.15.3 Ceiling panels: Where the weight of lay-in ceiling panels, used as part of fire-resistance rated floor/ceiling or roof/ceiling assemblies, is not adequate to resist an upward force of 4.88kg/m^2, wire or other approved devices shall be installed above the panels to prevent vertical displacement under such upward force.

12.2.15.4 Unusable space: In an assembly required to have a 1 hour fire-resistance rating, the ceiling membrane of a tested assembly is not required to be installed over unusable space, or the flooring is not required to be installed where unusable space occurs above.

12.3.15.5 Openings in fire-resistance rated floors: The required fire-resistance rating of floor or floor/ceiling assemblies shall be maintained where a penetration is made for electrical, mechanical, plumbing and communication conduits, pipes and systems.

12.3.16 ROOF CONSTRUCTION

12.3.16.1 General: Roofs shall be constructed of materials or assemblies of materials designed to afford the fire-resistance rating required by Table 6.1 as herein modified.

12.3.16.2 Stadia: The roof construction, including beams, trusses, framing, arches and roof decks, enclosing stadia of Type 1 or Type 2 construction shall be of non-combustible materials without a specified fire-resistance rating or of Type 4 construction.

12.3.16.3 Roofs 6 meters or higher: Where every part of the structural framework of roofs in buildings of Type 1 or Type 2 construction is 6 meters or more above the floor immediately below, omission of all fire protection of the structural members is permitted, including the protection of trusses, roof framing and decking.

12.3.16.4 Roofslabs, arches and decking: Where the omission of fire protection from roof trusses, roof framing and decking is permitted, roofs in buildings of Type 1 and Type 2 construction shall be constructed of non-combustible materials without a specified fire-resistance rating, or of Type 4 construction in building not over five stories 19.5m in height.

12.3.16.5 Firestopping: Firestopping of ceiling and attic spaces shall be provided as required by Section 12.2.23.

12.3.17 VERTICAL/SHAFTS

12.3.17.1 General: The provisions of this Section shall apply to all vertical shaft enclosures, except as provided for stairway enclosures in Sections 10.17.21 and 29.12, refuse chutes in (Chapter 27- Waste and Linen), and elevator and dumbwaiter hoist ways in Section 9.1.8.10.

12.3.17.2 Open shaft enclosures: The enclosing walls of shafts that are open to the outer air at the top shall be constructed of materials specified in (see section on Materials, ext. walls) for exterior walls of buildings and structures of the required fire-resistance rating specified in Table 6.1.

12.3.17.3 Covered shaft enclosures: The enclosing walls of interior covered shafts shall be constructed of approved materials with the fire-resistance rating specified in Table 6.1. The tops of covered shafts shall comply with Section 12.2.17.7.

12.3.17.4 Exception

1. Shafts in buildings of Use Group H-3 and serving a single dwelling unit are not required to be enclosed.
2. The minimum required fire-resistance rating for shaft enclosures connecting three floor levels or less shall be 1 hour.

12.3.17.5 Duct and pipe shafts: In all buildings other than buildings of Use Group H-3, vertical pipes arranged in groups of two or more which penetrate two or more floors and occupy an area of more than 0.093m^2, and vertical ducts which penetrate two or more floors, shall be enclosed by construction having the fire-resistance rating specified in Table 6.1. All combustible pipes and ducts connecting two or more stories shall be enclosed as indicated herein.

12.3.17.6 Shaft alternative: Where a shaft is required by Section 12.2.17.5, a shaft shall not be required where a pipe penetrate protection system tested according to ASTM E814 listed in the Schedule, is provided and has an F-rating and T-rating of 1 hour but not less than the required fire-resistance rating of the assembly being penetrated. The test shall be conducted with a minimum positive pressure differential of 7.5p (0.03 inches of water column).

12.3.17.7 Top enclosure: A shaft that does not extend to the underside of the roof deck of the building shall be enclosed with top construction of the same strength and fire- resistance rating as the floors of the building or structure in which it occurs, but not less than that of the fire-resistance rating of the shaft enclosure.

Bottom enclosure: All shafts that do not extend to the bottom of the building or structure shall be enclosed at the lowest level with construction of the same strength and fire-resistance rating as the lowest floor through which it passes, but not with a fire-resistance rating less than that of the shaft enclosure.

12.3.17.8 Shaft openings: Openings other than those necessary for the purpose of the shaftway shall not be constructed in shaft enclosures. All openings shall be protected with approved fire doors, fire windows or fire dampers complying with the provisions of Section 12.2.9, 12.2.18, 12.2.19 and 12.2.20.

12.3.17.9 Shaft wall penetrations: Non-combustible pipe, tube and conduit penetrating a shaft wall shall have approved firestopping installed around the penetrating pipe, tube and conduit. Such firestopping shall be capable of maintaining the integrity of the shaft wall when subjected to the test temperatures prescribed in ASTM E119 listed in the Schedule for the duration of time equal to the rating of the assembly to be penetrated and then subjected to the hose stream test as prescribed in ASTM E119 listed in the Schedule. Each penetration of a shaft wall by a combustible pipe, tube, or concuit shall be protected according ASTM E119 listed in the Schedule. The through-penetrating firestop system tested according to ASTM E814 shall have an F rating and T rating not less than the required fire-resistance rating of the shaft wall penetrated. The system tested according to ASTM E119 shall have a fire-resistance rating not less than the required fire- resistance rating of the shaft wall penetrated. The ASTM E814 test shall be conducted with a minimum positive pressure differential of 7.5 P (0.03 inches water column).

12.3.18 FIRE DOOR ASSEMBLIES

12.3.18.1 Fire door assemblies: Approved fire door assemblies as defined in this Code shall be constructed of any material or any material or an assembly of component materials which meets the test requirements of ASTM E152 listed in the Schedule and the fire-resistance rating herein required in Table 12.2.18, unless otherwise specifically provided for in this Code.

12.3.18.2 Twenty-minute doors: One-third hour (20-minute) fire doors shall be tested in accordance with ASTM E152 listed in the Schedule without the hose stream test.

12.3.18.3 Labelled protective assemblies: All fire door assemblies shall be labelled by an approved agency. Labelled protective assemblies meeting the requirements of this section or UL 10A, 14B and 14C for tin-clad fire door assemblies, and NFiPA 80 listed in the Schedule, shall be approved for use as provided for in this Code.

12.3.18.4 Labelled requirements: Fire doors shall have a label or other identification showing the name of the manufacturer, the fire-resistance rating and, where required for stairway fire doors by Section 7.17.17, the maximum transmitted temperature end point. Such label shall be approved and shall be permanently affixed. The label shall be applied at the factory where fabrication and assembly are done. Inspection shall be made by an approved agency.

12.3.18.5 Oversize doors: Approval of doors which cannot be labelled because of size shall be based on a certificate of inspection furnished by an approved testing agency for such oversized doors. The certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

12.3.18.6 Multiple doors in fire walls: Two doors, each with a fire-resistance rating of 1 $^1/_2$ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire-resistance rating to one 3 hour fire door.

12.3.18.7 Glass panels: Wired glass panels shall be permitted in fire doors within the limitations of Section 12.2.21 and as herein specifically prescribed.

12.3.18.8 Closing devices: Except as otherwise provided for openings in fire wall and fire separation walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof. The use of rate-of-rise heat-actuated devices, fusible links, or smoke detection devices on doors that are normally required to be open for ventilation or other specified purpose shall be permitted when the safety of the occupants is not endangered thereby.

12.3.18.9 Smoke-actuated closing devices: Where fire doors open onto an exit access, exit or horizontal exit and are not self-closing, door closers shall be smoke- actuated.

12.3.18.10 Closing time: Doors which are automatic-closing by smoke detection or by rate-of-rise detection, or self-closing, shall not have a delay in closing or reclosing of more than 10 seconds.

TABLE 12.11 FIRE DOOR FIRE-RESISTANCE RATINGS

Location	Fire-resistance rating in hours
Exit access corridor enclosures of 1-hour construction	1
Fire wall and fire separation wall of 3 or more hour construction	3
Fire walls, fire separation walls and exit enclosure of 1 / or 2-hour construction	2
Shaft and exit enclosures of 1 hour construction	1
Shaft enclosures and elevator hoistways of 2-hour construction	2
Other fire separation walls of 1-hour construction	1

Note a: For testing requirements, see Section 12.3.18.2

12.3.19. FIRE WINDOWS AND SHUTTERS

12.3.19.1 Fire-resistance rating: Approved assemblies of fire windows and fire shutters shall meet the test requirements of ASTM E163 listed in the Schedule. Fire windows shall be in the fixed closed position or be automatic-closing.

12.3.19.2 Exception: Steel window frame assemblies of 3mm minimum solid section or of not less than nominal 1.2mm thick formed shaft steel members fabricated by pressing, miltering, riveting, interlocking or welding and having provision for glazing with 6mm wired glass as required in Section 12.2.21 when securely installed in the building construction and glazed with 6mm labeled wired glass, shall be deemed to meet the requirements for a 3/4-hour fire window assembly.

12.3.19.3 Window mullions: All metal mullions which exceed a nominal height of 3.6m shall be protected with materials to afford the same fire-resistance rating as required for the wall construction in which the protective is located.

12.3.19.4 Swinging fire shutters: When fire shutters of the swinging type are used in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguished marks or letters not less than 15 centimeters high.

12.3.19.5 Rolling fire shutters: When fire shutters of the rolling type are used, they shall be of approved counterbalanced construction that can be readily opened from the outside.

12.3.20 FIRE DAMPERS

12.3.20.1 Approval: Fire dampers shall comply with UL 555 listed in the Schedule and shall bear the label of an approved agency. Fire dampers shall be installed in accordance with the manufacturer's installation instructions. Fire dampers shall be capable of maintaining the integrity of the required fire-resistance rating.

12.3.20.2 Where required: Fire dampers shall be provided at locations where air distribution systems penetrate assemblies required to have a fire-resistance rating.

12.3.20.3 Exception: Fire dampers are not required:

1. Where proper fire tests have shown that fire dampers are not necessary to maintain the integrity of the fire-resistance rated assembly.
2. Where an exhaust duct penetrates a fire-resistance rated shaft wall and the sub duct

extends not less than 55 centimetres vertically upward.

3. At penetrations of tenant separation and corridor walls in buildings equipped throughout with an approved automatic fire suppression system.
4. Where the ducts are constructed of steel and are part of an engineered smoke removal system.
5. At penetrations of corridor walls when the ducts are constructed of steel and do not have openings which communicate the corridor with adjacent spaces or rooms.
6. At penetrations of a roof assembly when ducts are open to the atmosphere.
7. In hazardous exhaust systems as defined in the mechanical code listed in the Schedule.
8. Where ceiling dampers are installed in accordance with Section 12.2.15.1.

12.3.20.4 Accessibility: Fire dampers shall be accessible

12.3.21 WIRED GLASS

12.3.21.1 Maximum size: One-quarter inch wired glass, which has been labelled for use in approved labelled opening protectives, shall conform to the size limitations set forth in Table 12.2.21.

TABLE 12.12 LIMITING SIZE OF WIRED GLASS PANELS

Rating, opening	Max. area m^2	Max. height m	Max. width m
3-hour	0	0	0
$1^1/_2$-hour doors in exterior walls	0	0	0
1-and $1^1/_2$-hour	06452	8.38	2.54m
$^3/_4$-hour	8362	13.71	13.71m
Fire windows	8362	13.71	13.71m

12.3.21.2 Fire walls: Wired glass in fire doors located in fire walls shall be prohibited except that where serving as a horizontal exit, a self-closing swinging door shall be permitted to have a vision panel of not more than $0.065m^2$ without a dimension exceeding 25 centimeters.

12.3.21.3 Fire separation walls: Wired glass vision panels shall not be used in fire doors of 1 /-hour fire-resistance rating intended for use in fire separation walls, unless the glass panels are not more than $0.065m^2$ in area.

12.3.21.4 Exit and elevator protectives: Unless specifically required by Section 7.2 to be solid in such locations where unusually hazardous conditions prevail, approved wired glass vision panels used in fire doors in elevator and stairway shaft enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator or stairway and shall not exceed the size limitations specified in Table 12.3.21.

12.3.21.5 Fire separation walls: One-quarter inch wired glass panels shall not be used in fire separation walls used for subdividing purposes as set forth in Section 12.2.12 when the required fire-resistance rating of the wall exceeds 1 hour. The maximum size of such panels shall not exceed the limitations for %-hour door.

12.3.22 FIRE-RESISTIVE REQUIREMENTS FOR PLASTER

12.3.22.1 Thickness of plaster: The required thickness of fire-resistance rated plaster

protection shall be determined by the prescribed fire tests for the specified use and type of construction and in accordance with the provision of (refer Section on gypsum and plaster) for interior plastering and (refer section on gypsum and plaster) for exterior plastering. The thickness in all cases shall be measured from the face of the lath when applied to gypsum lath or metal lath.

12.3.22.2 Plaster equivalents: For fire-resistive purposes, 13mm or unsanded gypsum plaster shall be deemed equivalent to 19mm or one-to three sanded gypsum or 25mm portland noncombustible plastering base and furring.

12.3.22.3 Double reinforcement: Except in solid plaster partitions, or when otherwise determined by the prescribed fire tests, plaster protection more than 25mm in thickness shall be reinforced with an additional layer of approved lath embedded at least 19 mm from the outer surface and fixed securely in place.

12.3.22.4 Plaster alternates for concrete: In reinforced concrete construction, gypsum or portland cement plaster is permitted to be substituted for 13mm of the required poured concrete protection, except that a minimum thickness of 10mm of poured concrete shall be provided in all reinforced concrete floors and 25mm in reinforced concrete columns in addition to the plaster finish. The concrete base shall be prepared in accordance with (refer section on gypsum and plaster).

12.3.23 FIRESTOPPING AND DRAFTSTOPPING

12.3.23.1 General: To prevent the free passage of flame and products of combustion through concealed spaces or openings in the event of fire, provisions shall be made to provide effective firestops as herein specified.

12.3.23.2 Firestopping materials: All firestopping shall consist of approved noncombustible materials or of materials of two thickness of 25mm lumber with broken lap- joint, or one thickness of 18.3mm plywood with joints backed by 18.3mm plywood, or of 50mm lumber installed with tight joints, shall be used in open spaces of wood framing.

12.3.23.3 Draftstopping materials: Draftstopping materials shall be not less than 13mm gypsum board, 19mm plywood or other approved materials adequately supported.

12.3.23.4 Integrity: The integrity of all firestopping and draftstopping shall be continuously maintained.

12.3.23.5 Required inspection: Firestopping and draftstopping shall not be concealed from view until inspected and approved.

12.3.23.6 Fire-stopping Required: Fire-stopping shall be provided in the locations specified in Section 12.3.23.7 through to 12.3.23.13.

12.3.23.7 Concealed wall spaces: In concealed spaces of stud walls and partitions, including furred or studded-off spaces of masonry or concrete walls, at the ceiling and floor or roof levels.

12.3.23.8 Connections between horizontal and vertical spaces: At all interconnections between vertical and horizontal spaces such occur at soffits over cabinets, drop ceilings, foyer ceiling and similar locations.

12.3.23.9 Stairs: In concealed spaces between stair stringers at the top and bottom of the run.

12.3.23.10 Ceiling and floor openings: At openings around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor levels, with noncombustible materials.

12.3.23.11 Architectural trim: In exterior cornices and other exterior architectural elements here permitted of combustible construction in Section 12.3.28 or when erected with combustible frames, at maximum intervals of 6 meters if non-continuous, they shall have

closed ends, with at least 10 centimeters of separation between sections.

12.3.23.12 Combustible finish and trim: In the space behind combustible trim and finish where permitted under this code and all other hollow spaces where permitted in fire-resistance rated construction at 3m intervals; or the space shall be solidly filled with noncombustible materials.

12.3.23.13 Concealed sleeper spaces: In concealed spaces formed by floor sleepers in areas of not more than 9.30m^2; or the space shall be solidly filled with noncombustible materials.

12.3.23.14 Draftstopping required: Draft stopping shall be provided in Types 3, 4 and 5 construction in the locations specified by Sections 12.3.23.15 and 12.3.23.20.

12.3.23.15 Floors: Where ceilings are suspended below solid wood joists or suspended or attached directly to the bottom of open web wood floor trusses, the space between the ceiling and the floor above shall be divided by providing draft stopping as specified in Section 12.3.23.16 through to 12.3.23.18.

12.3.23.16 Use Groups H-1 and H-2: In buildings of Use Groups H-1 and H-2 draftstopping shall be in line with the tenant separation walls when the walls do not extend to the floor sheathing above.

12.3.23.17 Use Groups H-3: In buildings of Use Group H-3, the space shall be divided into approximately equal areas not greater than 46.5m^2. The draft stopping shall be provided parallel to the main framing members.

12.3.23.18 Other use groups: In all other use groups, draft stopping shall be provided so that horizontal areas do not exceed 93m^2.

12.3.23.19 Exception: Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draft stopping is not required.

12.3.23.20 Attics and concealed spaces: Attics and concealed roof spaces shall be provided with draft stopping as specified in Sections 12.3.23.21 and 12.3.23.23.

12.3.23.21 Use Group H: In buildings of Use Group H, in the attic, mansard, overhang or other concealed roof space, above and in line with the tenant separation walls which do not extend to the roof sheathing above.

12.3.23.22 Exceptions

1. Where corridor walls provide a tenant separation, draftstopping shall only be required above one of the corridor walls.
2. Where flat roofs with solid joist construction are used, draftstopping over tenant separation walls is not required.
3. Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draft stopping is not required.
4. Draft stopping is not required in detached one-and two family dwellings.

12.3.23.23 Other use groups: In attics and concealed roof spaces, draft stopping shall be provided so that any horizontal area does not exceed 279m^2.

12.3.23.24 Exceptions

1. Where flat roofs with solid joist construction are used, draft stopping over tenant separation walls is not required.
2. Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draft stopping is not required.

12.3.23.25 Ventilation: Ventilation of concealed roof spaces shall be maintained in accordance with Section 9.2.7.

12.3.23.26 Access to attics: A readily-accessible access opening not less than 55cm by 75cm shall be provided to any attic area having a clear height of over 75cm. When doors or

other openings are provided in the draft stopping, they shall be self-closing and of approved materials specified in this section, and the construction shall be tightly fitted around all pipes, ducts or other assemblies piercing the draftstopping.

12.3.24 INTERIOR FINISH AND TRIM

12.3.24.1 General: Interior finish and trim of buildings shall conform to the requirements of this Section. Interior finish shall include all wainscoting and panelling or other finish applied structurally or for acoustical treatment, insulation, decoration or similar purposes. The use of a surface finish of paper or of material of not greater fire hazard than paper shall not be prohibited provided such finish does not exceed 1mm in thickness and is applied directly to a non-combustible base or substrate meeting the requirements of Section 12.3.5.2. Show windows in the first storey of buildings are permitted to be of wood or unprotected metal framing.

12.3.24.2 Exposed construction: These requirements shall not be considered as requiring the installation of interior finish, but where construction or fire protection materials are exposed in rooms or spaces used for the occupancies specified in Section
12.3.24.6, the hazard from rate of flame spread of such exposed materials shall not be greater than that of the interior finish permitted for such occupancy or use. Exposed portions of structural members complying with the requirements for Type-4 construction in Section 6.2.5 and Section 10.22 shall not be subject to interior finish regulation.

12.3.24.3 Smoke or gases: Interior finish materials shall not be permitted that have a smoke developed rating greater than 450 when tested in accordance with ASTM E84 listed in the Schedule. When restrictions are not otherwise established in this code, interior finish is not controlled, except that pyroxylin or similar finishes shall not be applied which, as dry films, produce excessive smoke or toxic fumes when exposed to fire.

12.3.24.4 Materials: Materials shall only be used for interior finish and trim as specifically provided in this Code for the occupancy or use of the space in which it is installed. Use of any material for floor finish, interior finish, and trim in a building of Type 1 or 2 construction within the scope permitted in this Section or Section 12.2.26 shall not declassify the building with respect to its type of construction.

12.3.24.5 Foam plastics: Foam plastics shall not be used as interior trim or finish except in compliance with this section and (refer Section on Materials and Plastics).

12.3.24.6 Interior finish: Interior finish of walls and ceilings shall have a flame spread rating not greater than that designated by the class prescribed for the various use groups listed in Table 12.3.2, when tested in accordance with the requirements of Section
12.3.6.2.

12.3.24.7 Basements: In buildings or structures other than Use Group H-3, Class I or II interior finish shall be used in all basements or other underground spaces from which there is not direct exit to the outside of the building, if subject to occupancy for any purpose other than storage or service facilities.

12.3.24.8 Maximum flame spread: Interior finish materials with flame spread classifications greater than 200 shall not be used in any room or space subject to human occupancy, except to such extent as specifically approved on the basis of a finding that such use does not significantly increase the life hazard.

12.3.24.9 Flame spread classifications: The classifications of interior finishes referred to herein correspond to flame spread ratings determined by ASTM E84 listed in the Schedule as follows: Class I flame spread, 0-25; Class II flame spread, 26-75; Class III flame spread, 76-200.

12.3.24.10 Rooms and enclosed spaces: Requirements for rooms or enclosed spaces are based upon spaces enclosed in partitions of the building or structure, and where fire-

resistance rating is required for the structural elements, the enclosing partitions shall extend from the floor to the ceiling. Partitions which do not comply with this shall be considered as enclosed spaces and the rooms or spaces on both sides thereof shall be counted as one. In determining the applicable requirements for rooms or enclosed spaces, the specific use or occupancy thereof shall be the governing factor, regardless of the use group classification of the building or structure. Where an approved automatic fire suppression system is provided, interior finish of Class II or Class III materials is permitted to be used in place of Class I or Class II materials respectively, where required in Table
12.3.24.6.

12.3.24.11 Interior trim: Baseboards, chair rails, mouldings, trim around openings and other interior trim, not in excess of 10 percent of the aggregate wall and ceiling areas of any room or space, shall be of Class I, II or Class III materials, except that trim around fire windows and fire doors shall comply with the requirements of Section 12.2.28.

12.3.24.12 Interior floor finish: Finished floors or floor covering materials of a traditional type, such as wood, vinyl, linoleum, terrazzo and other resilient floor covering materials are exempted from the requirements of this section. Floor coverings judged by the Code Enforcement Officer to represent an unusual hazard shall meet the classification prescribed for the various use groups listed in Table 12.2.24.12 when tested in accordance with the requirements of Section 12.2.6.2.

12.3.24.13 Suppression system exception: Where an approved automatic fire suppression system is provided, Class II materials are permitted in any area where Class I materials are required and material complying with the DOCFF-1 “pill test” listed in the Schedule are permitted in any area where Class II materials are required.

TABLE 12.13 INTERIOR FINISH REQUIREMENTS

Use Groups	Required vertical exits and passageways	Corridors providing exit access	Rooms or enclosed spaces [a]
A-1 Assembly, theaters	I	Ie	II[b]
A-2 Assembly, night clubs	I	Ie	II[b]
A-3 Assembly halls, terminals, restuarants	I	Ie	II[b]
A-4 Assembly, churches	I	II	III
B Business	I	II	III
C Educational	I	II	III
D Factory and industrial	I	II	III
E High hazard	I	II	IIIf
F-1 Institutional, residential care	I	II	III
F-2 Institutional, incapacitated	Ih	Ih	Ih
F-3 Institutional, restrained	I	I	III
G Mercantile	I	II	IId

Note a:			
H-1 Residential, hostels	I	II	For requirements applicable to rooms and enclosed spaces, see Section 12.3.24.15. Class III interior finish materials are permitted in places of assembly with a capacity of 300 persons or less.
H-2 Residential, multi-family dwellings	I	II	
H-3 Residential, 1-and 2-family dwellings	III	III	
I-1 Storage, moderate hazard	II	II	
I-2 Storage, low harzard	II	II	

Note c: Class III interior finish materials are permitted for wainscoting or paneling for not more than 93m^2 of applied surface area in the grade lobby when applied directly to non-combustible base or over furring strips applied to a non-combustible base and firestopped as required by Section 12.3.25.

Note d: Class III interior finish materials are permitted in mercantile occupancies of 279m^2 or less gross area used for sales purposes on the street floor only (balcony permitted).

Note e: Lobby areas shall be not less than Class II.

Note f: Where building height is over two stories, Class II shall be required.

Note g: For the classifications of interior finishes referred to herein, see Section 12.3.24.9. For interior finish requirements for exposed insulation, see Section 12.3.30.2.

Note h: Walls and ceilings shall be a minimum of Class II materials in individual rooms of not over four persons capacity. Where a complete approved automatic fire suppression system is provided, the minimum requirement for interior finish shall be Class II.

Note b:

TABLE 12.14 INTERIOR FLOOR FINISH REQUIREMENTS

Use Groups	Required vertical exits and passageways	Corridors providing exit access	Rooms or enclosed spaces [a]
A-1 Assembly, theatres	II	II	DOC FF-1[b]
A-2 Assembly, night clubs	II	II	DOC FF-1[b]
A-3 Assembly halls, terminals, restuarants	II	II	DOC FF-1[b]
A-4 Assembly, churches	II	II	DOC FF-1[b]
B Business	II	II	DOC FF-1[b]

C Educational	II	II	DOC FF-1
D Factory and Industrial	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1
E High hazard	DOC-FF-1[b]	DOC FF-1[b]	DOC FF-1
F-1 Institutional	II	II	DOC FF-1
F-2 Institutional, residential care	I	I	DOC FF-1
F-3 Institutional, restrained	II	II	DOC FF-1
G Mercantile	II	II	DOC FF-1
H-1 Residential, hostels	II	II	DOC FF-1
H-2 Residential, multifamily dwellings	II	II	DOC FF-1
H-3 Residential, 1-and 2-family dwellings	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1
I-1 Storage, moderate hazard	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1
I-2 Storage, low harzard	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1

Note a. For requirements for rooms and enclosed spaces, see Section 12.3.24.15.

Note b. For requirements for use of other than carpet materials, see Section 12.3.24.16. **Note c.** For classifications of floor finishes required herein, see Section 12.3.24.17.

12.3.24.14 Test report: All carpet required by this Section to meet critical radiant flux limits in accordance with Section 12.2.6.2 shall be tested by an approved agency. A copy of the test report identifying and representing the style to be installed shall be provided to the code enforcement officer upon request. The test report shall identify the carpet by manufacturer (or supplier) and style name, and shall be representative of the current construction of the carpet. The carpet shall be identified as to manufacturer (or supplier) and style by a hang tag or other suitable method, which shall indicate the classification of the material based upon the limits specified in Section 12.3.6.2.

12.3.24.15 Rooms and enclosed spaces: Requirements for rooms or enclosed spaces are based upon the spaces being enclosed with partitions extending from the floor to the ceiling. Where partitions do not satisfy this criteria, the room or space is considered part of the corridor.

12.3.24.16 Other materials: All carpet manufactured for sale in Nigeria is required by Federal regulations to pass tests as prescribed by the SON. If a material other than carpet is used, the material shall be shown to be at least as resistant to flame propagation as a material which passes relevant SON standards.

12.3.24.17 Classifications: The classifications in Table 12.3.24.12 correspond to that determined by ASTM E648 listed in the Schedule as follows: Class 1,0.45 Watts/cm^2: Class II, 0.22 Watts/cm^2.

12.3.25 APPLICATION OF INTERIOR FINISH

12.3.25.1 Attachment: Where interior finish is regulated by the requirements of this code, interior finish materials shall be applied or otherwise fastened in such a manner that they will

not readily become detached when subjected to room temperatures of 93 degrees C or less for 30 minutes, or otherwise become loose through changes in the setting medium from the effects of time or conditions of occupancy.

12.3.25.2 Application to structural elements: Interior finish materials applied to walls, ceilings or structural elements of a building or structure which are required to be fire-resistance rated or to be constructed of non-combustible component materials shall be applied directly against the exposed surface of concealed spaces created thereby fire stopped where in excess of 3m in any dimension (see Section 12.3.23.12).

12.3.25.3 Furred construction: Where walls, ceilings or other structural elements are required to be fire-resistance rated or to be constructed of non-combustible component materials and interior finish is set out or dropped distances greater than 44mm from the surface of such elements, only material of which both faces quality as Class I shall be used.

12.3.25.4 Exceptions

1. Class II finish materials shall be permitted when protected on both sides by an approved automatic fire suppression system in which case Class I or II materials shall be used.
2. Class II or III materials shall be permitted when attached to a non-combustible backing complying with Section 12.3.25.7 or to furring strips applied directly to such backing as provided in Section 12.3.25.2.

12.3.25.5 Type 4 construction: Interior finish materials shall be applied directly to the wood members and decking of Type 4 construction, or to furring strips applied to such members or wood decking as provided in Section 12.3.25.2.

12.3.25.6 Class II and Class III materials: Interior finish materials, other than Class I materials, which are less than 6mm in thickness shall be applied directly against a non-combustible backing or a backing complying with the requirements of Section 29.5.2 unless the tests under which such material has been classified were made with the materials suspended from the noncombustible backing.

12.3.25.7 Backing material: Backing for interior finish materials shall be a continuous surface with permanently tight joints, equal in area to the area of the finish, and extending completely behind such finish in all directions; and shall be of fire-retardant treated wood or any materials meeting the requirements of this code for non-combustible classification of material under Section 12.3.4.7.

When the backing does not constitute an integral part of the structural elements or system, it shall be attached directly to the structural elements or furring strips as required for the applicable of finish according to Section 12.3.25.2, or shall be suspended from the structural members at any distance provided concealed spaces created thereby shall be fire stopped in accordance with Section 12.2.23.

12.3.26 COMBUSTIBLE MATERIALS PERMITTED IN FLOORS OF TYPES 1 AND 2 CONSTRUCTION

12.3.26.1 General: Except as provided in Section 7.17 for stairs and Section 8.17, the use of combustible materials in or on floors of buildings of Types 1 and 2 construction shall be as herein specified.

12.3.26.2 Sleepers, bucks, and grounds: Floor sleepers, bucks, nailing blocks grounds shall not be constructed of combustible materials, unless the space between the fire- resistance rated floor construction and the flooring is solidly filled with non-combustible materials or fire

stopped in accordance with Section 12.3.23.13, and provided such open spaces shall not extend underside through permanent partitions or walls.

12.3.26.3 Flooring: Wood finish flooring is permitted to be attached direct to the embedded or fire stopped wood sleepers, and shall be permitted and cemented directly to the top surface of approved fire-resistance rated construction or directly to a wood sub floor attached to sleepers as provided in Section 12.3.26.2. Combustible insulating boards not more than 13mm thick and covered with approved finished flooring are permitted for sound deadening or insulating when attached directly to a non-combustible floor assembly wood sub flooring attached to sleepers as provided in Section 12.3.26.2.

12.3.27 DECORATIVE MATERIAL RESTRICTIONS

12.3.27.1 General: In buildings of Use Groups A, C, F-2, F-3 and H-1, all current draperies, hangings and other decorative materials suspended from ceilings shall be noncombustible or maintained flame resistance meeting requirements of Section 12.3.6 as herein specified.

12.2.27.2 Non-combustible: The permissible amount of non-combustible decorative hangings shall not be limited.

12.3.27.3 Flame-resistant: The permissible amount of non-combustible decorative hangings shall not exceed 10 percent of the total wall and ceiling area.

12.3.28 EXTERIOR TRIM RESTRICTIONS

12.3.28.1 Gutters and leaders: All gutters and leaders hereafter placed on buildings or structures of other than Type 5 construction, buildings of Use Group H-3 and private garages and similar accessory buildings shall be constructed of non-combustible materials.

12.3.28.2 Architectural Trim: Architectural trim shall be constructed and insulated in accordance with Sections 12.3.28.3 through 12.3.28.5.

12.3.28.3 Construction requirements: All architectural trim, such as cornices, veneers and other exterior architectural elements, which exceeds 12m in height above grade shall be constructed of approved non-combustible materials and shall be secured to the wall with metal or other approved non-combustible brackets. Combustible architectural trim, other than fire-retardant treated wood complying with Section 12.3.5 for exterior use, shall not exceed 10 percent of an exterior wall surface area where the fire separation distance is 1.5m or less.

12.3.28.4 Location: Where combustible architectural trim is located along the top of exterior walls, it shall be completely backed up by the exterior wall and shall not extend over or above the top of exterior walls.

12.3.28.5 Fire stopping: Continuous exterior architectural trim constructed of combustible materials shall be firestopped as required in Section 12.3.23.

12.3.28.6 Combustible half-timbering: In buildings of Types 3 and 4 constructions that do not exceed three stories or 12m in height above grade, exterior half-timbering and similar architectural decorations are permitted to be constructed of wood or other equivalent combustible materials, provided such trim is backed up solidly with approved non-combustible materials.

12.3.28.7 Balconies and similar appendages: All balconies, porches, decks and supplemental exterior stairs attached to or supported by buildings of Types 1 and 2 construction shall be constructed of non-combustible materials. Such appendages attached to or supported by buildings of Types 3, 4 and 5 construction shall be of either noncombustible or combustible construction. Such appendages of combustible construction, other than fire-retardant treated wood, shall afford the fire-resistance rating required by Table 6.1 for floor construction or shall be of Type 4 construction as described in Section 6.2.5 and the aggregate length shall not exceed 50 percent of the building perimeter on each floor.

12.3.28.8 Bay and oriel windows: All bay and oriel windows attached to or supported by

walls of other than Type 5 construction shall be of non-combustible construction, framed with brackets of steel, concrete or other approved non-combustible materials.

12.3.29 ROOF STRUCTURES

12.3.29.1 General: All construction, other than aerial supports, cloths dryers and similar structures less than 3.6m high, tanks and cooling towers as hereinafter provided and flog poles erected above the roof of any part of any building or structure more than 12m in height shall be constructed of non-combustible materials.

12.3.29.2 Scuttles: Trap doors and scuttles as required by Section 7.17.28 shall be not less than 60cm by 90cm in size. In Types 1 and 2 construction, trap doors and scuttles shall be of approved noncombustible materials.

12.3.29.3 Penthouses: Penthouses shall be considered a part of the next lower storey, and the enclosure shall conform to the requirements for exterior walls of the building type as regulated by Table 6.1 and (see section on Materials, ext. walls) except as modified herein.

12.3.29.4 Recessed walls: When the exterior wall of a penthouse is recessed 1.5meters or more from the exterior wall of the next lower storey and the exterior wall of the next lower storey is required to have a fire-resistance rating of greater than 1/ hours, the penthouse exterior wall shall be constructed with a fire-resistance rating of not less than 1/ hours, covered on the outside with noncombustible, weatherproof material and supported on protected steel or reinforced concrete construction.

12.3.29.5 Doors, frames, and sash: Doors, frames and window sash, except where otherwise specifically required to be fire-resistance rated under this Code, shall be constructed the same as other similar elements in the building or structure.

12.3.29.6 Other enclosed roof structures: Enclosed roof structures, other than penthouses as defined in Part 2, shall be considered a storey of the building and shall conform to the requirements for the building type as regulated by Table 6.1 and Part 21.

12.3.29.7 Mansards and other sloping roofs: Mansards and other sloping roofs shall comply with Sections 12.3.29.8 and 12.3.28.9

12.3.29.8 High slope roofs: Every mansard roof or other sloping roof having a pitch of more than 60 degrees (1.05 rad) to the horizontal hereafter erected on any building or structure of other than Type 5 construction more than three storeys or 12m in height shall be constructed of non-combustible materials with a fire resistance rating of not less than 1

hour . When the building is more than seven storeys or 25.5m in height, such roof shall afford the same fire-resistance rating required for the exterior walls of the building, but need not exceed 1/- hour fire-resistance rating.

12.3.29.9 Low slope roofs: Where the pitch is 60 degrees (1.05 rad) or less to the horizontal, the mansard or other sloping roof located on any building shall be constructed of not less than the same materials as required for the roof of the building shall be constructed of not less than the same materials as required for the roof of the building.

12.3.29.10 Dormers: The sides and roofs of dormers shall be of the same type construction as the main roof, except that where a side of the dormer is vertical extension of an exterior wall it shall be subject to the same fire-resistance rating requirements as apply to the wall of the building. The roofs dormers shall be protected with approved roof coverings complying with (refer to Section on Roofs and roof coverings). The sides of dormers shall be protected with approved roof coverings or with material permitted for covering the exterior walls of the building.

12.3.29.11 Water tanks: Water tanks shall be constructed and installed in accordance with Section 12.3.29.12 through to 12.3.29.16.

12.3.29.12 Supports: Water tanks having capacity of more than (2,200 litres) placed in or on a building shall be supported on masonry, reinforced concrete, steel or other approved noncombustible framing or on timber conforming to Type 4 construction; provided that, when such supports are located in the building the lowest storey, they shall be fire-resistance rated as required for Type 1A construction.

12.3.29.13 Emergency discharge: A pipe or outlet shall be located in the bottom or in the side close to the bottom, or the tank shall be fitted with a quick-opening valve, to enable the contents to be discharged in an emergency to a suitable drain complying with the plumbing code listed in the Schedule.

12.3.29.14 Location: A tank shall not be located over or near a stairway or elevator shaft unless a solid roof or floor deck is constructed underneath the tank.

12.3.29.15 Tank cover: All roof tanks exposed to the weather shall have approved covers sloping towards the outer edges.

12.3.29.16 Hoop and strap protection: When metal hoops are used in the construction of wood tanks, they shall be protected with approved corrosion-resistive coatings or manufactured from approved corrosion-resistive alloys.

12.3.29.17 Cooling towers: Cooling towers erected on the roofs of buildings when the base of the tower is more than 16.5m above grade shall be constructed of noncombustible materials or of fire-retardant treated wood.

12.3.29.18 Miscellaneous roof structures: Except as herein specifically provided, all towers, spires, dormers or cupolas shall be erected of the type of construction and fire-resistance rating required for the building to which they are accessory as regulated by Table 6.1 and 501. When the height of such appurtenant structures exceeds 25.5m above grade or when the area at any horizontal section of the tower, spire, dormer or cupola exceeds 18.6m^2, or when it is used for any purpose other than as a belfry or architectural embellishment, the structure and its supports shall be of Type 1 or 2 construction, or of fire-retardant treated wood complying with Section 12.2.5. Radio and television towers and antennae shall be constructed to comply with Sections 8.25 and 8.26

12.3.30. THERMAL AND SOUND INSULATING MATERIALS

12.3.30.1 General: Insulating batts, blankets, fills or similar types of materials other than fibreboard insulation, including vapour barriers and breather papers or other coverings, incorporated in construction elements shall be installed as required by this Section. Fibre

board insulation shall be installed as required by (see section on Materials Fibreboards).

12.3.30.2 Exposed installations: Such materials, when exposed as installed in rooms or spaces, including attics and crawl spaces of buildings or any type construction, shall have a flame spread rating of 25 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E84 listed in the Schedule. Plenum installations shall comply with the requirements of Section 12.2.31 and the Mechanical Code listed in the Schedule.

12.3.30.3 Concealed installations: Insulating materials, when concealed as installed in buildings of any type construction, shall have a flame spread rating of 75 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E84 listed in the Schedule.

12.3.30.4 Facings: Where such materials are installed in concealed spaces such as wall, floor or ceiling cavities, attics or crawl spaces in buildings of Types 3, 4 and 5 construction, the flame spread and smoke developed rating limitations do not apply to facings, provided that the facing is installed behind and in substantial contact with the unexposed surface of the ceiling, floor or wall finish.

12.3.30.5 Cellulosic insulation: Cellulosic insulation shall meet the requirements of CPSC Standard 16 CFR, Parts 1209 and 1404, listed in the Schedule.

12.3.31 PLENUMS

12.3.31.1 General: Supply and return air plenums shall be limited to uninhabited crawl spaces, areas above a ceiling or below the floor, or attic spaces, Plenums shall be limited to one fire area. Fuel-fired equipment shall not be installed within a plenum. Plenums shall be classified as non-combustible plenums (Section 12.3.31.2), as combustible plenums (12.3.21.8) or as stud and joist space plenums (Section 12.3.31.11).

12.3.31.2 Non-combustible plenums: Plenums shall be constructed with noncombustible material. Combustible material shall not be exposed within a plenum except as permitted in Section 12.3.31.3 through to 12.3.31.7.

12.3.31.3 Pipe: Pipe shall be non-combustible and, where insulated, the insulation shall have a flame spread of 25 or less and smoke developed rating of 50 or less when tested in accordance with ASTM E84 listed in the Schedule.

12.3.31.4 Ceiling and thermal material: Thermal and acoustical materials shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84 listed in the Schedule.

12.3.31.5 Ducts: Rigid or flexible ducts and connectors shall conform to the Mechanical Code listed in the Schedule.

12.3.31.6 Duct coverings: Duct coverings, linings, tape and connectors shall conform to the Mechanical Code listed in the Schedule.

12.3.31.7 Wire: Wire shall be low voltage or power-limited wire or cable. Wire shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15 and a flame spread of not greater than 1.5m when tested in accordance with UL 910 listed in the Schedule.

12.3.31.8 Combustible plenums: In Types 3, 4 and 5 construction, the plenum shall be constructed with approved material. Combustible material, pipe or wire exposed within the plenum shall be permitted.

12.3.31.9 Size: Combustible plenums shall be draftstopped every 279m^2 in area.

12.3.31.10 Exception: Plenums shall be limited to one fire area without draftstopping in buildings equipped throughout with an approved automatic fire suppression system.

12.3.31.11 Stud and joist spaces: The space between studs or joists shall not be used as a plenum for supply air. The space between studs or joists used as a plenum for return air shall

not be part of a required fire-resistance rated assembly. Air shall be removed from one floor level only. All connections shall be fire-stopped and draft stopped.

12.3.32 SMOKE AND HEAT VENTS

12.3.32.2 Vent size and spacing: The vent area and the spacing of the vents shall comply with Table 12.3.32.

12.3.32.3 Releasing devices: Smoke and heat vents shall open automatically by activation of a heat-responsive device rated 38 degrees C to 104 degrees C above ambient. The releasing mechanism shall be capable of operation such that the vent shall fully open when the vent is exposed to a time-temperature gradient that reaches an air temperature of 260 degrees C within 5 minutes. Vents shall be capable of being opened by an approved manual operation.

12.3.32.4 Curtain boards construction: Curtain boards shall be provided to subdivide a vented building. Curtain boards shall be constructed of material that will resist the passage of smoke and is consistent with the building type of construction. Curtain board location and depth shall comply with Table 12.3.32. The bottom of the curtain board shall be level.

PART III
ENFORCEMENT

CONTROL OF BUILDING WORKS

Sections ***Page***

SECTION 13 CONTROL OF BUILDING WORKS

13.1 ESTABLISHMENT OF CONTROL OF BUILDING WORKS

13.1.1 Code Enforcement Division/Section/Unit:

13.1.1.1 There shall be established in all Federal, State and Local Government Urban Development Agencies, a **Code Enforcement Division/Section/Unit** in their Development Control Department.

13.1.1.2 Composition: The Building Code Enforcement Division/Section/Unit shall comprise the following registered professionals: Architects; Engineers; Town Planners; Fire Officers; Land Surveyors; Builders; Quantity Surveyors; Estate Surveyors and Valuers; Public Health and Safety Officers. Any of the professionals listed in Section 2.2.4 may head the Code Enforcement Division/Section/Unit.

13.1.1.3 Powers and duties of Code Enforcement Division/Section/Unit

13.1.1.3.1 The Code Enforcement Division/Section/Unit shall enforce the provisions of this Code through the appropriate registered professionals.

13.1.1.3.2 The Code Enforcement Division/Section/Unit shall have power to implement the provisions of this Code to secure the intent thereof.

13.1.1.3.3 The Code Enforcement Division/Section/Unit shall on request, so far as is required in the discharge of official duties, receive the assistance, and co-operation of other Officers in all Government Ministries, Departments, Parastatals, Police, and other Law Enforcement Agencies.

13.1.1.3.4 Access to premises: The Code Enforcement Division/Section/Unit or an authorised representative may enter any and all premises or buildings at all reasonable times to inspect same or to perform any duty imposed by the enforcement of this Code, provided that if such building is occupied, he shall first present proper credentials and request entry; and if such building or premises be unoccupied, shall first make reasonable effort to locate the owner or other person having charge or control of the building or premises and request entry. Where entry is refused, or cannot be ordinarily secured, the official shall have recourse to every remedy provided by law to secure entry.

13.1.1.3.5 Emergency measures: The Code Enforcement Division/Section/Unit shall issue all necessary notices or orders to remove illegal or unsafe conditions, to require the necessary safeguards during constructions, to require adequate exit facilities in existing buildings or structures, and to ensure compliance with all the Code requirements for health,

safety and general welfare of the public. He shall also have powers in respect of the followings:

13.1.1.3.6 Vacating structure: When, in the opinion of the Code Enforcement Division/Section/Unit, there is actual and immediate danger of failure or collapse of a building or structure or any part thereof which would endanger life, or when any structure or part of a structure has fallen and life is endangered by the occupation of the building or structure, the Code Enforcement Officer is hereby authorised and empowered to order and require the inmates and occupants to vacate the same forthwith. The Code Enforcement Division/Section/Unit shall cause to be posted at each entrance to such building, a notice reading as follows: "This Structure is Unsafe and its Use or Occupancy has been prohibited by the Code Enforcement Division/Section/Unit". It shall be unlawful for any person to enter such building or structure except for the purpose of making the required repairs or for demolition of same.

13.1.1.3.7 Temporary safeguards: When, in the opinion of the Code Enforcement Division/Section/Unit, there is actual and immediate danger of collapse or failure of a building or structure or any part thereof which would endanger life, the Code Enforcement Division/Section/Unit shall cause the necessary work to be done to render such building or structure or part thereof temporarily safe, whether or not the legal procedure, herein described, had been instituted (Section 3.8).

13.1.1.3.8 Closing streets: When necessary for public safety, the Code Enforcement Division/Section/Unit shall temporarily close streets, sidewalks, buildings and structures and places adjacent to such unsafe structure, and prohibit the same from being used.

13.1.1.3.9 Emergency repairs: For the purposes of this Section, the Code Enforcement Division/Section/Unit shall employ the necessary labour and materials to perform the required work as expeditiously as possible.

13.1.1.3.10 Costs of emergency repairs: Costs incurred in the performance of emergency work shall be paid from the treasury of the jurisdiction on certificate of the Code Enforcement Division/Section/Unit. The legal counsel of the jurisdiction shall institute appropriate action against the owner of the premises where the unsafe building or structure is, or was, located for the recovery of such costs.

13.1.1.3.11 Inspections: The Code Enforcement Officer shall make all the required inspections, or the Code Enforcement Officer shall accept reports of inspections by approved agencies or individuals, and all reports of such inspections shall be in writing and certified by a responsible officer of such approved agency or by the responsible individual.

13.1.1.3.12 The Code Enforcement Division/Section/Unit is authorised to engage such expert opinion as deemed necessary to report upon unusual technical issues that arise subject to the approval of the appointment authority.

13.1.1.3.13 Credentials and identification: The Code Enforcement Division/Section/Unit and authorised representatives shall carry proper credentials and identification of their respective office for the purpose of inspecting any and all buildings and premises in the performance of duties under this Code, and shall be appropriately attained in an approved form.

13.1.1.3.14 Proposals for amendments: The Code Enforcement Division/Section/Unit may propose amendments to existing requirements, or additional requirements to ensure applicability due to local climatic, cultural or other conditions; provided that such proposals shall not have the effect of waiving structural or fire performance requirements specifically provided in this Code or violating accepted professional practice involving public safety. Such proposals shall be made to the National Code Advisory Committee for consideration and decision.

13.1.1.3.15 Records: The Code Enforcement Division/Section/Unit shall keep official records of applications received, including drawings and other documents, permits, and certificates issued, fees, collected, reports of inspections, notices, and orders issued. Such records shall be retained in official archives, and properly and safely stored.

13.1.1.3.16 Activity reports: The Code Enforcement Division/Section/Unit shall submit at stipulated periodic intervals, a written statement of operations to the appointing authority in the form and content as shall be prescribed by such authority.

13.2 SCOPE

13.2.1 PRE-DESIGN STAGE

13.2.1.1 Requirements

i Perimeter survey and topographical survey of the site.

ii The Development Permit for the proposed development obtained by the owner from the Planning Authority.

13.2.1.2 Enforcement: The Code Enforcement Division/Section/Unit shall ensure compliance with the above requirements.

13.2.2 DESIGN STAGE

13.2.2.1 Requirements: Working drawings and specifications prepared by registered design professionals.

13.2.2.2 Enforcement: The Code Enforcement Division/Section/Unit shall ensure that the above requirements are submitted with application for building approval.

13.2.3 CONSTRUCTION STAGE

13.2.3.1 Requirements: Contract documents.

13.2.3.2 Enforcement: The Code Enforcement Division/Section/Unit shall ensure that the above requirements are submitted with notice to commence construction.

13.2.4 POST-CONSTRUCTION STAGE

13.2.4.1 Requirements

i Certificate of Fitness for Habitation.

ii As-Built Drawings.

iii Building Maintenance Manual.

iv Building Condition Survey Report.

13.2.4.2 Enforcement: The Code Enforcement Division/Section/Unit shall ensure compliance with the above requirements.

13.3 VIOLATIONS AND SANCTIONS

13.3.1 Any act that is performed, caused or permitted by any person, firm or corporation that is in conflict with, or not in compliance with any of the provisions of this Code shall be a violation.

13.3.2 Unlawful acts: It shall be unlawful for any person, firm or corporation to erect, construct, alter, extend, repair, remove, demolish, use or occupy any building or structure violating the provisions of this Code.

13.3.3 Notice of violation: The Code Enforcement Division/Section/Unit shall serve a notice of violation or order in writing; on the person responsible for the erection, construction, alteration, extension, repair, removal, demolition, use or occupancy of a building or structure in violation of the provisions of this Code, or in violation of a detail statement or a plan approved thereunder, or in violation of a permit or certificate issued under the provisions of this Code. Such order shall direct the discontinuance of the unlawful act and the abatement of the violation and shall be complied with, within twenty-one (21) working days.

13.3.4 Prosecution of violation: If the notice of violation is not complied with within the stipulated period, the Code Enforcement Division/Section/Unit shall request the legal counsel of the jurisdiction to institute the appropriate proceeding at law or in equity to restrain, correct or abate such violation or to require the removal or termination of the unlawful use of the building or structure in violation of the provision of this Code or of the order or direction made pursuant thereto.

13.3.5 Sanctions: Any person who shall violate a provision of this Code or shall fail to comply with any of the requirements thereof or who shall erect, construct, alter or repair a building or structure in violation of an approved plan or directive of the Code Enforcement Division/Section/Unit, or of a permit or certificate issued under the provisions of this Code, shall be guilty of an offence punishable under the existing law.

13.3.6 Abatement of violation: The imposition of the penalties herein prescribed shall not preclude the legal counsel of the jurisdiction from instituting appropriate action to prevent unlawful construction or to restrain, correct or abate a violation, or to prevent illegal occupancy of a building, structure or premises or to stop an illegal act, conduct, business or use of a building or structure on or about any premises.

13.4 BOARD OF PETITION

13.4.1 Petition: Any person to whom the provision of this Code applies who has been served with an unsafe order or structure or a duly authorised representative who has been served with an unsafe order and notice to make such structure safe, secure, or habitable or to take down such structure shall have the right, except in cases of emergency, to demand the appointment of a Board of Petition (as specified in Section 2.4.2) if that person deems such order to be unnecessary, improper or reasonable. Such demand shall be in writing with a statement of the reasons therefor.

13.4.2 Composition of the Board of Petition: The Board of Petition shall consist of five persons. The membership shall be four representatives drawn from relevant professional bodies and the fifth member shall be a legal practitioner knowledgeable in planning and building law of requisite experience, or a retired judge.

13.4.3 Inspection by the Board of Petition: The Board of Petition shall have powers to inspect a building or structure and to confirm, modify or revoke the order of the Code Enforcement Division/Section/Unit as is just and proper in the interest of public health, safety and welfare. They shall have the duty of determining the extent of reconstruction, restoration or rehabilitation in the repair of an unsafe building or structure in the case of disagreement or dispute.

13.4.4 Written report by the Board: The Board of Petition shall determine its findings and submit a report in writing affirming, modifying or nullifying the order of the Code Enforcement Division/Section/Unit in whole or in part and recommending the remedial steps to be taken where applicable to render the building or structure safe or to abate the violation.

13.4.5 Outcome of the petition: The findings and decisions of any three members of the Board shall be deemed conclusive and certified copies of the report shall be filed with the Code Enforcement Division/Section/Unit and with the owner or his representative and shall be binding on all parties.

13.5 UNSAFE BUILDINGS, STRUCTURES, BUILDING SERVICES AND EQUIPMENT

13.5.1 Definition: All buildings or structures regulated by this Code and other related technical codes which are structurally inadequate or have inadequate means of egress, or which constitute a fire hazard, or are otherwise dangerous to life and property are, for the purpose of this Section, unsafe.

13.5.2 Unsafe building services and equipment

g. Building service equipment and installations regulated by such codes, which constitute a fire, electrical or health hazard, or unsanitary condition, or is otherwise dangerous to human life is for the purpose of this section, unsafe;

h. any use of buildings, structures unable to sustain the design loads specified in this Code are hereby designated as unsafe building appendages;

i. all such unsafe buildings, structures or appendages and building service equipment and installations are hereby declared to be public nuisances and shall be abated by repair, rehabilitation, depletion or removal in accordance with the procedures set forth in this Code.

13.6 NOTICES

13.6.1 A person carrying out building works shall give the Code Enforcement Division/Section/Unit notice in writing of:

(i) The commencement of work, at least seven days, in advance.

If the person carrying out the work does not inform the Code Enforcement Division/Section/Unit as stated above, he shall comply with any notice in writing from the Code Enforcement Division/Section/Unit requiring him within a reasonable time to cut into, lay open or pull down so much of the work as prevents the Code Enforcement Division/Section/Unit from ascertaining whether any of the provisions of this Code has been contravened.

(ii) When the Code Enforcement Division/Section/Unit has given notice in writing which specifies the manner in which any work contravenes the requirements of this Code, a person who has carried out any further work to secure compliance with this Code, shall within a reasonable time after the completion of such further work, give notice in writing to the Code Enforcement Division/Section/Unit of its completion.

(iii) The completion of any stage of work, not more than seven (7) days after such completion.

(iv) The completion of the building, not more than (7) days thereafter, or (if a building or part of a building is occupied before total completion) not less than seven (7) days before occupation as well as not more than seven (7) days after completion.

(v) Before the commencement of any construction works, a site signboard showing the names and addresses of the client, professionals and contractor involved in the project shall be erected in a place to be seen clearly by the general public.

For the purposes of sub-section 3.5.1, the calculation of number of days, Saturdays, Sundays and Public Holidays shall be excluded.

13.7 INSPECTIONS

13.7.1 General: All construction or works for which an approval is required shall be subject to inspection by the Code Enforcement Division/Section/Unit and certain types of construction shall have continuous inspection by special inspectors as specified in Section 3.7

A survey of the plot shall be required by the Code Enforcement Division/Section/Unit to verify that the structure is located in accordance with approved plans. It shall be the duty of the permit applicant/holder of permit to cause the work to be accessible and exposed for inspection purposes. The Code Enforcement Division/Section/Unit shall not be liable for expense incurred in the removal or replacement of any material required to allow inspection.

13.7.2 Inspection requests: It shall be the duty of the person carrying out the work

authorised by a permit to notify the Code Enforcement Division/Section/Unit that such work is ready for inspection. The Code Enforcement Division/Section/Unit may require that every request for inspection be filed at least one working day before such inspection is desired. Such request shall be in writing. It shall be the duty of the person requesting any inspections required either by this Code, or any other related technical codes, to provide access to and means for proper inspection of such work.

13.7.3 Inspection record card: Work requiring a building permit shall not be commenced until the permit holder or his agent have posted an Inspection Record Card to allow the Code Enforcement Division/Section/Unit to conveniently make the required entries thereon regarding inspection of the work. This card shall be maintained in such position by the permit holder until certificate of use and habitation has been issued by the Code Enforcement Division/Section/Unit.

13.7.4 Approval required: The permit holder shall give three (3) days notice in writing to the Code Enforcement Division/Section/Unit, indicating the part of the Building, or structure that would be ready for inspection in accordance with this Code.

If the Code Enforcement Division/Section/Unit does not inspect or cause to be inspected the works indicated in the notice within seven (7) days, the work shall proceed as if such inspection had been made.

13.7.5 Required building inspections: Re-inforcing steel or structural framework of any part of any building or structure shall periodically inspected by the Code Enforcement Division/Section/Unit.

The Code Enforcement Division/Section/Unit upon notification from the owner, or his agent, shall make the following inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his agent wherein the same fails to comply with this Code.

13.7.5.1 Foundation inspection: To be made after excavation for footings are complete and any required re-inforcing steel is in place. For concrete foundations, any required forms shall be in place prior to inspection. All materials for the foundation shall be on the site except where concrete is ready-mixed in accordance with the provisions of this Code.

Where the foundation is to be constructed of approved treated wood, additional inspections may be required by the Code Enforcement Division/Section/Unit.

13.7.5.2 Concrete slab or under-floor inspection: To be made after all in-slab or under-floor building service equipment, conduit, piping accessories and other ancillary equipment items are in place but before any concrete is placed or floor sheathing installed including the sub-floor.

13.7.5.3 Frame Inspection: To be made after the structural frame at each floor level, fire blocking and bracing are in place and all pipes chimneys and vents are complete and the first fix electrical and mechanical, (plumbing, heating wires, pipes and ducts) are approved.

13.7.5.4 Final inspection: To be made after finish grading and the building is completed and ready for occupancy.

13.7.6 Required building service equipment inspections

13.7.6.1 General: All building service equipment for which a permit is required by this Code shall be inspected by the Code Enforcement Division/Section/Unit. When the installation of any building service equipment is complete, an additional and final inspection shall be made. Building service equipment regulated by the technical codes shall not be connected to the water, fuel or power supply or sewer system until authorised by the Code Enforcement Division/Section/Unit.

13.7.6.2 Replacement of building service equipment: Building service inspection shall

not prohibit the operation of any equipment installed to replace existing building service equipment in occupied portion of the building provided for inspection of such building service equipment has been filed with the Code Enforcement Division/Section/Unit not more than 48 hours after such replacement work is completed, and before any portion of such building service equipment is concealed by any permanent portion of the building.

13.7.7 Other inspection: In addition to the called inspections specified above, the Code Enforcement Division/Section/Unit may make or require other inspections of any construction work to ascertain compliance with the provisions of this Code, or technical codes and other laws which are enforced by the Code Enforcement Division/Section/Unit.

13.7.8 Re-inspection: A re-inspection fee may be assessed for each inspection when such portion of work for which inspection is called is not complete or when corrections called for are not made.

This subsection shall not be interpreted as requiring re-inspection fees the first time a job is rejected for failure to comply with the requirements of the technical codes, but as controlling the practice of calling for inspections before the job is ready for such inspection or re-inspection.

Re-inspection fees may be assessed when the permit card is not properly posted on the work site, the approved plans are not readily available to the inspector, for failure to provide access on the date for which inspection is requested, or for deviating from plans requiring the approval of the Code Enforcement Division/Section/Unit. To obtain a re-inspection, the applicant shall file an application in writing upon a form furnished for that purpose, and pay the prescribed re-inspection fee.

In instances where re-inspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

13.8 SPECIAL INSPECTIONS

13.8.1 General: In addition to the inspections required by Section 3.6 the owner shall request a special inspection or employ a special inspector during construction on the following types of work:

13.8.1.1 Concrete: During the taking of test specimens and placing of all re-inforced concrete and pneumatically placed concrete.

Exceptions

a. Concrete for foundations conforming to the minimum requirements of this Code, provided the Code Enforcement Division/Section/Unit finds that a special hazard does not exist.
b. For foundation concrete when the structural design is based on a specified compressive strength no greater than 2000 psi (KN).

13.8.1.2 Ductile moment-resisting concrete frame: For moment resisting frames designed for seismic load in structures within designated seismic zones in Nigeria, a specially qualified inspector who would provide reports to the person responsible for the structural design shall provide continuous inspection of the placement of the re-inforcement and concrete and shall submit a certificate indicating compliance with plans and specifications.

13.8.1.3 RE-INFORCING STEEL AND PRE-STRESSING STEEL

a. During all stressing and grouting of pre-stressing concrete.
b. During placing of rei-nforcing steel, placing of tendons and pre-stressing steel for all concrete required to have special inspection by Section 3.7.1.1

13.8.1.4 Welding:

a. **Ductile Moment Resisting Frame**
Welded connections between the primary members of ductile moment-resisting steel frames, shall be tested by known destructive methods for compliance with U.B.C standard welding 27.6 and job specifications. (Refer structural welding code-steel, ANSI/AWS D1.1-88.)

b. All structural welding, including welding of re-inforcing steel.

13.8.1.5 High-strength bolting: During all bolt installations and tightening operations.

Exceptions

a. The special inspector need not be present during the entire installation and tightening operation, provided he has:

(i) inspected the surfaces and bolt type for conformance to plans and specifications prior to start of bolting, and

(ii) will, upon completion of all bolting, verify the minimum specified bolt tension for 10 percent of the bolts for each connection with a minimum of two bolts per connection.

b. In bearing-type connections when threads are not required by design to be excluded from the shear plane, inspection prior to or during installation will not be required.

13.8.1.6 Structural masonry: During preparation of masonry wall prisms, sampling and placing of all masonry units, placement of re-inforcement, inspection of grout space, immediately prior to closing of clean-outs, and during all grouting operations.

EXception: Special inspection need not be provided when design stresses have been adjusted to permit non-continuous inspection.

13.8.1.7 Insulation concrete fill: During the application of insulating concrete fill when used as part of a structural system.

Exception: The special inspections may be limited to an initial inspection to check the deck surface and placement of re-inforcements. The special inspector shall supervise the preparation of compression test specimens during this initial inspection.

13.8.1.8 Spray-applied fireproofing: As required by relevant technical code.

13.8.1.9 Piling, drilled piers and caissons: During driving and testing of piles and construction of cast-in-place drilled piles or caissons. See Items 3.7.1.1 and 3.7.1.3 for concrete and re-inforcing steel inspection.

13.8.1.10 Special grading, excavation and filling: During earthwork excavations, grading and filling operations inspection to satisfy requirements of this Code.

13.8.1.11 Special cases: Work, which in the opinion of the Code Enforcement Division/Section/Unit, involves unusual hazards.

13.8.1.12 Special inspector: The special inspector shall be a qualified person who shall demonstrate his competence, to the satisfaction of the Code Enforcement Division/Section/Unit, for inspection of the particular type of construction or operation requiring special inspection.

13.8.1.13 Duties and responsibilities of the special inspector: The special inspector shall observe the work assigned for conformance with the approved design drawings and specifications.

13.8.2 Waiver of special inspection: The special inspector shall furnish inspection reports to the Code Enforcement Division/Section/Unit, the project architect, engineer, and other

designated persons. All discrepancies shall be brought to the immediate attention of the constructor for correction, then, if uncorrected, to the architect and to the Code Enforcement Division/Section/Unit.

13.8.3 Periodic special inspection: The special inspector shall submit a final signed report stating whether the work requiring special inspection was, to the best of his knowledge, in conformance with the approved plan and specifications and the applicable workmanship provision of these codes.

13.9 SERVED ORDERS AND NOTIFICATION

13.9.1 Contravention notice: The Code Enforcement Division/Section/Unit shall serve a contravention notice when a building or structure in any way violates any of the provisions of this Code, or the prosecution of work on any building or structure or parts thereof is carried on in such a manner as to be in conflict or subsequently violate the provisions of this Code. Such order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

13.9.2 Stop Work Order: Upon notice from the Code Enforcement Division/Section/Unit, that work on any building or structure is being prosecuted contrary to the provision of this Code, or in an unsafe and dangerous manner, such work shall be immediately stopped. The Stop Work Order shall be in writing and shall be given to the owner of the property involved, or to the owner's agent, or to the person doing the work, and shall state the conditions under which work will be permitted to resume.

No further work shall continue on any building work on which a Stop Work Order has been served unless the order is revoked, in writing. Any person who shall continue any work in or about the structure after having been served with a Stop Work Order, except work that has been instructed as abatement shall be liable to a fine the sum of which shall be determined by the appropriate authority.

13.9.3 Quit premises order: Whenever any building or structure regulated by this code is being used contrary to the provisions of this Code, or has been declared unsafe, dangerous and unsuitable for habitation, or is slated for demolition, or is being used in a manner as to constitute nuisance or hazard, the Code Enforcement Division/Section/Unit may order the building or structure or parts thereof vacated by serving a Quit Premises Order on the owner, or any person occupying the building or structure.

(i) Quit Premises Order shall only be revoked upon complete abatement of the violation(s) or unsafe and dangerous conditions.

(ii) When a Quit Premises Order is served to facilitate demolition of a building or structure, the Enforcement Agency may demolish or remove such structure after seven days of issuing the Quit Premises Order Notice, except in cases of emergencies when the order shall take immediate effect.

(see section 2.3.6.2).

13.9.4 Demolition Order: The Code Enforcement Division/Section/Unit may serve a Demolition Order Notice in respect of any building or structure which does not cannot in any way be made to conform with this Code. The Demolition Order Notice shall instruct the owner to remove the dangerous or defective structure within seven (7) days, at the expiration of which the building or defective structure shall be removed by the Enforcement Division/Section/Unit and the cost of effecting the order shall be recovered from the owner.

13.9.5 Mode of Service

13.9.5.1 **Notices, Orders** and other documents required or authorised by the provisions of this Code to be served on the owner or occupier of any premises shall be deemed to be properly addressed if addressed to the description of the "Owner" or "Occupier" of such

premises without further name or description.

13.9.5.2 Every Notice, Order, and other documents required or authorised by the provisions of this Code to be served on any person may be served by:

a. pasting in a conspicuous place on the premises with photographs taken;
b. and by delivering same to the addressee in person;
c. or if the person addressed with an Order Notice cannot be found within the city after diligent search, then such Notice shall be served by registered post, or certified mail to the last known address of such person;
d. or by publication in the local daily papers.

13.10 CONNECTION TO UTILITIES

13.10.1 Permanent connections: No person shall make connections from a source of energy, fuel or power to any building service equipment which is regulated by the technical codes and for which a permit is required by this Code until approved by the Code Enforcement Division/Section/Unit.

13.10.2 Temporary connections: The Code Enforcement Division/Section/Unit may authorise the temporary connection of the building service equipment, fuel, or power for the purpose of testing building service equipment, or for use under a temporary certificate of habitation.

13.11 CERTIFICATE OF USE AND HABITATION

13.11.1 New building: A building or structure hereafter erected shall not be used or occupied in whole or in part until the certificate of use and habitation shall have been issued by the Code Enforcement Division/Section/Unit.

13.11.2 Building hereafter altered: A building or structure hereafter enlarged, extended or altered to change from one use group to another or to a different use within the same use group, in whole or in part, and a building or structure hereafter altered for which a certificate of use and habitation has not been heretofore issued, shall not be occupied or used until the certificate shall have been issued by the Code Enforcement Division/Section/Unit, certifying that the work has been completed in accordance with the provisions of the approved permit. Any use or occupancy, which was not discontinued during the work alteration, shall be discontinued within 30 days after the completion of the alteration unless the required certificate is secured from the Code Enforcement Division/Section/Unit.

13.11.3 Existing building: Upon written request from the owner of an existing building or structure, the Code Enforcement Division/Section/Unit shall issue a certificate of use and habitation, provided there are no violations of law or orders of the Code Enforcement Division/Section/Unit pending, and it is established after inspection and investigation that the alleged use of the building or structure has heretofore existed. This Code shall not require the removal, alteration or abandonment of, or prevent the continuance of, the use and habitation of a lawfully existing building or structure, unless such use is deemed to endanger public safety and welfare.

13.11.4 Changes in use and habitation: After a change of use has been made in a building or structure, the re-establishment of a prior use that would not have been legal in a new building of the same type of construction, is prohibited unless the building complies with all applicable provisions of this Code. A change from one prohibited use, for which a permit has been granted, to another prohibited use, shall be deemed a violation of this Code.

13.11.5 Temporary habitation: Upon the request of the holder of a permit, the Code Enforcement Division/Section/Unit shall issue a temporary certificate of habitation for a

building or structure, or part thereof, before the entire work covered by the permit shall have been completed, provided such portion or portions will be occupied safely prior to full completion of the building or structure without endangering life or public welfare.

13.11.6 Contents of certificate: When a building or structure is entitled thereto, the Code Enforcement Division/Section/Unit shall issue a certificate of use/habitation within ten (10) days after written application. The certificate shall certify compliance with the provisions of this Code and the purpose for which the building or structure will be used in its several parts. The certificate of use/habitation shall specify the use group, in accordance with the provisions of Chapter 5 the type of construction as defined in Chapter 6 and any special stipulations and conditions of the building permit.

13.11.7 The Code Enforcement Division/Section/Unit may in writing, suspend or revoke a certificate of use/habitation issued under the provisions of this Code.

13.11.7.1 Revocation: The Code Enforcement Division/Section/Unit may, in writing, suspend or revoke a certificate of habitation issued under the provisions of this Code whenever the certificate is issued in error, or on the basis of incorrect information supplied, or when it is determined that the building or structure or portion thereof is in violation of any ordinance or regulation or any of the provisions of this Code.

13.12 WORKMANSHIP AND SUPERVISION

13.12.1 All building works shall be executed, installed and completed in a skillful and acceptable manner so as to secure the results intended by this Code.

13.12.2 All building works shall be generally supervised by a registered architect and engineer in line with their inputs.

13.12.3 Any contractor who is engaged to carry out construction work in accordance with this Code shall satisfy the professional registration Laws of the Country.

13.12.4 The management of the execution of the building works including the supervision of artisans and tradesmen shall be carried out by a registered builder.

13.13 ALTERNATIVE MATERIALS

The provisions of this Code are not intended to prevent the use of any material not specifically prescribed by this Code, provided that an alternative has been approved and its use authorised by the Building Code Advisory Committee. The Code Enforcement Division/Section/Unit shall allow any such alternative, provided he finds that the proposed design is satisfactory and complies with the provisions of this Code and that the materials, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this Code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation. The Code Enforcement Division/Section/Unit shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in files of the Code Enforcement Division/Section/Unit.

13.14 USED MATERIALS AND EQUIPMENT

Used materials, equipment and devices shall not be re-used unless they have been reconditioned, tested and placed in good and proper working condition and approved for use by the Code Enforcement Division/Section/Unit.

13.15 RESEARCH AND INVESTIGATIONS

The Code Enforcement Division/Section/Unit shall require that sufficient technical data be submitted to substantiate the proposed use of any material or assembly, and if it is determined that the evidence submitted is satisfactory proof of performance for the use intended, the code enforcement officer shall allow its use subject to the requirements of this

Code, and the prior approval of the Building Code Advisory Committee.

13.16 TEST

Whenever there is insufficient evidence of compliance with any of the provisions of this Code or evidence that any new material or construction method does not conform to the requirements of this Code, the Code Enforcement Division/Section/Unit may require tests as proof of compliance to be made at no expense to the Code Enforcement Division/Section/Unit.

Test methods shall be as specified by this Code or by other recognised test standards. If there are no recognised and accepted test methods for the proposed alternates, the Code Enforcement Division/Section/Unit shall in consultation with relevant specialists determine test procedures. All tests shall be made by an approved Agency. Reports of such test shall be retained and stored by the Code Enforcement Division/Section/Unit.

13.17 RECORDS

In all cases, the application for modification of existing structures and for building permit as well as the final decision of the Code Enforcement Division/Section/Unit, and all supporting tests or reports shall be in writing and shall be officially recorded in the permanent records of the Code Enforcement Division/Section/Unit.

13.18 EXISTING STRUCTURES

13.18.1 Continuation of existing use: The legitimate use and occupancy of any structure existing on the date of promulgation of this Code, or for which it has been heretofore properly approved, shall be permitted to continue without change, except as is specifically covered in this Code, or other relevant regulations listed in the Schedule.

13.18.2 Change in use: It shall be unlawful to make any change in the use or occupancy of any structure or portion thereof which would subject it to any special provisions of this Code without the approval of the Code Enforcement Division/Section/Unit, and the Code Enforcement Division/Section/Unit's certification that such structure meets the intent of the provisions of regulations governing building construction for the proposed new use and occupancy, and that such change does not result in any greater hazard to public safety or welfare.

13.18.3 Additions, alterations or repairs: Additions, alterations, or repairs to any structure shall conform to that required of a new structure without requiring the existing structure to comply with all the requirements of this Code. Additions, or alterations, shall not be made to any existing structure or building which will cause the existing building or structure to be in violation of any of the provisions of this Code, nor shall such additions or alteration cause the existing building or structure to become unsafe or in any way adversely affect its stability, ventilation, fire safety means of egress, sanitation or the general performance of the building.

The totality of any building so altered which involves a change in use or occupancy, shall not exceed the height, number of floors, and area permitted for new buildings, including the new additions if any.

Alterations, or additions shall not be made to any existing building or structure when such a structure or building is not in full compliance with the provisions of this Code, except when such addition or alteration or repair will result in the existing building or structure being in full compliance with the provisions of this Code.

13.19 REHABILITATION AND MAINTENANCE

13.19.1 Maintenance: All buildings and structures, and all parts thereof, shall be maintained in a safe and sanitary condition.

All devices or safeguards which are required by this Code shall be maintained in good order.

The owner or his designated agent shall be responsible for the maintenance of buildings and structures. The Code Enforcement Division/Section/Unit shall cause the re-inspection of any building or structure to determine compliance with this sub-section.

13.19.2 Application: Application or notice to the Code Enforcement Division/Section/Unit shall not be required for ordinary repairs or rehabilitation provided that such repairs or rehabilitation shall not include the cutting away of any wall load bearing, partition or portion thereof, the removal or cutting of any structural beam or bearing support, or the removal or change of any required means of egress, or re-amendment of parts of a structure affecting the existing requirements, nor shall ordinary repairs include addition to, alteration of, replacement or relocation of utility pipes or conduits, drainage, sewer, electrical or mechanical installations affecting public health or general safety.

13.19.3 Building condition survey report: Building Condition Survey Report for buildings of five (5) floors and above shall be carried out every ten (10) years by the registered professionals involved in the original design and construction stages of the structure, and be submitted to the Code Enforcement Division/Section/Unit.

13.20 DEMOLITION OF STRUCTURES

13.20.1 Service connection: Before a structure can be demolished or removed, the owner or agent shall notify all utilities having service connections with the structure such as water, electricity telecommunications, gas, sewer and other connections.

A permit to demolish or remove a structure shall not be issued until the respective service connections and appurtenant equipment, such as meters and regulators, have been removed or sealed and plugged in a safe manner.

13.20.2 Notice to adjoining owners: Only when written notice has been given by the applicant to the owners of adjoining plots and to the owners of wired or other facilities, of which the temporary removal is necessitated by the proposed work, shall a permit be granted for the removal of a building or structure.

13.20.3 Plot regulation: Whenever a structure is demolished or removed, the premises shall be maintained free from all unsafe or hazardous conditions by the proper regulation of the plot, restoration of established grades and the erection of the necessary retaining walls and fences in accordance with the provisions of Part III, Section 6.0.

13.20.4 Demolition shall not be carried out in a manner or with such equipment that violates the provisions of Part III, Section 8.0, or in any way constitute a hazard to life, property or environment, before, during or after the demolition exercise.

13.21 TEMPORARY STRUCTURES

13.21.1 Definition: Buildings and structures moved into or located within an area to which this code applies, shall comply with the provisions of this Code for new buildings and structures and shall not be used or occupied in whole or in part until the certificate of use and habitation shall have been issued by the Code Enforcement Division/Section/Unit.

13.21.2 Temporary structures: Temporary structures such as reviewing stands and other miscellaneous structures, sheds, canopies or fences may be erected by special permit from the Code Enforcement Division/Section/Unit for a limited period of time. Such buildings or structures need not comply with the type of construction or fire resistive time periods required by this Code. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated in the permit which shall not exceed 60 days.

13.22 LISTED BUILDINGS

13.22.1 Definition: Listed buildings are structures that have been designated by official action of the Federal, State, or Local Government as having special historical, architectural, artistic and aesthetic significance.

13.22.2 Repairs and alterations: Repairs, alterations, and additions necessary for the preservation, restoration, rehabilitation, or continued use of a building or structure may be made without conformance to all the requirements of this Code when authorised by the Code Enforcement Division/Section/Unit, provided that:

a. any unsafe conditions as described in this Code are abated;
b. the restored building or structure will be no more hazardous based on life, safety, fire safety, and sanitation than the existing building;
c. the building shall not be put to any use or occupancy when the abatement of the unsafe aspects do not adequately remove hazard to life, safety, fire etc., or when the adequate abatement of such unsafe aspects shall substantially detract from the historical, or artistic significance of the building or structure.

13.23 EXEMPT BUILDINGS AND WORKS

13.23.1 Requirements

a. A building intended to remain where it is erected for less than 60 days such as a stand for a temporary exhibition;
b. a building used only by people engaged in the erection, extension, alteration, demolition, or improvement of a building or fences erected for the protection of the public during the course of that work;
c. a detached building which does not exceed 10m^2 in floor area, 4m in height and which contains no sleeping accommodation.

13.23.2 Service of registered professionals: Nothing in sub-section 1.9.1 shall preclude the need to engage the services of appropriate registered professionals in the development of such building to secure reasonable standards of health and safety in or about them.

PART IV SCHEDULES AND REFERENCES

Sections ***Page***

REFERENCED STANDARDS

REFERENCED STANDARDS

The following is a listing of the standards referenced in this Code, the effective date of the standard, the promulgating agency of the standard and the sections) of this Code that refer to the standard.

ANSI/AWS	SECTION 13.9	
Standard reference Number	**Title**	**Referenced in code Section**
D1.1-88	American National Standards Institute Incorporation American Welding Society.....	13.14.1.4

ASTM	SECTION 4	
Standard reference Number	**TITLE**	**Referenced in code Section**
D92	Flash and fire points by Cleveland Open Cup- Method of Test for.....	Table 4.7.2(a)
D93	Flash point by Pensky - Martens Closed Tester- Method of Test for.....	Table 4.7.2(a)
NFiPA495	Code for Explosive Materials	Table 4.7.2(b) Notes

EC/TC/N FSC/U BC SECTION 5

Standard Reference Number	Title	Referenced In Code Section Number[1]
Electrical Code		5.2.8
Telephone Code		5.2.9
National Fire Safety Code		5.3.7.2
U.B.C. Standard No. 38.1		5.3.7.3
U.B.C. Standard No. 13.1		5.3.7.9
U.B.C. Standard No. 43.7		5.12.2
U.B.C. Standard No. 17.1		5.13.1
U.B.C. Standard No. 32.1		5.13.1
U.B.C. Standard No. 42.1		5.18.1, 5.19.2, 5.19.3
U.B.C. Standard No. 17.3		5.18.1
U.B.C. Standard No. 32.7		5.18.2.5
UB.C. Standard No. 17.4		5.18.2.5
U.B.C. Standard No. 17.2		5.18.2.7
U.B.C. Standard No. 175		5.18.3

U.B.C. Standard No. 52-3

SECTION 7

UBC

Standard reference number	Title	Referenced in code Section number
U.B.C. Standard No. 43.7		7.1.2.4
U.B.C. Standard No. 6-1		7.2.8.3
U.B.C. Standard No. 43-2		7.4.2.2.3
U.B.C. Standard No. 43-6		7.8.10.1.

NFiPA

SECTION 7.2

Standard reference number	Title	Referenced in code Section number
	Flammable and Combustible Liquids Code	7.2.4.7, 7.2.21.1
30	National Electrical Code	7.2.4.6, 7.2.24.2
70	Identification of the Fire Hazard of Materials	7.2.4.7.8.1
704	Fire Tests for Flame Resistant Textile and Film	7.2.5.1.2
701	Assembly Seating, Tents and Air Supported Structures	7.2.14.1, 7.2.28.4
102	Prevention of Fire and Dust Explosions in Grain Elevators	7.2.7.2
NFiPA B	Cellulose Nitrate Motion Picture Film	7.2.15.1
40	Single and Multiple Station Smoke Detectors or Smoke Detectors for Fire Protective Signaling Systems	7.2.11.7.1
UL 217 or 268	Roof-top Heliport Construction and Protection	7.2.16.1.2
	Manufacturing and Handling Starch	
	Prevention of Fire and Dust Explosions in Grain Elevators	
NfiPA 418	Prevention of Fire and Dust Explosions in Feed Mills	
61A	Milling of Agricultural Commodities for Human Consumption	
61B	Processing and Finishing of Aluminium	
61C	Pulvertize Fuel Systems Installation and Operation	
6D	Manufacture of Aluminium or Magnesium Powder standard for the	
65	Dust Explosion Coal Preparation Plants	
85F	Dust Explosion in the Plastics Industry Prevention of	
651	Sulfur Fires and Explosions Prevention of	
653	Dust Explosions in Woodworking and Wood floor	
654	Manufacturing Plants Prevention of	7.2.19.1
653	Dry Cleaning Plants	7.2.21.4
664	Spray Application Using Flammable and Combustible	

NfiPA
33

	Materials	
34	Dipping and Coating Processes Using Flammable or Combustible Liquids	7.2.24.1
ANSI	Loads, Minimum Design in Buildings and other Structures Building Code Requirements for	8.2.54

ASTM

Standard reference number	Title	Referenced in code Section number
90	Airborne Sound Transmission Loss of Building Partitions Laboratory Measurements of	9.2.12.2
492	Impact Sound Transmission Through Floor Ceiling Assemblies Using the Tapping Machine Laboratory Measurement of	9.2.12.3
G.A 600	Fire Resistance Design Manual	9.2.12.4
NCWA TEK 69A	STC Values of Concrete Masonry Walls	9.2.12.4
B1ATN5A	Sound Insulation Clay Masonry Walls	9.2.12.4

ASME SECTION 7.3

Standard	Title	Referenced reference number in code Section number
A 17	Elevators, Dumbwaiters, Escalators and Moving Walks Safety Code for	10.2.1.2

ANSI SECTION 7.46

Standard	Title	Referenced reference number in code Section number
Z49	Safety in Welding and Cutting	13.14.3

Title	Referenced in code Section number
	BS 6100.5.2:1984 BS 6270.1:1982 BS 1217: 1975 NCP 1:1973 N1S 158:1982 BS 1200: 196, 15.1.2 15.3.1 15.5.1 15.6, 15.7 15.7 (ii)

Standard reference number	Title
NCPM:1973 N1S 11 (1984)	
BS 12 (1978)	

Referenced in code Section number

NCP! 1 (1973} Sec.2.2 NCPI 1 (1973) Sec.6 N1S 12 N1S 13 N1S

16 16.1

16.2 16.2 16.2 (ii) 16.2ta» 16.2 (v)
(a) 16.2 (vi) 16.2 (vi)

BS/ASTM SECTION 10.4

Standard reference number	Title	Referenced in code Section number
BS 952		17.13
BS 3447: 1962		17.1.4
BS 6206: 1981		17.1.9
ASTM C126 Ceramic Glazed Structural Clay Facing Tile,	Facing Brick and Solid Masonry Units Specifications for.....	17.1.16 496

NIS/BS SECTION 10.5

Standard reference number	Title	Referenced in code Section number
NIS 117 (1981)		18.2
NIS 117 (1981) Sec.6.3		18.3.6 (c). 18.4.1
NIS 117 (1981) Sec.9.3.9.4.95		18.3.8
NIS 180 (1983)		18.6.1, 18.6.3
NIS 189 (1983)		18.6.2
BS 2989:1982		18.6.4
NIS 180.5 (1983)		18.6.5
NIS 7 (1982)		18.6.7
NIS 180.8.12: (1983)		18.6.8
BS 3660 (1976)		18.7.2
BS 1470:11972)		18.7.3
BS 1474: (1972)		18.7.4
BS 1473:(1972)		18.7.5
BS 4842 (1972)		18.7.6
BS 1420 (1945)		18.8.2
BS 2870 (1980)		18.8.5
BS 2875 (1969)		18.8.6
BS 849 (1979)		18.8.7
BS 6569 (1985)		18.8.8
BS 1178 (1982)		18.8.9

NIS/BS SECTION 10.14

Standard reference number	Title	Referenced in code Section number
NIS 11: (1974)		20.1.2
BS 12 (1978)		20.1.3
BS 1191 (1973)		20.2.0
BS 890 (1972)		20.3.1
BS 6588 (1985)		20.3.2
BS 6610 (1985)		20.3.2
BS 647 (1981)		20.4.1
BS 749 (1969)		20.4.2
BS 1203 (1979)		20.4.3
BS 1444 (1970)		20.4.5

BS SECTION 10.14 (Continued)

Standard reference number	Title	Referenced code Section number
OS 1241 (1959)		20.5.12 (ii)
BS 1242 (1960)		20.5.12 (iii)
BS 256,258,274,		20.6.1

267,268,3810,
1053(1966)
1070(19731,929,
1215,1282,1336(1971),
2521,2524(1966),
2523,
2532 (1954),
2660 (1966),
3357 (1961),
3698 (1964),
4652 (1971),

4756 (1971),
4764 (1986),

5082 (1974)
5358 (1976),
3416 (1975),
3634 (1963),
4147 (19801,

41.54(1980)	“
BS 929	20.6.3
BS 1011	20.6.6
BS 5082 H974)	20.6.8
BS 3900 (1969)	20.6.7
BS 242. 243,253, 632 (199G)	20.8.1
BS 245 (!976)	20.8.2
BS 391 (1962)	20.8.3
BS 4725i1971)	20.8.4
BS 544 11934)	20.8.7
BS 3040 (1981)	20.4.6
BS 4071 (1986)	20.4.8
BS3544	20.4.8
BS3270 (1976)	20.4.9
BS 5350	20.4.10
BS 5442	20.4.10
BS 5980 (1980)	20.4.11
BS 598 Paris 1 and 2 (1914)	20.5.1(i)
BS 598 Paris 3 (1985)	20.5.1(ii)
BS 2000 (1983)	20.5.1 (iii)
BS 5094 (1974)	20.5.1 (iv)
BS 5284 (1976)	20.5.1(v)
BS 747 Class 5 (1968)	20.5.2
BS 747 Class 1 (19B8)	20.5 3(i)
BS 747 Class 3 11968)	20.5.3.(ii)
BS 3837 (1977)	20.54
BS 4735	20.54
BS 476 Part 3	20.5.5
BS 6577 (1985)	20.5.6, 20.5.7
	23.5 10, 20.5.11
BS410	20.5.6
BS 6577	20.5.9
BS 988 (1973)	20.5.12

BS/UBC SECTION 10.21

Standard reference number	Title	Referenced in code Section number
BS 1755 (1951) BS 4901 (1976) BS 3227		21.1.2
(1980)		21.1.3
		21.4

BS 3869 (1965)	21.1.6
BS 6319	21.1.7
BS 4201 (1985)	21.2, 21.2.2
UBC Standard Section 5207	21.2.5

NCP2/NCP1 SECTION 10.22

¡¹11?

Standard reference number	Title	Referenced in code Section number
NCP2 (1973) Table 1		22.2
NCP2 (1973) Table 2		22.2
NCP2 (1973) Table 3		22.2.7
NCP2 (1973) Table 4		22.3
NCP2 (1973) Table 5		22.4
NCP2 (1973) Table 6		22.5
NCPI (1973) Part III		22.5.1
NCP2 (1973) Table 7		22.5.2
NCP2 (1973) Table 8		22.5.3
NCP2 (1973) Table 16		22.7
NCP2 (1973) Section 7:17 7.18.5.0	to	22.8.2
ASTME 84		22.9
NCP2 (1973) Section 9.2.5		22.9.2

NCP1/ASME SECTION 8

¡¹11?

Standard reference number	Title	Referenced in code Section number
NCP1 (Part 3)		24.4.1. 24.14.1 ASME A17.1
	Elevators, Dumbwaiters, Escalators and Moving Walks Safety Code for	24.8.2

AWPA/NfoPA/BS/ASTM SECTION 8.9

¡¹11?

Standard reference number	Title	Referenced in code Section number
AWPA C2 or	Pressure Treatment Lumber Bridge Tiles Timber, and Mine Ties	25.7.1
03	Pressure Treatment Piles	25.7.1

AWPI	American Wood Preservers Institute	25.7.2
AWPA C2 or C4 AWPB-FON		25.7.2
NFoPA TR7		25.7.3
BS8110(1985)	All Weather Wood Foundation System Basic Requirements, 1983 Supplement	25.7.2 25.9.2 25.9.6
25 12.4 BS8110.318 ASTM		25.144
D.1143		25.15.1, 25.16.1
ASTM A36 A252	Piles under Axial Compressive Load - Testing ..... Structural Steel - Specifications for	
A283	“	“ ..... ”
A572		“ ..... ”
A588		“ ..... ”
ASTM A416	“ Uncoated Seven Wire Stress Relieved	
	Strand for Pre-stressed Concrete Specifications for	25.18.3.2
AWPA C3	Pressure Treatment Piles.....	25.19.2
AWPB	American Wood Preservers Bureau	25.19.2
MPI	Preservative Treated Wood products -	
MP2 or MP4 AWPA M4		
	Care of	25.19.2
NFoPA TR7	All Weather Wood Foundation System	
	Basic Requirements, 198” Supplement	25.24.3

AWPA/NfoPA/BS/ASTM SECTION 9.1

i¹11?

Standard reference number	Title	Referenced in code Section number

AWPA/NfoPA/BS/ASTM SECTION 12.2

m?

Standard reference number	Title	Referenced in code Section number
ASTM E 119	Fire Test if Building Construction and	29.4.2, 29.5.2,
	Materials Methods of	29.8.8, 29.8.12,
PCI MNL 124.77	Fire Resistance of Precast Prestressed	29.1.7.9
	Concrete - Design for.....	29.4.2
GA 600	Fire Resistance Design Manual	29.4.3
ASTM E136	Behavior of Materials in a Vertical Tube	
	Furnace at 750° C. - Standard Test	29.4.8

	Method for	
ASTM E84	Surface Burning Characteristics of Building Materials Test method for	29.4.9 29.5.1, 29, 24.3. 29.24.9, 29.30.2, 29.30.3, 29.31.3, 29.31.4
AWPA C20	Fire Retardant Pressure Treatment Structural Lumber	29.5.2
AWPA C 27	Fire Retardant Pressure Treatment Plywood	29.5.2

ASTM SECTION 12.2 (Continued)

i[1]11

Standard reference number	Title	Referenced in code Section number

SECTION 15 COMPLIANCE FORMS

Forms ***Page***

SETTING OUT COMPLIANCE FORM

Project title.....

Name of owner .....

Site location ..... Plot No.

Date of commencement

Site plan	Approved	Not Approved
Building line/Set back	Observed	Not Observed
Profile/Lines	Approved	Not Approved
Datum level	Established	Not Established
Levels	Designed	Actual
Foundation		
Suspended slabs		
Deviation from approved plan, if any		
Justification		
General comment		

Professional Attestation

I attest that I have fully complied with the setting out details as designed and approved.

Name/Registration No .....

Registered Builder Signature/CARBON Seal .....

2. I certify that I have supervised the setting out details and confirm compliance with the design.

Name/Registration No .....

Registered Architect Signature/ARCON Seal .....

Date .....

Date submitted to Code Enforcement Authority .....

NB: This should be produced and signed in 5 copies.

Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

[FORM 2]

FOUNDATIONS/BASEMENT COMPLIANCE FORM

Project title					
Name of owner					
Site location			Plot No.		
Operations					
Excavations	Dimensions	Remarks			
Depth		Complied			
		Not complied			
		Justifications			
Width		Complied			
		Not complied			
		Justifications			
Shuttering/Supports	Required	Not required	Remarks		
T reatments					
Blinding	Designed thickness	Constructed thickness	Justification		

FOUNDATIONS/BASEMENT COMPLIANCE FORM — *continued*

Reinforcement cutting/placement	Complied	Not complied	Justification		
Concrete work, Foundation bases, Column beams and ground beams	Complied	Not complied	Designed strength	Achieved strength	Justification
Quality control cube test	7 days	14 days	28 days	Justification	
Testing house					
General remarks					
Foundation walls sandscrete blocks	Size	Strength	Remarks	Treatment	Justification
	Depth				
Backfilling	Depth	Progressively compacted	Rammed	Justification	
Filling/Hardcore	Depth	Material/Size	Progressively filled	Rammed	Justification

FOUNDATIONS/BASEMENT COMPLIANCE FORM — *continued*

Oversite concrete	Thickness				
	Reinforcement (if any)				
	Strength Achieved	Cube test at 7 days	Cube test at day 14 days	Cube test at day 28 days	Justification

Nature of Curing (Specify)

General remarks

Professional Attestation

Registered Builder

I certify that I have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.

Name/Registration No. of Builder

Signature/CARBON Seal

Registered Structural Engineer

I certify that this stage of work is in accordance with the structural details as designed and approved.

Name/Registration No. of Structural Engineer

Signature/CARBON Seal

Date

FOUNDATIONS/BASEMENT COMPLIANCE FORM — *continued*

Registered Architect

I certify that I supervised this stage of work and that the work is in accordance with the approved design and specifications.

Name/Registration No of Architect Signature/ARCON Seal Date

NB: This should be produced and signed in 5 copies.

Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

_____ ROOFING AND CLOSING - UP COMPLIANCE FORM

Project title					
Name of owner					
Site location			Plot No.		
Operations					
Wall plate (where applicable)	Material used	Adequacy in size	Adequacy in strength and quality	Justification	
Concrete roof slabs	Thickness				
	Reinforcement (if any)				
	Strength achieved	Cube test at 7 days	Cube test at 14 days	Cube test at 28 days	Justification

ROOFING & CLOSING - UP COMPLIANCE FORM — *continued*

FOUNDATIONS/BASEMENT COMPLIANCE FORM — *continued*

ROOFING & CLOSING - UP COMPLIANCE FORM — *continued*

Formworks /Supports	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Roof frames and structure	Designed/ Specifications	Constructed	Justification	
Roof covering	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Flashes and ridges	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Eaves and fascia boards	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Insulation (if any)	Material used	Adequacy in size	Adequacy in strength and quality	Justification

ROOFING & CLOSING - UP COMPLIANCE FORM — *continued*

Windows	Material used	Adequacy in size	Adequacy in strength and quality	Justification
External doors	Material used	Adequacy in size	Adequacy in strength and quality	Justification

General Remarks/Workmanship

Professional Attestation

Registered Builder

I certify that I have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.

Name/Registration No. of Builder

Signature/CARBON Seal

Registered Structural Engineer **ROOFING & CLOSING - UP COMPLIANCE FORM —** *continued*

I certify that this stage of work is in accordance with the structural details as designed and approved. Name/Registration No. of Structural Engineer

Signature/CARBON Seal

Registered Architect

I certify that I supervised this stage of work and that the work is in accordance with the approved design and specifications. Name/Registration No. of Architect Signature/CARBON Seal

NB: This should be produced and signed in 5 copies.
Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

SUPERSTRUCTURE COMPLIANCE FORM

Project title					
Name of owner					
Site location			Plot No.		
Operations					
Formworks /Supports	Material used	Adequacy in size	Adequacy in strength and quality	Justification	
Columns and beams Re-inforcements bars (sizes)	Designed/ Specifications	Constructed	Justification		
Concrete works quality control cube tests)	Designed strength at	7 days	14 days	28 days	Justification
	Nature of curing				
Formworks /Supports	Material used	Adequacy in size	Adequacy in strength and quality	Justification	

SUPERSTRUCTURE COMPLIANCE FORM — *continued*

Suspended floor slabs	Thickness				
	Reinforcement (if any)				
	Strength achieved	Cube test at 7 days	Cube test at 14 days	Cube test at 28 days	Justification
Staircases (where applicable)	Risers/Treads	Goings	Anti slip	Nosing	Justification
	Reinforcement				
	Strength achieved	Cube test at 7 days	Cube test at 14 days	Cube test at 28 days	Justification
Walls	Material used	Size	Design strength	Constructed	Justification
	Depth				
Painting (Burglary bars)	Material used	Adequacy in size	Adequacy in strength and quality	Justification	

SUPERSTRUCTURE COMPLIANCE FORM — *continued*

Window hoods	Material used	Size	Design strength	Constructed	Justification
	Depth				
Quality Control (Cube Test)	Designed strength at	7 days	14 days	28 days	Justification
Testing House					

General Remarks/Workmanship

Professional Attestation

Registered Builder

I certify that I have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.

Name/Registration No. of Builder

Signature/CARBON Seal

SUPERSTRUCTURE COMPLIANCE FORM — *continued*

Registered Structural Engineer

I certify that this stage of work is in accordance with the structural details as designed and approved. Name/Registration No. of Structural Engineer

Signature/CARBON Seal Date

Registered Architect

I certify that I supervised this stage of work and that the work is in accordance with the approved design and specifications. Name/Registration No.

of Architect Signature/CARBON Seal Date

NB: This should be produced and signed in 5 copies.

Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

MECHANICAL COMPLIANCE FORM

Project title				
Name of owner				
Site location			Plot No.	
Operations				
Piping and connections works	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Fittings and fitting materials	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Mechanical equipments	Equipments used	Manufacturers	Adequacy and quality	Justification
Safety systems	Equipments used	Manufacturers	Adequacy and quality	Justification
Testing	Methods used	Adequacy and effectiveness	Date	Justification
Confirmation, Compliance and Approvals	Methods used	Adequacy and effectiveness	Date	Justification
General Remarks/Workmanship				
Professional Attestation				
Registered Builder				

I certify that I have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.

Name of Registered Builder

Signature/CARBON Seal

Date

Registered Mechanical Engineer

I certify that this stage of work compiled with the structural details as designed and approved.

Name/Registration No. of Structural Engineer Signature/CARBON Seal Date

Registered Architect

I certify that I supervised this stage of work and that the work complied with the approved design and specifications.

Name/Registration No. of Architect

Signature/CARBON Seal

Date

NB: This should be produced and signed in 5 copies.
Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

ELECTRICAL COMPLIANCE FORM

Project title				
Name of owner				
Site location		Plot No.		
Operations				
Piping, conduits and connections works	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Distribution boards	Equipments used	Manufacturers	Adequacy and quality	Justification
Switch Gears	Equipments used	Manufacturers	Adequacy and quality	Justification
Change over switches	Equipments used	Manufacturers	Adequacy and quality	Justification
Patxes boxes	Equipments used	Manufacturers	Adequacy and quality	Justification
Wiring, cables, drawings, joinings and terminations	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Lightings fittings	Fittings used	Manufacturers	Adequacy and quality	Justification

ELECTRICAL COMPLIANCE FORM — *continued*

Other installations	Material equipments used	Adequacy in size	Adequacy in strength and quality	Justification
Checkings	Methods used	Adequacy and effectiveness	Date	Justification
Testing	Methods used	Adequacy and effectiveness	Date	Justification
Confirmation, compliance and approvals	Methods used	Adequacy and effectiveness	Date	Justification
General Remarks/Workmanship				
Professional Attestation				
Registered Builder				
1 certify that 1 have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.				
Name/Registration No. of Builder				
Signature/CARBON Seal				
Date				

ELECTRICAL COMPLIANCE FORM — *continued*

ELECTRICAL COMPLIANCE FORM — *continued*

Registered Electrical Engineer

I certify that this stage of work is in accordance with the structural details as designed and approved. Name/Registration No. of

Structural Engineer Signature/CARBON Seal Date

Registered Architect

I certify that I supervised this stage of work and that the work is in accordance with the approved design and specifications.

Name/Registration No. of Architect Signature/CARBON Seal Date

NB: This should be produced and signed in 5 copies.
Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

FINISHES COMPLIANCE FORM

Project title	
Name of owner	
Site location	Plot No.
Operations	

FINISHES COMPLIANCE FORM — *continued*

Internal doors	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Architraves	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Plastering (Internal Walls)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Staircases	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Plastering (Ceiling)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Flooring	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Skirtings	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Cornices	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Plastering (External Walls)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Windows hoods	Material used	Adequacy in size	Adequacy in strength and quality	Justification

FINISHES COMPLIANCE FORM — *continued*

Painting (Internal Walls)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Painting (Burglary bars)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Finishes (Internal Doors)	Material used	Adequacy in size	Adequacy in strength and quality	Justification
Finishes (Ceilings)	Material used	Adequacy in size	Adequacy in strength and quality	Justification

General Remarks/Workmanship

Professional Attestation

Registered Builder

I certify that I have physically managed the production process of this work and confirm that the quality is as designed and specified in the approved documents.

Name of Registered Builder

Signature/CARBON Seal

Date

FINISHES COMPLIANCE FORM — *continued*

Registered Structural Engineer

I certify that this stage of work is in accordance with the structural details as designed and approved.

Name/Registration No. of Structural Engineer

Signature/CARBON Seal

Date

Registered Architect

I certify that I supervised this stage of work and that the work is in accordance with the approved design and specifications. Name/Registration No.

of Architect Signature/CARBON Seal Date

NB: This should be produced and signed in 5 copies.
Number of items covered shall be taken as minimum required depending on the scale and complexity of project.

FORM NO. BC/SWO/01

STOP WORK/REMOVAL/DISCONTINUATION NOTICE

It has been observed that you have commenced the erection of a:

| | Building |^| Fence |^| Temporary structure |^| Extension

| | Renovation,

situated..... at without:

a First obtaining an approved plan;

b Complying with the specifications of the plan.

2. In accordance with Section 53 of Decree 88 of 15th December, 1992, you are hereby ordered to:-

| | Stop work forthwith,

| | Remove your structure entirely;

☐ Comply with the specifications of your approved building plan.

3. This Order takes immediate effect upon service on you in accordance with Section 54 of Decree 88 under reference and your disregard of or failure to comply with this Order lead to litigation on conviction.

4. Representations, if any, on this order should be made to the Enforcement Officer not later than

Chief Town Planning Officer

Letter Ref.....of ..... received by me.

Name of Receiver .....

Signature .....

Received/Posted/Mailed .....

Site Location .....

Served By:- Name .....

Signature .....

Date .....

(Note: Tick the boxes as appropriate, Please).

NB: This form should be produced and signed in 5 copies.

Number of items covered shall be taken as minimum required depending on the scale and complexity of project

1. For additional provisions on number of exits from Group E and H Occupancies and from rooms containing fuel-fire equipment or cellulose nitrate, (see Section 8.4.1.4).
3. Elevators shall not be construed as providing a required exit.
4. Access to secondary areas on balconies or messanines may be by stairs only, except when such secondary areas contain the only available toilet facilities.
5. Reviewing stands, grandstands and bleachers need not comply.
6. Access requirements for conference rooms, dining rooms, lounges and exhibit rooms that are part of an office use shall be the same as required for the office use.
7. Access to floors other than that closets to grade may be by stairs only, except when the only available toilet facilities are on other levels.
8. When the floor closet to the grade offers the same programs and activities available on available toilet facilities are on other level.
9. Access to floors other than that closet to grade and to garages used in connection with apartment houses may be by stairs only.

7.10.5 Open parking structures: Parking structures shall have not less than two exits from each parking tier, except only one exit is required where vehicles are mechanically